4. Environmental Consequences

4.1 Introduction

This chapter analyzes the environmental consequences, or impacts, that are expected to occur as a result of implementing the management actions described in Chapter 2. The depth and breadth of the impact analyses presented in this chapter is commensurate with the level of detail of the management actions presented in Chapter 2, and on the availability and/or quality of data necessary to assess impacts. The baseline used for expected impacts is the current conditions in the Planning Area described in Chapter 3 (Affected Environment). The analysis for the proposed plan amendment is presented by resource and organized into the following sections:

- Summary of goals and management actions that affect the resource; and
- Analysis of direct and indirect impacts and mitigation specific to the proposed plan amendment on an area-wide basis, and then to the leases subject to litigation.

Cumulative impacts are discussed in Chapter 5 (Cumulative Impacts).

4.1.1 Impact Analysis Methodology

In general, impacts to resources in the Planning Area are analyzed by determining the effects on a given resource from oil and gas leasing and development management actions that would occur for each alternative under the 2015 RFD Scenario (see Appendix B).

Impacts are related to desired future conditions by comparing the impacts from implementation of management actions to achieving the goals and objectives specified for each resource/resource program and to the existing environmental conditions. For management actions that do not achieve the stated goals and objectives or that generally do not meet BLM's multiple use mandate, or that result in significant negative changes to physical or social conditions, the impact is characterized as adverse. For management actions that do achieve goals and objectives, the impact is characterized as beneficial. If a management action does not specifically affect a desired future condition, there is no impact. Finally, if there is not enough specificity to determine whether a management action would achieve the goals and objectives, the impact can only be described in general terms.

4.1.2 Types of Impacts to be Addressed

Direct and Indirect Impacts

Terms referring to the intensity, context (geographic extent), and duration of impacts are used in this chapter. Impacts are not necessarily only negative; positive benefits are specified as such. The standard definitions for terms used in the impacts analysis include the following:

- **Adverse** – the effect is negative.
- **Beneficial** – the effect is positive.
- **Negligible** – the effect is at the lower level of detection; change would be hard to measure.
- **Minor** – the effect is slight but detectable; there would be a small change.
- **Moderate** – the effect is readily apparent; there would be a measurable change that could result in small but permanent change.
- **Major** – the effect is large; there would be a highly noticeable, long-term, or permanent measurable change.

- **Localized** – the effect occurs in a specific site or area.
- **Temporary** – the effect occurs only during implementation of a management action.
- **Short-term** – the effect occurs only for a short time after implementation of a management action.
- **Long-term** – the effect occurs for an extended period after implementation of a management action.
- **Permanent** – the effect is irreversible; the resource would never revert to current conditions.
- **Direct** – effect that occurs as a result of actions on the resource being addressed.
- **Indirect** – effect that occurs as a result from actions on other resources.

Off-site and Cumulative Impacts

Off-site impacts are impacts that occur to resources or lands outside the Planning Area as a result of BLM oil and gas leasing management actions taking place within the Planning Area.

Cumulative impacts are addressed in Chapter 5 (Cumulative Impacts). Cumulative impacts are defined as:

> *The impact on the environment which results from the incremental impact of the action when added to past, present, or reasonably foreseeable future actions, regardless of what agency or person undertakes such actions. Cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time. Cumulative impacts can result from similar projects or actions, as well as projects or actions that have similar impacts* (40 CFR 1508.7).

The time frame for the cumulative impacts analysis begins at the anticipated time the RMPA would take effect, and extends for the 15- to 20-year life of the plan.

4.1.3 Incomplete or Unavailable Information

Impacts are quantified where possible. Impacts are sometimes described using ranges of potential impacts or in qualitative terms. In the absence of quantitative data, impacts are described based on the professional judgment of the interdisciplinary team of technical specialists using the best available information. Impacts analysis based on incomplete or unavailable information is identified where applicable in this chapter.

4.1.4 Assumptions

Several general assumptions were made to facilitate the analysis of potential impacts. The assumptions listed below are common to all resources. Other assumptions specific to a particular resource are listed under that resource.

- Changes in BLM policies have been made since the 2007 RMP was approved.
- Funding and personnel would be sufficient to implement any alternative described.
- The approved RMPA would be in effect for 15 to 20 years.

4.2 Energy and Minerals

Minerals management considers the impacts on commercial/industrial development, casual use, and recreational collection of mineral resources and on energy sources. The RMPA addresses potential future oil drilling of up to 37 new wells and the associated 206 acres of ground disturbance and potential impacts that would restrict or limit the development of solid mineral resources on Federal mineral estate. An impact would occur if oil well drilling and development restricted access to other minerals or energy development.

4.2.1 Introduction

Oil and gas exploration and production and limited salable mineral production currently take place in the Central Coast Field Office Planning Area. Currently, no commercial-scale solar and wind energy development exist within the CCFO Planning Area on BLM-administered lands. Commercial-scale wind is unlikely to be developed on BLM-administered lands in the CCFO Planning Area because wind resources are poor. It is unlikely that commercial-scale solar projects would be developed on BLM-administered land in the CCFO Planning Area because most of the land does not have less than 5 degree slope. While it is possible to build solar projects on areas with a greater than 5 degree slope, such projects would require more grading and would be less commercially viable at a commercial-scale. These resources are not discussed further in this section.

This RMPA/EIS goal for energy and mineral resource management is to allow development of energy and mineral resources to meet the demand for energy and mineral production while protecting natural and cultural resources in the area.

To achieve this goal, the following objectives related to oil and gas leasing and development would be established:

- Balance responsible mineral resource development with the protection of other resource values;
- Provide opportunities for mineral exploration and development under the mining and mineral leasing laws; and
- Provide mineral materials needed for community and economic purposes.

The Management Actions from the 2007 HFO RMP and new management actions for oil and gas leasing are presented in Section 2.10.

Types of Impacts

Direct impacts to minerals are considered to be those that prohibit the development of Federal mineral estate. Indirect impacts include where new oil well drilling sites or expansion of existing fields restrict access to surface mineral deposits and limit the overall production. It is unlikely that a single new well site covering 1 to 2 acres would completely affect the feasibility of developing a profitable commercial sand and gravel or building stone quarry. Multiple well pads could potentially reduce the feasibility of developing a sand and gravel or building stone quarry. In some cases it may be possible to access deep petroleum resources using directional drilling techniques without limiting future development of mineral deposits. Shared access roads and joint development of solid mineral and oil and gas resources, where coincident, are commonly practiced where feasible and without conflict.

Assumptions

- The same level of oil and gas development under the 2015 RFD Scenario would apply to Alternatives A, C, D, and E (i.e., up to 37 exploratory and development wells on 206 acres of disturbance). Alternative B assumes up to 32 exploratory and development wells on up to 179 acres of disturbance.

- All surface-disturbing activities related to the 2015 RFD Scenario would likely occur on BLM-administered mineral estate in Fresno, Monterey, and San Benito Counties within the area of high oil and gas occurrence potential (shown in Figure 5-1) for the CCFO Planning Area but could occur in any open areas throughout the CCFO Planning Area.
- Most new oil and gas well locations developed under the 2015 RFD Scenario would likely be within, or proximate to, established producing oil and gas fields or near lands that are already leased for such activities.
- Sand and gravel needed for construction on the oil and gas leases would be minor given the limited amount of new roads. Sand used in well stimulation generally is not mined in California (DOC, 2015).
- Ancillary facilities for oil and gas production (e.g., pipelines, compressor stations, etc.) and downstream activities such as oil processing at refineries and natural gas transmission and distribution are separate activities that would not be substantially affected by the RFD Scenario, aside from the need to carry produced oil and gas to the existing transmission pipeline network over a distance that is likely to be less than 10 miles.

4.2.2 Impacts Common to All Alternatives

Drilling of up to 37 new oil and gas wells on Federal oil and gas leases with approximately 206 acres of surface land occupancy could locally impact access to surface mineral deposits. An impact would occur if some or all of the mineral resource could not be developed. However, the temporary nature of many oil well sites would not completely restrict access to other minerals. Similarly, existing mines would not completely interfere with the future oil well drilling as directional drilling techniques would make petroleum targets accessible. Consequently, temporary restrictions to mineral access would occur only where future well drilling sites are permitted within known mineral resource areas. The worst-case scenario (i.e., 37 wells and 206 acres of surface disturbance) is assumed for each alternative herein.

For all alternatives, oil and gas exploration and development could occur in any of the Federal estate lands within the CCFO Planning Area and could potentially affect access to surface mineral deposits.

For all alternatives, the leases subject to the settlement agreement are located in hillside areas not currently supporting active mines. The Vallecitos field is located north of the historic New Idria mercury mine. The Carmel Stone Mine (Section 28, T22S, R9E), a Monterey Shale surface mine, is located within one lease located approximately 6 miles west of San Ardo and just north of Williams Hill.

4.2.3 Impacts of Alternative A (No Action)

Alternative A has the most acres open (available with standard lease stipulations and endangered species stipulations) to oil and gas leasing and provides the most flexibility for oil and gas development and would not affect potential future operations. Impacts to surface mineral deposits would be the same as described in Section 4.2.2 but could occur within a larger area.

Alternative A would utilize the 2015 RFD Scenario while continuing current management under the existing 2007 HFO RMP (BLM, 2007).

The existing 2007 HFO RMP developed the following Management Actions under other resource programs that could impact energy and mineral development:

- **Social and Economic Conditions.** Management actions specified for social and economic conditions address varying degrees of promoting commodity development in the Planning Area, which can affect the degree to which energy and minerals development can be implemented economically.
- **Transportation and Access.** Several management actions for transportation and access impose limitations on vehicle use, development of new roads, and closure of existing road networks in the Planning

Area. Since energy and minerals development requires the use of vehicles and potentially new road construction, this resource program has the potential to significantly affect the ability to develop these resources.

- **Land Tenure Adjustments.** Disposal of BLM-managed lands with high potential for energy or mineral production would have an adverse impact on the development of these resources if the lands acquired were restricted for such use, either by private owners or other public entities.

Mitigation

Mitigation Measure EM-1 addresses the potential conflict of access between surface mineral resources and future oil well drilling. The measure outlines the procedures that could be implemented to lessen the degree of potential adverse energy and mineral impacts from development of oil and gas leases under Alternative A. During review of whether to accept or deny project proposals, BLM managers could decide to attach additional stipulations or measures, such as the following, to minimize or avoid potential energy and mineral effects.

EM-1 **Review Mineral Potential.** A lease application shall include a review of historic and recent mining activity within or directly adjacent to the lease boundary. The review shall also include a review of mineral resource potential for metallic deposits, sand and gravel, diatomaceous earth, building stone and other industrial minerals. The review may include opportunities to share access roads and to locate new well sites to avoid areas with moderate to high potential for these resources.

Leases Subject to Settlement Agreement – Subalternative 1

The 14 non-NSO leases as identified in Case No. 11-06174 and Case No. 13-1749 would be issued. As such, no impact would occur to potential lease holders.

The 14 non-NSO leases as identified in Case No. 11-06174 and Case No. 13-1749 are located in areas near or within historic or recent mine areas. Consequently, implementation of Mitigation Measure EM-1 is required before granting the lease or included as a lease stipulation.

Leases Subject to Settlement Agreement – Subalternative 2

The two non-NSO leases as identified in Case No. 11-06174 should not have been issued, and the 12 prospective non-NSO leases as identified in Case No. 13-1749 would not be issued. As such, no resource impact would occur.

4.2.4 Impacts of Alternative B

Alternative B would limit leasing to existing oil and gas fields defined by DOGGR with 754,000 acres closed to leasing. This alternative provides the least flexibility for oil and gas operators, and would limit the locations where future exploratory wells could be drilled. The open areas could experience drilling of up to 32 new wells and would have the same potential for creating mineral access restriction in these areas. Impacts to surface mineral deposits would be the same as described in Section 4.2.2 but could occur within a smaller area.

Mitigation

Mitigation Measure EM-1 would apply to Alternative B.

Leases Subject to Settlement Agreement

Under Alternative B, the majority of BLM-managed areas that contain the 14 non-NSO leases would be closed to leasing.

Under Alternative B, the majority of BLM-managed areas that contain the 14 non-NSO leases would be closed to leasing. The area that remains open would not be near existing mineral operations so the leases would be unlikely to have any effects to minerals.

4.2.5 Impacts of Alternative C

Alternative C would limit leasing to high oil and gas occurrence potential areas with over 394,400 acres closed to leasing. This alternative provides less flexibility for oil and gas operators than Alternative A but more than Alternative B. The open areas could experience drilling of up to 37 new wells and would have the same potential for creating mineral access restriction. Impacts to surface mineral deposits would be the same as described in Section 4.2.2 but could occur within a smaller area.

Mitigation

Mitigation Measure EM-1 would apply to Alternative C.

Leases Subject to Settlement Agreement

The majority of the14 non-NSO leases as identified in Case No. 11-06174 and Case No. 13-1749 would be open. As such, no impact would occur to the potential lease holders.

The 14 non-NSO leases as identified in Case No. 11-06174 and Case No. 13-1749 are located in areas near or within historic or recent mine areas. Consequently, implementation of Mitigation Measure EM-1 is required before granting the lease or included as a lease stipulation.

4.2.6 Impacts of Alternative D

Alternative D would limit leasing to Federal mineral estate underlying BLM surface estate areas with 655,400 acres closed to leasing. This alternative provides less flexibility for oil and gas operators than Alternative A and Alternative C but more than Alternative B. The open areas could experience exploration by up to 37 new wells and would have the same potential for creating mineral access restriction. Impacts to surface mineral deposits would be the same as described in Section 4.2.2 but could occur within a smaller area.

Mitigation

Mitigation Measure EM-1 would apply to Alternative D.

Leases Subject to Settlement Agreement

Under Alternative D, the majority of BLM-managed areas that contain the 14 non-NSO leases would be closed to leasing.

Under Alternative D, the majority of BLM-managed areas that contain the 14 non-NSO leases would be closed to leasing. The area that remains open would not be near existing mineral operations so the leases would be unlikely to have any effects to minerals.

4.2.7 Impacts of Alternative E

Alternative E would allow leasing in Federal mineral estate outside of California DWR designated groundwater basins and sub-basins with 99,400 acres closed to leasing. This alternative provides less flexibility for oil and gas operators than Alternative A but more than Alternative B, Alternative C, and Alternative D. The open areas could experience exploration by up to 37 new wells and would have the same potential as Alternative A for creating mineral access restriction. Impacts to surface mineral deposits would be the same as described in Section 4.2.2 but could occur within a smaller area.

Mitigation

Mitigation Measure EM-1 would apply to Alternative E.

Leases Subject to Settlement Agreement1

The majority of the14 non-NSO leases as identified in Case No. 11-06174 and Case No. 13-1749 would be open; however approximately 7,000 acres would be subject to NSO limiting the lease holder operations.

The 14 non-NSO leases as identified in Case No. 11-06174 and Case No. 13-1749 are located in areas near or within historic or recent mine areas. Consequently, implementation of Mitigation Measure EM-1 is required before granting the lease or included as a lease stipulation.

4.3 Geology

A wide range of potential impacts, including land subsidence, expansive soils, landslides and seismically induced landslides, and seismic hazards of surface fault rupture and strong ground shaking, were considered for the CCFO Planning Area and potential well drilling sites. Geologic formations, slope conditions, and proximity to active faults were considered by their potential to contribute to geologic hazards. Areas prone to risk for potential adverse impacts due to existing geologic, topographic, or soils conditions were identified and their relationship to proposed project components analyzed. Where existing conditions suggest a potential risk or impact, mitigation measures were identified to reduce the risk or impact.

4.3.1 Introduction

The 2007 RMP includes no specific geologic hazard management actions.

Assumptions

- The same level of oil and gas development under the 2015 RFD Scenario would apply to each alternative (i.e., 37 exploratory and development wells on 206 acres of disturbance).
- All surface-disturbing activities related to the 2015 RFD Scenario would likely occur on BLM-administered lands in Fresno, Monterey, and San Benito Counties within the area of high oil and gas occurrence potential (shown in Figure 5-1) for the CCFO Planning Area but could occur on any open lands throughout the CCFO Planning Area.
- Ancillary facilities for oil and gas production (e.g., pipelines, compressor stations, etc.) and downstream activities such as oil processing at refineries and natural gas transmission and distribution are separate activities that would not be substantially affected by the RFD Scenario, aside from the need to carry produced oil and gas to the existing transmission pipeline network over a distance that is likely to be less than 10 miles.

4.3.2 Impacts Common to All Alternatives

A geologic hazard impact is considered significant if people, property or the environment experience adverse effects or a loss. Typically earthquake ground shaking and fault rupture hazards are considered for structures where human occupancy occurs for extended periods of time (residence or work facilities). However, ground shaking or fault rupture within oil field areas that results in damage to an oil well (cement seals or casing failure), leaks of hazardous materials or chemicals, or ruptures of crude oil pipelines could also impact the environment. Although liquefaction potential and expansive soils are site-specific issues that may not affect many locations in the Planning Area, they should be evaluated before designing and constructing long-term storage tank facilities for oil or hazardous chemicals. Landslides could damage access roads and pipelines resulting in risk of injury or spills of chemicals or crude oil. The extraction of oil and gas, including the use of enhanced recovery practices, and groundwater can lead to land subsidence and a permanent reduction in aquifer storage (CCST, 2014). The amount of subsidence would depend on local conditions, including how much water is withdrawn and from where (CCST, 2014). One study of oil and gas fields in Houston found that oil and gas withdrawal was responsible for a very small portion of the total observed land subsidence (Holzer and Bluntzer, 1984). There are also many instances where enhanced recovery projects resulted in significant land deformation and subsidence (Taylor *et al*., 2014). As described in Section 4.7 (Groundwater Resources), groundwater use for well stimulation treatments in the RFD Scenario is expected to be very small (up to 55 acre-feet per year). Consequently, the anticipated land subsidence impacts are minor. A more detailed analysis of potential impacts to aquifer storage and land subsidence would be required on a site-specific basis as appropriate.

The potential for induced seismicity due to hydraulic fracturing or fluid disposal in Class II injection wells as they are currently carried out is considered to be low (CCST, 2014). Stimulation activities applied

at the scale presently employed in other regions of the U.S. currently requires the disposal of much larger volumes of both flowback water from the stimulations themselves and produced water resulting from increased and expanded production, which could increase the hazard (CCST, 2014).

In March 2015, the BLM issued a final rule regarding hydraulic fracturing on Federal and Indian lands intended to reduce risks to resources and the environment. 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). The following describes the effects of hydraulic fracturing on induced seismicity with and without implementation of the final rule.

The BLM hydraulic fracturing rule does not include specific provisions that address induced seismicity. As noted in the final rule, the research on the phenomena of induced seismicity from hydraulic fracturing operations is still ongoing and inconclusive. For hydraulic fracturing operations proposed in seismically active areas or when the BLM determines through the internal and public scoping process that seismic impacts are an issue, risks of induced seismicity would be evaluated through the NEPA analysis, including analysis of the proposed drilling and fracturing operations. The final regulations require submittal of additional geologic information prior to hydraulic fracturing to help further that review.

Under SB 4, hydraulic fracturing and fluid disposal are regulated by DOGGR through permit applications for well stimulation. Oil and gas developers would be 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). These regulations include cessation of hydraulic fracturing within the specified radius until DOGGR has completed the evaluation of whether there is a causal relationship between the detected earthquake and the hydraulic fracturing. Regardless of whether the BLM hydraulic fracturing rule is upheld or overturned, the regulations under SB 4 would be implemented on BLM-administered land in California and would reduce potential effects of induced seismicity.

The CCFO has developed BMPs and SOPs related to geologic hazards and oil field development activities (Appendix D). These include:

- Civil engineering studies or geotechnical studies may be required to determine feasibility prior to road or other construction. Construction in areas of extremely unstable bedrock formations and active landslides will not be permitted or would require special design criteria.
- New wells and roads should be located in areas where cut and fill shall be minimized to the extent practicable.

4.3.3 Impacts of Alternative A (No Action)

Alternative A would utilize the 2015 RFD Scenario while continuing current management under the existing 2007 HFO RMP. The potential effects of drilling up to 37 new oil and gas wells would include oil and gas well drilling or construction of access roads and pipelines near or across active faults, grading access roads and drill pads on potential unstable slopes or existing landslides, and construction of facilities on potentially liquefiable or expansive soils. Induced-seismic effects of hydraulic stimulation are the same as those described in Section 4.3.2.

Mitigation

GEO-1 **Avoid Active Fault Zones.** The applicant shall provide documentation to BLM that the location and trend of the proposed well will not be within or enter into and have adequate setback from an active Alquist-Priolo Earthquake Fault Zone, unless the applicant can show to BLM's satisfaction that the well drilling or stimulation treatment (including hydraulic fractur-

ing) will not be affected by rupture of a known fault, seismically induced ground shaking, and/or ground failure. The Application for Permit to Drill (APD) shall include a geologic report identifying Alquist-Priolo faults and proximity to access roads and drill pads.

GEO-2 **Prepare an Earthquake Response Plan.** For well sites located within 1.0 mile of an Alquist-Priolo Earthquake Fault Zone prepare and submit to the BLM for approval an Earthquake Response Plan outlining post-earthquake inspection and repair plans to evaluate any damage that has occurred. The plan shall include spill prevention, control and countermeasure plans to address hazardous materials associated with well drilling and well stimulation activities.

GEO-3 **Prepare a Geotechnical/Geologic Report.** As part of the APD for well drilling the applicant shall submit to BLM a geotechnical and geologic report addressing potential geologic hazards, including liquefaction and expansive soil risk, at new facilities, pipelines, or tank batteries. Landslide hazard areas and potentially unstable slopes shall be identified and evaluated for access roads and drill pads.

Leases Subject to Settlement Agreement – Subalternative 1

The 14 non-NSO leases as identified in Case No. 11-06174 and Case No. 13-1749 would be issued and are located in areas with active faults, landslides and potentially unstable slopes, and potential expansive soils. Consequently, implementation of Mitigation Measures GEO-1, GEO-2, and GEO-3 are required before granting the lease or be included as a lease stipulation.

Leases Subject to Settlement Agreement – Subalternative 2

The two non-NSO leases as identified in Case No. 11-06174 should not have been issued, and the 12 prospective non-NSO leases as identified in Case No. 13-1749 would not be issued. As such, no resource impact would occur.

4.3.4 Impacts of Alternative B

Alternative B would limit leasing to existing oil and gas fields defined by DOGGR with 754,000 acres closed to leasing. The open areas could experience exploration by up to 32 new wells and would have the same potential for expansive soils and landslides as Alternative A. Alternative B has three small open lease areas near active faults.

Mitigation

Mitigation Measures GEO-1, GEO-2, and GEO-3 would apply to Alternative B.

Leases Subject to Settlement Agreement

Under Alternative B, the majority of BLM-managed mineral estate that contain the 14 non-NSO leases would be closed to leasing. If new wells were drilled in the open areas over the next 15 years, they would have the same geologic hazard impacts and mitigation as Alternative A.

4.3.5 Impacts of Alternative C

Alternative C would limit leasing to high oil and gas potential areas with 394,400 acres closed to leasing. The open areas could experience exploration by up to 37 new wells and would have the same potential for geologic hazards as Alternative A.

Mitigation

Mitigation Measures GEO-1, GEO-2, and GEO-3 would apply to Alternative C.

Leases Subject to Settlement Agreement

The majority of the14 non-NSO leases as identified in Case No. 11-06174 and Case No. 13-1749 would be in areas open under this alternative. If new wells were drilled in the open areas over the next 15 years, they would have the same geologic hazard impacts and mitigation as Alternative A.

4.3.6 Impacts of Alternative D

Alternative D would limit leasing to Federal mineral estate underlying BLM surface estate areas with 655,400 acres closed to leasing. The open areas could experience exploration by up to 37 new wells and would have the same potential for strong ground shaking, expansive soil, and landslide hazards as Alternative A. Alternative D includes very limited lease areas near the potentially active Rinconada fault.

Mitigation

Mitigation Measures GEO-2, and GEO-3 would apply to Alternative D.

Leases Subject to Settlement Agreement

Under Alternative D, the majority of BLM-managed mineral estate that contain the 14 non-NSO leases would be closed to leasing. If new wells were drilled in the open areas over the next 15 years, they would have the same geologic hazard impacts and mitigation as Alternative A.

4.3.7 Impacts of Alternative E

Alternative E would allow leasing in Federal mineral estate outside of California DWR designated groundwater basins and sub-basins with 99,400 acres closed to leasing. The open areas could experience exploration by up to 37 new wells and would have the same geologic hazard impacts as Alternative A.

Mitigation

Mitigation Measures GEO-1, GEO-2, and GEO-3 would apply to Alternative E.

Leases Subject to Settlement Agreement

The majority of the14 non-NSO leases as identified in Case No. 11-06174 and Case No. 13-1749 would be in areas open under this alternative. If new wells were drilled in the open areas over the next 15 years, they would have the same geologic hazard impacts and mitigation as Alternative A.

4.4 Hazardous Materials and Public Safety

This section addresses the U.S. Bureau of Land Management's (BLM's) Best Management Practices (BMPs) and Standard Operating Procedures (SOPs) for the proper management of hazardous materials to protect human health and the environment. This section also describes the types of potential impacts that Alternatives A through E could have related to hazardous materials on the environment and to public safety in the BLM Central Coast Field Office (CCFO) Planning Area. It addresses the types of mitigation that could be implemented to minimize impacts, where applicable.

4.4.1 Introduction

Approach to Impact Assessment

The Resource Management Plan Amendment (RMPA) alternatives would allow oil and gas development in identified areas of the BLM CCFO Planning Area. Oil and gas development involves extracting fluid minerals from the earth using various methods described in the Reasonably Foreseeable Development (RFD) Scenario (see Appendix B). The regional setting (see Section 3.4.3) and current conditions (see Section 3.4.4) reflect certain existing hazards of upset conditions associated with existing oil and gas production, well drilling, well stimulation treatments, transportation systems, and processing facilities.

The routine, non-routine, accidental, and upset conditions associated with oil and gas development potentially pose a risk to the environment and public health and safety. An upset is outside the expected normal operating conditions (e.g., loss of well containment during drilling, or piping leak during production, release of toxic gas such as hydrogen sulfide, etc.). The hazards of both routine and upset conditions of oil and gas development activities are considered in this analysis.

This analysis reviews possible risks associated with the exposure to hazards, the use of hazardous materials, and possible generation of hazardous wastes. The analysis describes the potential risk of upset and impacts to the environment and public and worker safety. Hazards include conditions that could potentially affect worker health and safety and possibly the nearby public at large. Examples include exposure to hazardous materials, such as naturally occurring substances (e.g., asbestos and/or heavy metals), chemicals or hazardous waste, or to physically hazardous situations, as may occur in areas of high wildfire potential or in proximity to unstable slopes or landslides.

Management Common to All Alternatives

Public health and safety is an aspect of the BLM management rather than an environmental component resource. Consequently, impacts to public health and safety are a direct result of the management actions in other resource programs. The discussion of the effects on public health and safety in each alternative would be limited to the effects in areas where hazardous materials could be present due to oil and gas exploration or development activities, access to areas in terms of response time to hazardous materials releases, and vehicle traffic.

The existing 2007 HFO RMP established the following objectives to achieve goals for hazardous materials and public safety management:

- Identify and control imminent hazards or threats to human health and/or the environment from hazardous substance release on public lands (e.g., abandoned mine lands (AML) sites).
- Reduce hazardous waste produced by BLM activities and from authorized uses of public lands through waste minimization programs that include recycling, reuse, substitution, and other innovative, safe, cost-effective methods of pollution prevention.
- Ensure that authorized activities on public lands comply with applicable Federal, State, and local laws, policies, guidance, and procedures.

- Promote working partnerships with states, counties, communities, other Federal agencies, and the private sector to prevent pollution and minimize hazardous waste on public lands.
- Protect visitors from risks associated with AMLs and former military lands having unexploded ordnance from either safety hazards and/or environmental releases of chemicals of concern.

The Hazardous Materials and Public Safety Management Actions from the 2007 HFO RMP include:

- **HAZ-COM1.** Maintain an inventory of hazardous materials sites, including abandoned mine sites, BLM facilities, and former military facilities (i.e., Fort Ord).
- **HAZ-COM2.** Ensure that all BLM-authorized activities comply with Federal, State, and local hazardous materials laws and regulations.
- **HAZ-COM3.** Reduce the use of Federal funds for clean-up of contaminated lands by seeking cost avoidance and/or cost recovery from the legally responsible parties.
- **HAZ-C1.** Evaluate existing trails and roads for sediment production and drainage in areas where naturally occurring asbestos (NOA) and heavy metals are likely to be present.
- **HAZ-C2.** Conduct air quality analyses to determine the presence and potential exposure to NOA during common activities in an area of potential concern.
- **HAZ-C3.** Where NOA is present at hazardous levels, post signs and/or inform users that NOA is present, what the risks are, and how users can avoid exposure.

By design, BLM BMPs, Oil and Gas SOPs, and Implementation Guidelines (Appendix D) are in place to reduce the potential for public safety impacts during oil and gas exploration and production by implementing measures that require hazardous materials to be stored in sealed containers, prompt response to cleanup, the standardized use of drip pans and secondary containment, and the proper containment and disposal of produced water and flowback fluids following well stimulation activities. The SOPs and Implementation Guidelines include Subsection 1.8.5, which describes BLM requirements for drilling new wells. While these SOPs have a particular focus on reducing environmental impacts, some of the requirements also reduce public health impacts and safety hazards due to the presence (or expected presence) of hazardous materials. The following are examples of those requirements:

- All liquids shall be in closed, covered containers. Any spills of hydrocarbon/hazardous substances shall not be left unattended until clean-up has been completed.
- A spill prevention plan must be submitted to BLM prior to project approval for new wells, well completion or work-overs, installation of new facilities (buildings, tanks, pipelines, production equipment, etc.), routine maintenance activities and well abandonments. The prevention plan must identify a Spill Response Team, comprised of State and Federal emergency response agencies and provides contact numbers for each representative or representative agency.
- Install plunger lifts and smart automation systems, which monitor well production parameters to reduce methane emissions from well blowdowns.
- Reduce fugitive gas leaks by implementing a Directed Inspection and Maintenance program, which identifies and effectively fixes fugitive gas leaks using leak detection (e.g., infrared camera(s), organic vapor analyzer(s), soap solution, and/or ultrasonic leak detector(s)) and measurement (e.g., calibrated bagging, rotameters, high volume samplers). Note: Fugitive emissions are often a precursor of larger leaks.
- Require that operators obtain and maintain as current 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 (COA) could be specifically designed and applied by BLM to protect groundwater include; zone isolation, general casing depth and cement requirements, pressure testing, casing integrity testing, fluid surveys, and/or wellhead monitoring.

- Design roads, well pads, and facilities for exploratory wells to impact and fragment the least acreage practicable. New facilities shall be designed to maintain natural drainage and runoff patterns. Non-commercial wells shall be restored as soon as appropriate using BLM restoration methods.
- Timely plugging and abandonment of depleted wells will be required. This includes plugging the well bore with cement, removing all materials and equipment, and recontouring/revegetation of well site as specified in the conditions of approval.
- Sufficiently impervious secondary containment, such as containment dikes, containment walls, and drip pans, should be constructed and maintained around all qualifying petroleum facilities, including tank batteries and separation and treating areas consistent with the U.S. EPA Spill Prevention, Control, and Countermeasure regulation (40 CFR 112).
- The appropriate containment and/or diversionary structure would be sufficiently impervious to oil, glycol, produced water, or other fluid and would be installed so that any spill or leakage would not drain, infiltrate, or otherwise escape into the ground, surface, or navigable waters before clean-up is completed.
- Proper containment of oil and produced water in tanks, drilling fluids in reserve pits, and locating staging areas away from drainages would prevent potential contaminants from entering surface waters.
- Chemical containers should not be stored on bare ground or exposed to the sun and moisture. Labels must be readable. Chemical containers should be maintained in good condition and placed within secondary containment in case of a spill or high velocity puncture. All secondary containment must be designed to preclude entry from wildlife and livestock.
- Set and cement surface casings to sufficient depths to protect water bearing zones outside of the production zone(s).
- Consider the use of a closed loop drilling system. In the absence of a closed loop system, tanks and pits must be designed to preclude the entry of wildlife and livestock.
- Produced water from oil and gas operations would be disposed of in accordance with the requirements of Onshore Oil and Gas Order #7.
- Construction activities that disturb one or more acres of soil or less than 1 acre but are part of a larger common plan of development or sale having the potential to disturb one or more acres (includes clearing, grading, and ground disturbances such as stockpiling or excavation) are required to obtain coverage under the General Permit for Discharges of Stormwater Associated with Construction Activity (Construction General Permit, Order 2009-0009-DWQ) and manage construction in accordance with permit requirements.

Types of Impacts

Potential hazardous materials and public safety effects include the hazards associated with oil and gas exploration and production; risks associated with contact with produced fluids and well stimulation treatment chemicals; vehicular travel on county, the BLM- and operator-maintained roads; firearms accidents near oil and gas facilities during hunting season and by casual firearms use such as target shooting; and natural events such as range fires.

Areas with intensively developed oil fields that remain open to public access may result in the exposure of the public to a hazardous industrial environment including the dangers associated with hydrogen sulfide or methane gas and petroleum production. Active oil fields and active well sites are industrial areas where permissible public access would be carefully evaluated. In certain cases, access can be limited or restricted where active drilling, well stimulation, or other well workover activity is occurring.

This section considers the following types of hazards:

- A hazard to the public created through the routine transport, use, or disposal of hazardous materials.
- A hazard to the public created from changes in air quality, although concentrations of NOx, SOx, and/or ozone potentially above the National Ambient Air Quality Standards (NAAQS) (see Section 4.5, Air Quality).
- A hazard to the public created by increased vehicle traffic associated with oil and gas exploration and development including well stimulation activities.
- A hazard to the public created through conditions involving the increased risk of the release of hazardous materials (airborne and liquid spills).
- A hazard to the public created through conditions involving the increased risk of gas releases (toxicity/ flammability).
- A hazard to the public created by intensively developed oil fields that remain open to public access may result in the exposure to a hazardous industrial environment (toxic or flammable materials).
- Fracturing-induced seismic events (see Section 4.3, Geology).
- Oil leaks from field gathering and intrastate crude pipelines.

Key attributes that affect the indicators are:

- Number of wells and related infrastructure;
- Acres where oil and gas exploration and development could occur; and
- Response time to hazardous materials incidents or vehicle accidents.

Assumptions

The analysis uses the following key assumptions:

- Hazardous materials and wastes are used and generated during oil and gas well development.
- With increased oil and gas exploration and development comes an inherent risk associated with an increase in the amount of hazardous materials used, generated, transported, and stored.
- While steam injection has been the primary enhanced oil recovery (EOR) technique applied to the fields, EOR and well stimulation treatments including hydraulic fracturing can be expected to be utilized.
- Oil and gas development may involve well stimulation treatments. For this analysis, hydraulic fracturing has been selected as the most likely well stimulation technology employed, since it involves the most logistics and potentially has the most health and safety impacts. Recent oil and gas activity in the CCFO Planning Area has involved only limited levels of well stimulation by hydraulic fracturing. In the Fresno County portion of the CCFO Planning Area, which has the highest level of well stimulation activity, 4 percent of recently producing wells indicate any record of previous hydraulic fracturing (see Appendix B, Table 2). No records of hydraulic fracturing were found for the Lynch Canyon and San Ardo fields.
- With the exception of San Ardo, the crudes from the CCFO Planning Area are considered sweet (<0.5% sulfur) or semi-sweet (<0.8% sulfur). Lacking information on the hydrogen sulfide concentrations in produced gas, we presume for the sweet crudes it is below the level where it poses a short-term acute health risk. A conservative value used for emergency response planning guidelines (ERPG) is 100 parts per million (ppm) for a 60 minute exposure or a dose of 6,000 ppm-min. For a 15 minute exposure, the concentration would be 400 ppm for the same dose. This analysis discusses the potential hazard, in the event the H_2S levels in produced gas may occur at higher levels (above 0.8% sulfur).

- Most of the exploration and production wastes generated during oil and gas exploration and development activities would be exempt from the Resource Conservation and Recovery Act (RCRA) hazardous waste regulations (e.g., produced water, produced oil, chemicals used for drilling and completion). Exempt waste material and debris from drilling would be classified as solid waste rather than hazardous materials because of the exemption for oil and gas exploration and development.
- Management of non-exempt hazardous materials, substances, and waste (including storage, transportation, and spills) would be conducted in compliance with 29 CFR 1910 (Occupational Safety and Health Standards), 49 CFR 100-185 (Pipeline and Hazardous Materials Safety Administration, U.S. Department of Transportation), 40 CFR 100-400 (Protection of the Environment, EPA), Comprehensive Environmental Response Compensation and Liability Act (CERCLA), Oil Pollution Act (OPA), RCRA, Toxic Substances Control Act, Clean Water Act, and other Federal and State regulations and policies regarding hazardous materials management.
- The BLM's Hazard Management and Resource Restoration Program would respond to accidental surface releases of hazardous material on the BLM-administered public land. Containment and emergency cleanup actions would be implemented on sites posing a threat to the public safety and/or the environment.
- BLM's oil and gas inspection and enforcement program aids in reducing the risks associated with negligent release of hazardous chemicals into the environment.
- The population would continue to increase, and there would be a corresponding increase of use of public lands.
- Promotion of the areas within the CCFO Planning Area as vacation and outdoor recreational destinations by the public would continue and could potentially result in an increasing number of visitors encountering hazards on public lands.
- Vehicle traffic would increase in proportion to oil and gas exploration and development.

4.4.2 Impacts Common to All Alternatives

The RFD Scenario (i.e., between zero and 37 development and exploratory wells with approximately 206 acres of surface disturbance over the next 15 to 20 years on Federal mineral estate in the Planning Area) would occur under all of the alternatives. The worst-case scenario (i.e., 37 wells and 206 acres of surface disturbance) may occur for each alternative herein. Therefore, any hazards and impacts related to gross well count (e.g., increased vehicle traffic, worker exposure, chemical use for well stimulation treatments) will be similar for all alternatives.

The oil and gas development would be as defined by the 2015 RFD Scenario (Appendix B). The well locations are non-specific, but some development would be expected on current leases near the existing Coalinga and San Ardo fields. The development is also expected to require up to 10 miles of new transmission pipeline to allow oil and gas production to be connected to existing oil and gas transportation systems. Under all alternatives, 37 new wells would be developed regardless of the range of options for closure of lands to oil and gas development.

Natural Hazards and Hazards of Oil and Gas Development

During well drilling, hazardous materials such as equipment maintenance fluids and fuels, oil, and hydraulic fluid would be used and stored at the well site and nearby staging areas. During hydraulic fracturing, acid well stimulation, or EOR — additional hazardous chemicals including acid and fluid additives would be expected to be located on the proposed project site (e.g., activator, biocide, breaker, and surfactant) (DOC, 2015). Spills and leaks of hazardous materials during well drilling, well stimulation, and maintenance activities could result in impacts to soil or groundwater.

In oil and gas operations, as with most industrial activities, the general public typically is either physically excluded or not permitted on the project site. This reduces the potential for the public to be exposed to specific site hazards. Leases for oil and gas development in the CCFO Planning Area are typically in remote areas, which would limit the number of unauthorized visitors, or fenced so as to prevent unauthorized access. Natural hazards related to wildland fire may also occur in the oil field sites.

For workers employed at an oil and gas field site, there is the potential to be exposed to hazardous materials. Hazardous materials are those materials considered to be toxic, corrosive, flammable, reactive, irritating, and strongly sensitizing. The use of such hazardous materials may pose a threat to human health and/or the environment through routine emissions and/or accidental releases.

Additional hazards are posed by operations. These include vehicle and equipment accidents, equipment noise, direct electrical hazards from power lines and generators, and exposure to chemicals in commonly used products such as gasoline, paint, and cleaning agents. Hazards may also occur due to fire, explosion, fugitive natural gas emissions, and improper storage of hazard materials and/or wastes.

At work sites, hazards are commonly identified and described in written and approved on-site health and safety plans that include appropriate emergency procedures, telephone numbers, routes to the nearest hospital emergency room or trauma center, and mitigation measures. Prior to project commencement, operators will require health and safety plans to be read, discussed, and signed by all on-site workers and supervisors.

For the purposes of this environmental analysis, hazards and hazardous materials associated with oil well drilling and well stimulation treatment are analyzed and discussed, independent of location. It is assumed that new well drilling and well stimulation treatment methodology and chemicals used would be similar across the CCFO Planning Area and similar to standard petroleum exploration and development practices in California.

Extraction of petroleum resources generally requires drilling of wells into the subsurface resources and basins to allow the oil and gas to flow to the surface by its own (using formation pressure) or in the case of oil from partially depleted fields, by pumping. Activities associated with oil and gas production include:

- Constructing well pads at the drill site
- Well drilling
- Well completion (e.g., perforation, cementing, stimulation, etc.)
- Commencing production
- Abandonment

Public Exposure to Hazards of Oil and Gas Operations

The mission of the BLM is to manage access to public lands for commercial and recreational interests. Areas with intensively developed oil fields that remain open to public access may result in the exposure of the public to a hazardous industrial environment including the dangers associated with hydrogen sulfide gas and petroleum production. As described in Section 3.4.3, the CCFO Planning Area is an area of heavy crude production that lacks substantial levels of natural gas production. Only one operator out of four in the Coalinga field reported any natural gas production in 2014 and for several years prior. Limited levels of gas production generally avoids the potential hazards of handling, processing, and transporting produced gas.

Oil and gas exploration and development are cyclical businesses, with periods of high and low levels of activities. Therefore, an operator may decide to temporarily “shut in” producing wells and wait for conditions to improve. The highly viscous nature of most heavy crude oil common in the CCFO Planning Area, typical low well head pressures, and the relatively low corrosive properties of the fluids (low sulfur crude) make the known dangers of shutting in a well for long periods and then bringing it back online less

of a mechanical problem in the CCFO Planning Area than in other producing regions of the country. Monitoring and supervising temporary abandonment of wells would be undertaken by DOGGR and BLM.

The following additional conditions may be required before the temporary abandonment of a producing oil and gas well, service well, or an injection well.

- **Zone Isolation.** The requirement to isolate the producing interval (General Requirement #4) is waived. This waiver is based on the information submitted with the application and the geologic data in *Volume II – California Oil and Gas Fields*, which may indicate the absence of usable water aquifers above the producing horizon.
- **Mechanical Integrity of Casing.** The mechanical integrity of the casing may be determined using a hydrostatic pressure test method.
- **Fluid Surveys.** In accordance with the requirements of the State of California Idle Well Program, a fluid level survey will be performed at two- to five-year intervals while the well is temporarily abandoned. A copy of the survey will be submitted to the BLM within five business days of the survey.
- **Monitoring of Wellhead Pressures and Temperatures.** Wellhead pressure and temperature will be continuously monitored while the well is temporarily abandoned. Any pressure/temperature change will be promptly reported to the BLM.
- **Isolation of the Producing Interval.** The producing interval shall be isolated by setting a plug in the casing within 100 feet above the producing interval if a rising fluid level, an increasing wellhead pressure, or an increasing wellhead temperature is detected. The plug could be either a retrievable or drillable-type bridge plug or a cement plug of at least 100 feet in length.

Closures of Oil and Gas Fields

As a further precaution, some public lands within existing oil and gas fields may be closed to public access. The rationale for the public closure of these intensively industrialized areas stems from a concern for public safety in these areas. Specifically, such areas could pose threats from exposure to, high temperature piping and equipment, hydrogen sulfide gas, natural gas, and crude oil. Complete public closure could be determined to be the appropriate management tool for the protection of human health and safety, if other options, such as requiring all publics to receive the specialized training needed to be in these areas and use the required equipment (H_2S monitors, fire retardant clothing, etc.) were deemed infeasible and unenforceable. Any such closures would be determined on a case-by-case basis accounting for the nature of the hazard and level of risk. In addition to existing fields, public access should also be restricted near active exploratory well drilling sites and wells undergoing stimulation or maintenance to further protect the public. This may require temporary road closure, signage, and developing alternative routes

Release of Hazardous Materials

Airborne Hazards

Well blowout is an accidental event that can occur during a well stimulation treatment and result in immediate hazards to workers and the public. Such an event may result in a release of oil and gas to the environment. In the event there is a gas release during a blowout, the gas may travel downwind into populated areas depending on the location of the field with respect to the populated area and the direction and strength of the prevailing wind. If the flammable gas cloud encounters an ignition source, a flash fire at the well head can occur and possibly ignite any volatiles left in the spill of crude oil. Flash fires have the potential to cause acute health risks to oilfield workers and possibly the public. In addition, if the release contains sour gas — a toxic hazard is associated with the blowout. The use of properly designed blowout preventers (BOP) limits the duration of blowouts and subsequent hazards so that the direct effects of the

blowout are generally limited. Well blowouts are relatively rare, or rarer than other events, such as casing failures and other construction-related defects providing the potential for directly relatable health risks.

There are many chemicals used during well stimulation treatments, including liquid acid mixtures and granular solids or sands for proppant. In combination, these chemicals and hydrocarbons can generate flammable mixtures that could under certain circumstances result in an explosion or fire if an ignition source were introduced. There have been a number of documented incidents where a blowout of a two phase stream of flammable gas/liquid resulted in the ignition of the resulting vapor cloud.

Blowout statistics for California oil and gas well drilling and production operations are collected by DOGGR. Four sources of blowout data were used for this study. DOGGR tracks surface well blowouts as a part of its mandate "to prevent, as far as possible, damage to life, health, property and natural resources" during "the drilling, operation, maintenance, and abandonment of wells" (PRC Section 3106). In response to this mandate, DOGGR generates three sources of data concerning blowouts (Jordan, 2008). DOGGR staff generates a published report using a standard form for each blowout. These data are typically entered into an electronic database. Additionally, DOGGR's "Annual Report of the Oil and Gas Supervisor" describes blowouts in the southern San Joaquin Valley region for study years between 1992–2006. In addition to data from DOGGR, staff at the Bakersfield Californian newspaper located all articles concerning blowouts during the 14-year study period: 32 blowouts were (uniquely) reported by only one source, 70 blowouts were reported by more than one source, and thus a total of 102 individual blowouts were identified.

Blowout statistics for the southern San Joaquin Valley (DOGGR District 4), as the largest hydrocarbon producing district in California, from 1991 to 2005, analyzed by Lawrence Berkeley National Laboratory (LBNL) for well drilling and work-over activities in non-thermal wells (Jordan, 2008), indicate the following:

- The frequency of blowouts during drilling or work-over is 0.0035/year per well or 1 in 28,000 wells for non-thermal wells.
- In the event of a blowout, 35 percent resulted in injuries and 15 percent resulted in environmental damage.
- Injuries ranged from sprains and abrasions to burns. No fatalities were cited for drill related blowouts, but one fatality was recorded by the overall data for drilling and operational well blowouts.
- Environmental damage consisted of various concentrations of oil covering 0.2 to 41 acres.
- No public impacts (as reported for Kern County) occurred during blowouts from these drilling activities; however, public impacts did occur from blowouts for the whole data set (thermal/non-thermal, drilling/operational wells) and ranged from loss of electricity, to road closures, to evacuation of homes and a school.
- The average duration of a drilling or work-over blowout was 10 hours.
- The statistics described here (Jordan, 2008) also showed a steady decline in the number of blowouts per year from 11 per year in the early 1990s to one in 2005, whereas the average blowout rate per well covers the total period. These data indicate that well blowouts during well drilling and completion in some instances pose a major hazard to service company employees, albeit at a relatively low rate of occurrence.

These statistics are for overall oil and gas operations during drilling and work over operations, which precede completions including well stimulation. They would be applicable to new wells drilled to benefit from well stimulation treatment.

The release of sour gas (containing hydrogen sulfide) during a blowout has the potential to produce the most severe effects due to the toxicity of the hydrogen sulfide. Closures of offsite public areas as a result blowouts may have been due to this specific hazard, since it has the most severe consequences in regards to human health and the difficulty related to containment. Most of the other hazards (e.g., fire, overpressure, oil contact) would be limited to the immediate vicinity of the damaged well. Operator emergency response planning documents should address public emergency evacuation situations (including those that may arise from blowouts) and procedures.

Per OSHA, hydrogen sulfide gas causes a wide range of health effects. Workers are primarily exposed to hydrogen sulfide by breathing it. The effects depend on the concentration of the hydrogen sulfide in atmosphere the individual is exposed to and the duration of the individual's exposure. Acute short-term exposure to very high concentrations can quickly lead to death (OSHA, 2005). A level of hydrogen sulfide gas at or above 100 ppm is Immediately Dangerous to Life and Health (IDLH) for a 30 minute exposure. At higher concentrations, hydrogen sulfide rapidly causes olfactory impairment. For most people, a concentration of 150 ppm is enough to immediately deaden the sense of smell. At a concentration of about 750 ppm or higher, inhalation of hydrogen sulfide gas can cause immediate collapse and unconsciousness.

Chronic long-term exposures can also result in health effects, and the threshold limit value for hydrogen sulfide is 5 ppm over 8 hours. Thus, workers in areas containing hydrogen sulfide must be monitored for signs of overexposure. Active monitoring for hydrogen sulfide gas and good planning and training programs for workers are the best ways to prevent injury and death. Thus, per API Recommended Practice 49, all drilling and/or servicing personnel should be trained in the potential dangers of hydrogen sulfide and precautions to be taken when it is encountered. Continuous hydrogen sulfide monitors/detectors should be available when drilling, workover or servicing a well with a potentially hazardous concentration of hydrogen sulfide. Protective breathing equipment shall be located so that it is quickly and easily available (API, 2001).

Proppant consists of small granular solids such as sands and ceramic beads. Sand is delivered via truck and then loaded into sand movers, where it is transferred via conveyer belt and blended with other hydraulic fracturing fluids prior to injection into the wellbore. Silica sand is often used as a proppant in most of the hydraulic fracturing operations. The National Institute for Occupational Safety and Health (NIOSH) identified exposure to airborne silica as a health hazard to workers conducting some hydraulic fracturing operations during recent field studies. In normal use, well stimulation liquid chemicals are transported and stored in U.S. DOT approved totes, and in general, spills are normally limited in size and do not pose a serious acute health risk from inhalation exposure; surface water contamination is discussed separately.

NIOSH and OSHA identify seven primary sources of silica dust exposure during hydraulic fracturing operations (OSHA, 2012):

- Dust discharged from thief hatches on top of the sand movers during refilling operations while the machines are running (hot loading).
- Dust discharged and pulsed through open side fill ports on the sand movers during refilling operations.
- Dust generated by on-site vehicle traffic.
- Dust released from the transfer belt under the sand movers.
- Dust created as sand drops into, or is agitated inside the blender hopper and on transfer belts.
- Dust released from operations of transfer belts between the sand mover and the blender; and
- Dust released from the top of the end of the sand transfer belt (dragon's tail) on sand movers.

Breathing silica could produce silicosis, which potentially leads to lung disease causing inflammation and reducing the lungs ability to take oxygen. Several OSHA standards and directives cover operations that may expose workers to silica, including:

- Air Contaminants (29 CFR 1910.1000)
- Hazard Communication (29 CFR 1910.1200)
- Respiratory Protection (29 CFR 1910.134)

OSHA's Directive CPL 03-00-007, titled National Emphasis Program – Crystalline Silica, has detailed information on silica hazards, guidelines for air sampling, guidance on calculating Permissible Exposure Limits (PELs) for dust containing silica, and other compliance information.

Valley Fever is also a potential hazard for oil and gas field workers. Cal/OSHA has taken action to protect workers in the oil and gas industry — as well as wild land firefighters, geologists, agricultural workers, and others engaged in earth-moving work or exposed to dusty conditions — from Valley Fever. Workers in the oil and gas extraction industry in California risk contracting Valley Fever, which is caused by a microscopic fungus that lives in the topmost 2 to 12 inches of soil. A person can get Valley Fever if he or she breathes in the fungus (*Coccidioides immitis*) that causes the disease. The fungus grows in the soil. It gets into the air when the ground is broken and the dirt and dust spread into the air. People with jobs that require digging in the soil have the greatest chance of getting Valley Fever. Drilling and other activities have the potential of disturbing the ground and releasing dust and fungal spores into the air.

OSHA's October 2013 fact sheet, "Advice to Employers and Employees Regarding Work-Related Valley Fever," outlined the causes of the potentially serious fungal infection and preventative measures while reminding employers to report cases of illness. Because there is no vaccination for Valley Fever, the fact sheet urged employers to take steps to protect their workforces, such as determining whether they work in an endemic area (mainly the Central Valley of California), adopting site plans to reduce exposure, protecting workers against exposure with NIOSH-approved respiratory protection filters, training workers on the risks of Valley Fever, and more. The Morbidity and Mortality Weekly Report from Centers for Disease Control and Prevention dated March 29, 2013, reports an average annual increase of 13 percent in the incidence of reported Valley Fever cases in California. While the fungus is consistently present in the soil of many undeveloped areas, highly endemic counties are Fresno, Kern, Kings, Madera, Merced, San Luis Obispo, and Tulare. The number of new Valley Fever cases reported in California has increased dramatically in the last few years, according to the California Department of Public Health, presenting a significant risk to public and worker safety.

Employers have a legal responsibility to report to Cal OSHA any serious injury or illness, or death, of an employee occurring in a place of employment or in connection with any employment.

Tips for reducing the risk of Valley Fever exposure include:

- Determine if a worksite is in an area where fungal spores are likely to be present.
- Adopt site plans and work practices that minimize the disturbance of soil and maximize ground cover.
- Use water, appropriate soil stabilizers, and/or re-vegetation to reduce airborne dust.
- Limit workers' exposure to outdoor dust in disease-endemic areas.
- When exposure to dust is unavoidable, provide approved respiratory protection to filter particles.
- Train supervisors and workers in how to recognize symptoms of Valley Fever and minimize exposure.

Surface Water Contamination

All phases of oil and gas development, including geophysical surveys, well pad grading, well drilling, or well stimulation, involve use of hazardous materials such as vehicle fuels, oil, hydraulic fluid, and other vehicle maintenance fluids that are routinely used and stored in staging areas and at worksites. Gasoline, diesel fuel, oil, hydraulic fluid, lubricants, paints, solvents, adhesives, and cleaning chemicals used in construction activities, equipment, and vehicles could potentially be released during well drilling and maintenance as a result of accidents, and/or leaking equipment or vehicles. Spills and leaks of hazardous materials during drilling and maintenance activities could potentially result in soil or groundwater contamination. Drilling muds are generally nonhazardous mixtures of water, bentonite and other drilling mud additives. However, heavy metals (mercury, cadmium, arsenic, and hydrocarbons) may mix with the drilling fluid and be temporarily contained in the mud pits and waste pits. Fluids used during well stimulation, including EOR and hydraulic fracturing, as well as the flowback fluids or produced water are known to contain low to moderate levels of contamination by hazardous substances. Wastewater is routinely injected for well stimulation or disposed of in deep formation injection wells.

An accidental release of a potentially harmful or hazardous material into a dry stream bed or wash would not be expected to directly affect water quality. Similarly, an accidental spill or release of hazardous materials outside of a stream channel would not be expected to directly affect water quality. However, accidental spills or releases of hazardous materials into a dry stream bed or wash, or on the banks of a stream channel, could indirectly impact water quality through runoff during a subsequent storm event, when the spilled material would be mobilized into a drainage or waterbody. Analysis of the potential for an accidental spill or leak of hazardous materials to affect water resources is presented in Section 4.8 (Surface Water Resources).

Accidental spills or releases of hazardous materials could potentially impact groundwater through direct percolation and/or advection following a rainfall event. Hazardous material spills that are left on the ground surface for an extended period or that are followed quickly by a storm event could leach through the soil and into the groundwater, thereby resulting in the degradation of groundwater quality. The potential for these effects to occur as a result of the alternatives are addressed in Section 4.7 (Groundwater Resources) and Section 4.8 (Surface Water Resources).

A Storm Water Pollution Prevention Plan (SWPPP) would be required for grading and ground disturbance activities exceeding 1 acre. The SWPPP should include a project-specific Spill Prevention Plan (SPP), which is required per CCFO BMPs and SOPs, covering grading for access roads and drill pads, well drilling, and well stimulation. Well field staging yards and storage tank batteries containing greater than 1,320 gallons will require a Spill Prevention, Control, and Countermeasure (SPCC) Plan. The SWPPP, SPP, combined with a SPCC Plan, as well as implementation of BMPs related to fueling and the handling, use, and storage of hazardous materials, and specific BMPs for well drilling and well stimulation, would mitigate accidental spills and leaks of hazardous materials. Preparation, approval prior to the start of site work (grading) or drilling, and compliance with such plans and BMPs would be included as part of each lease agreement in order to reduce the likelihood of spills.

In March 2015, the BLM issued a final rule regarding hydraulic fracturing on Federal and Indian lands intended to reduce risks to resources and the environment. 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). The following describes potential risk of hydraulic fracturing to contaminate surface water with and without implementation of the BLM final rule.

All well stimulation projects subject to the BLM rule on hydraulic fracturing shall require preparation of spill control and emergency response plans to reduce the impacts of accidental spills and leaks. SB 4 (14 CCR Sections 1783.1 and 1786) also requires the operators to prepare a Spill Contingency Plan, which accounts for all fluids, addresses handling of well stimulation fluid and additives, and includes steps for spill response in the event of an unauthorized release. Section 1786 of the SB 4 Well Stimulation Treatment Regulations also requires that operators be in compliance with all applicable testing, inspection, and maintenance requirements for production facilities that are storing and handling well stimulation fluids. Therefore, if the BLM final rule is overturned, the effect regarding handling and spill response would be similar under SB 4.

Chemical additives used in well stimulation fluid consist of a blend of common chemicals that increase water viscosity, help extend the fracture, and suspend/transport the proppant and water mixture farther out into the fractures. Table 4.4-1 lists the typical fluids used in hydraulic fracturing. Generally no more than three to eight chemical products are present at one time at any given site, and unused products are removed from the site by the service company when the treatment is complete.

Table 4.4-1. Typical Hydraulic Fracturing Fluid Additives

Additive Type	Typical Main Compound	Purpose
Activator	EDTA/Copper Chelate	Agent used to degrade viscosity
Biocide	Propionamide	Prevents or limits growth of bacteria
Breaker	Sodium Persulfate	Agent used to degrade viscosity
	Ammonium Persulfate	
Crosslinker	Borate	Developing viscosity
Gel	Polysaccharide	Gelling agent for developing viscosity
	Naphtha hydrotreated heavy	
Clay Control	Potassium Chloride (KCl)	Clay-stabilization additive which helps prevent clay particles from migrating in water-sensitive formations
	Alkylated quaternary Chloride	
Acid/base (pH) Adjusting Agent	Acetic Acid	Adjusts pH to proper range for fluid
	Potassium Carbonate	
	Sodium Hydroxide	
Proppant	Silica	Holds open fracture to allow oil and gas to flow to well
Surfactant	Ethanol	Aids in recovery of water used during fracturing
Water	Water	Base fluid creates fractures and carries proppant, also can be present in some additives

Source: Halliburton, 2014.

The contamination of drinking water aquifers by well stimulation, especially hydraulic fracturing, continues to be a public concern. The contamination could potentially occur from subsurface or surface migration of fracturing fluids during and after well completion. The Clean Water Act authorizes the National Pollutant Discharge Elimination System (NPDES) permit program to regulate the disposal of flowback fluids (following fracturing) into surface waters of the United States.

BLM final rule on hydraulic fracturing and the California SB 4 rules regulate the storage and containment of well stimulation treatment chemicals at the well site. The BLM final rule requires that recovered fluids (including flowback and produced water) be stored in rigid enclosed, above-ground tanks and cannot be stored in sumps or pits, with very limited exception. SB 4 regulations require that recovered fluids be stored in containers but does not specifically require that the containers be enclosed. It does not allow the fluids to be stored in sumps or pits. Therefore, both SB 4 and the BLM final rule require storage of flowback in containers. However, the BLM final rule is more stringent than the SB 4 regulations because it requires that the containers be enclosed. The potential for a surface release of flowback to occur is greater if the container is not enclosed, as is the potential for overfill due to rain water accumulation, wildlife to be trapped in the tanks, and the continuous venting of volatile compounds into the air.

Although the BLM final rule requires a closed container, which is a more protective container than required under SB 4, SB 4 requires secondary containment for any production facilities in place for 30 days or more and a Spill Contingency Plan to be implemented immediately in the event of an unauthorized release. Additionally, as with the final rule, SB 4 would not allow the recovered fluids to be stored in sumps or pits. These measures would reduce the likelihood of contamination of drinking water aquifers. Finally, SB 4 requires groundwater monitoring on a well-specific, field-wide, or regional basis and the groundwater plans are subject to review and approval by the SWRCB. Therefore, while it is unlikely that there would be contamination due to the storage of the recovered fluids, groundwater monitoring would ensure any contamination would be found and addressed.

Chemical Confidentiality. One of the recommendations of the U.S. Department of Energy, Secretary of Energy Advisory Board (SEAB) Shale Gas Subcommittee's report is to provide disclosure of fracturing fluid compositions. The lack of such information has contributed to the public concern regarding the public risks of wells stimulation techniques. Regulations under the BLM final rule on hydraulic fracturing (see 43 CFR Part Section 3162.3-3) and California SB 4 (14 CCR Section 1788) require, among other public disclosures, a complete list of the chemicals and the maximum concentration of each and every chemical constituent of the well stimulation fluids used, so that a complete health study can be conducted. The BLM final rule is more restrictive because it requires this public disclosure within 30 days, and SB 4 requires the public disclosure within 60 days, otherwise the requirements are substantially similar. If the BLM final rule were overturned, this disclosure would continue to occur in California under SB 4. Furthermore, operators are required to sample, analyze and submit the analysis to the DOGGR for all flowback fluid.

Temporary Storage. Under all alternatives, exploratory (wildcat) and field development drilling within the CCFO Planning Area during the next 15 to 20 years is estimated to reach 37 wells (Appendix B). Consequently, the temporary storage, handling, and use of hazardous materials within one of the active oil fields or adjacent areas where exploration is likely, is not anticipated to require exceptional levels of response to leaks or spills. Well stimulation activities would also require temporary storage and use of hazardous chemicals (principally acid). All well drilling, well stimulation and field production facilities (storage tanks, separation and treating areas) would be required to follow BLM Implementation Guidelines, or BMPs and SOPs, for chemical storage including placement on impervious surface, secondary containment, drip pans, labels on all containers, and covered/sun shield storage. CCFO BMPs and SOPs (in Appendix D) outline the requirements to keep drilling pits free of hydrocarbons and to properly remove and dispose of contaminated materials and substances during site reclamation, including closing the drilling pits, and this would help to prevent accidental release of or public exposure to chemicals.

Subsurface Contamination

Underground injection is the most common method of disposing of fluids or other substances from shale crude oil extraction operations. Disposal of flowback fluids and produced water via underground injection is regulated under the Safe Drinking Water Act's Underground Injection Control (UIC) program. Injection wells that may be used for disposal of flow back water and other produced waters are classified as Class IID in EPA's UIC program and require State or Federal permits. The primary objective of the UIC program, whether administered at the State or Federal level, is protection of underground sources of drinking water (USDWs). There are two areas of concern regarding subsurface contamination of aquifers by hydraulic fracturing fluids:

- Underground loss of well integrity at the depth of the aquifer, and
- Formation fractures extending vertically and reaching the bottom of the aquifer.

Well Integrity. The BLM's final rule regarding hydraulic fracturing requires best practice performance standards for well integrity testing, including cement return and pressure testing prior to drilling, as well as cement evaluation and remediation plans for surface casing that does not meet standards. The rule also eliminates the use of sample "type wells" for well integrity demonstrations, instead requiring best practices for all wells. Regulations under SB 4 (14 CCR Section 1784.1) also require similar well integrity testing such that if the BLM final rule were overturned, well integrity would still be confirmed. Additionally, regulations under SB 4 (14 CCR Section 1787) require monitoring of casing pressures after stimulation. According to Section 1784.1 of the regulations, the entire system has to be tested at 125 percent of the maximum surface pressure anticipated 30 minutes prior to stimulation, and a 24-hour notification is required so the State may witness the test. Additionally, the well owner/operator must perform a radial cement evaluation and the integrity of the casing will be monitored during stimulation (Section 1784.2).

The regulations specify the requirements for well casing cementing depths to protect or minimize damage to usable groundwater. Regulations under the BLM's final rule and SB 4 re-establish these requirements for well stimulation treatments and include additional requirements for cement quality and documentation. Both the BLM final rule and SB 4 require the applicant to demonstrate that all usable water and other mineral-bearing formations would be isolated and protected from contamination. Continuous monitoring of casing annuli pressure during stimulation, and frequent monitoring after treatment can detect potential integrity problems and allow implementation of corrective actions before severe contamination of usable groundwater occurs. Because SB 4 requirements for cement evaluation and testing are substantially similar to the BLM final rule, if the rule were overturned, risks of damage to usable groundwater would still be minimized under SB 4. Additional SB 4 regulations (Sections 1784, 1785, and 1787) require data submission and well monitoring during these steps of the stimulation program.

Fracture Penetration of Groundwater Zone. Another concern has been that fractures induced by well stimulation may grow vertically, if the stresses in the formation are such that vertical fractures are possible and where present in oil fields, could extend into the usable groundwater zone. However, fractures in the deep zones tend to be vertical due to overburden pressures, while fracturing in shallower zones tend to be in the horizontal direction. The occurrence of usable waters in oil and gas fields vary significantly and can often be found within hydrocarbon zones. In some cases, the physical distances involved between the fracturing depth and the shallow aquifers used for drinking water precludes interaction between the fractures and the fresh waters. See Section 4.7 (Groundwater Resources) for information on the risks of fractured formations and contaminants affecting the groundwater zone.

Well Water Testing. Engineering controls and administrative procedures reducing risk to usable groundwater aquifers are discussed in Section 4.7 (Groundwater Resources). Baseline water testing is a BMP that the BLM encourages. The BLM may require water testing and monitoring, especially if water quality impacts are a substantial concern based on local conditions and where the BLM or a cooperating landowner or manager manages the surface estate where testing could yield useful water quality information. In addition, the regulations under SB 4 (Section 1783.3) ensure the availability of water testing of wells to land owners with wells used for drinking or irrigation water. The cost of the testing is to be borne by the operator.

Irrigation with Produced Water

California is the third largest generator of produced water behind Texas and Wyoming (U.S. DOI, 2011). The U.S. Department of Energy, SEAB Shale Gas Subcommittee's report investigated the management and beneficial uses of produced water in Western states, including irrigation and livestock water use. The report provides information from the Food and Agriculture Organization on constituent limits for irrigation water. The limits were set from the perspective of health of plant growth only. The mechanisms for the constituent entering the food chain were not addressed. There may be an opportunity to supplement irrigation water use with produced water in California, but more information on the risks to human consumption of the irrigated food is needed (SEAB, 2011).

Pressurized Gas Releases

Modern drilling practices control well pressure to keep oil and natural gas from escaping into the environment. The primary ways to control subsurface pressure is by circulating weighted drilling fluid (drilling mud) down the drilled hole, and sealing off the rock layers with steel casing and cement.

All well drilling incorporate basic well control measures to drill safely and protect the subsurface and surface environment. Basic well control relies on weighted drilling fluids to balance the pressures encountered while drilling to maintain control of the well at all times. Drilling fluid weight must be balanced against formation pressures. The weight cannot be too heavy not too light. Heavy drilling fluid can exert too much pressure against the formation with the possibility of fracturing the zone, or too little pressure which leads to loss of

well control. Drilling fluid must be carefully balanced throughout the entire length of the well. Well control is furthermore enhanced with the required use of Blowout Prevention Equipment (BOPE) placed on the top of the well and provides protection against blowouts and includes the ability to circulate out a "kick," which is subsurface fluid in the well that effectively reduces the weight of the drilling fluid column. An operator drilling on Federal mineral estate must submit an APD containing all the information required by Onshore Order 1, including minimum specifications for BOPE that will be used to keep control of well pressures encountered while drilling. Onshore Order 2 identifies the minimum requirements for BOPE and the minimum standards for testing the equipment. Additionally, well BOPE requirements are covered under 14 CCR Section 1722.5.

Blowout preventer equipment systems are comprised of a combination of various components. The following components are required for operation under varying rig and well conditions:

- blowout preventers (BOPs);
- choke and kill lines;
- choke manifolds;
- control systems;
- auxiliary equipment.

The primary functions of these systems are to confine well fluids to the wellbore, provide means to add fluid to the wellbore, and allow controlled volumes to be removed from the wellbore. These series of large valves and other devices installed on top of the well, allow drillers to manage pressure increases or close the well, if necessary. By closing and opening the appropriate valve or series of valves, the drillers can re-establish control of the well and adjust the drilling fluid weight to account for the increased pressure. Because BOPs are critical to the safety of the crew, the rig, and the well, they are inspected, tested, and refurbished at regular intervals. Due to the extensive development of some oil and gas reservoirs in the CCFO Planning Area, well pressures have declined in many locations.

Truck and Passenger Transportation

Vehicle traffic would increase in proportion to oil and gas exploration and development, although the incremental change under the RFD Scenario would be small. Routine oil and gas production throughout the CCFO Planning Area involves a baseline of activity (see Section 4.18, Transportation and Access). New well development and well stimulation treatments add truck and passenger traffic to California roads that increases hazards to the public either through vehicle movements or transportation of hazardous materials.

An example of the equipment used and level of activity during hydraulic fracturing activities appears in Table 4.4-2 below.

Table 4.4-2. Typical Equipment Used for Hydraulic Fracturing Activities

Equipment	Activity	Number	Duration of Use (days)
Control van	Fluid quality and data monitoring*	2	1 or 2
Pump truck	Pumping	4	1 or 2
Flatbed	Chemical storage (holds approximately 10 tote tanks)	1	1 or 2
Manifold/treating iron trailer	Hauls pipes	1	1 or 2
Tanker/mixer (5,000 gallon)	Gel storage and hydration unit	1	1 or 2
Blender	Blend fluid and proppant	1	1 or 2
Crane	Lifting heavy equipment	1	1 or 2
Sand chief (150 ton capacity)	Sand storage	1 to 4	5 to 7 days

Table 4.4-2. Typical Equipment Used for Hydraulic Fracturing Activities

Equipment	Activity	Number	Duration of Use (days)
Pickup truck or van	People/tools transport	2	1 or 2
Water tanks (500 barrel laydown tanks or 400 barrel upright tanks)	Water storage	8 to 15	5 to 7 days
Water trucks (4,000 or 5,000 gallon) (if not available via pipeline)	Supplies water	~50 to 63 round trips**	Prior to hydraulic fracturing activities
Sand trucks (25 ton capacity)	Hauls sand	8 to 20 round trips	Prior to hydraulic fracturing activities

Source: DOGGR, 2014; Halliburton, 2014; Schlumberger, 2014; Baker Hughes, 2014.

* Workers in the monitoring van include individual personnel responsible for: (1) status of equipment; (2) monitoring blending; (3) engineering; (4) quality control of the fluid being pumped; and (5) observation (from the operator company).

** Approximately 5 to 10 million gallons of water is typically required for both exploratory drilling and hydraulic fracturing stimulation of the Monterey Formation, which would result in 1,000 to 2,000 round-trip truck trips to deliver water to the site.

To estimate the number of trucks required for proppant deliveries, the number of rail cars was first developed. For each well between 200-500 tons of proppant is delivered by rail, and all proppant rail deliveries are assumed to be into Bakersfield. 300 tons of proppant was assumed, which is the equivalent of three rail cars per well based on 100 tons per rail car. The proppant is delivered to the wells in 25-ton trucks, which results in 12 trucks for each well. An average distance was selected for each region depending on the location of the well fields from Bakersfield. The distances from Bakersfield to the well fields were determined by estimating the mileage on State or interstate highways. Table 4.4-3 shows the total maximum number of roundtrips and roundtrip miles by county and field as a proxy for possible well locations.

Table 4.4-3. Annual Proppant Deliveries and Roundtrip Miles

County / Field[1]	Stimulation Wells per Year	Roundtrip Miles from Bakersfield[2]	Roundtrips per year[3]	Roundtrip Miles per Year
Fresno / Coalinga	1	225	12	2700
Fresno / Jacalitos	<<1	225	0	nil
Fresno all traffic	1	225	12	2700
Monterey / Lynch Canyon	<<1	300	0	nil
Monterey / San Ardo	1	300	12	3600
Monterey all traffic	1	300	12	3600
Total	**2**	**—**	**24**	**6300**

1 - Fresno and Monterey Counties are anticipated to have hydraulically fractured wells.
2 - Distance from Bakersfield to the average location of well fields in region.
3 - Assumes 12 truck deliveries of proppant per well.

The well stimulation truck deliveries include stimulation water, water tanks, chemical additives, sand chiefs, and pumps/mixers. Trucks to haul solid waste are also needed. Two chemical flatbeds, two waste trucks, and four auxiliary trucks for equipment such as pumps and mixers were assumed per well. The roundtrips for water were 63 for both existing and new hydraulically fractured wells, shown in Table 4.4-2. The roundtrip miles for all categories except proppant were assumed at 50 miles per roundtrip at the region level. At the field level, the roundtrip miles were 10 miles for trips within the fields, based on an average field size.

The maximum number of roundtrips and roundtrip miles for stimulation water, chemical flatbeds, waste, and auxiliary equipment (pumps and mixers) is shown in Table 4.4-4. The largest number of roundtrips is for water, which as a conservative assumption, was assumed to be completely delivered by truck.

Table 4.4-4. Annual Number of Trips and Roundtrip Miles for Chemicals, Waste, Stimulation Water and Auxiliary Equipment

County / Field[1]	Stimulation Wells per Year	Water Truck Roundtrips[2]	Water Truck Roundtrip Miles[3]	Chemical Flatbed and Waste Roundtrips[4]	Chemical Flatbed and Waste Roundtrip Miles[3]	Auxiliary Truck Roundtrips[5]	Auxiliary Truck Roundtrip Miles[3]
Fresno / Coalinga	1	63	3,700	4	240	2	240
Fresno all traffic	1	63	3,700	4	240	2	240
Monterey / San Ardo	1	63	3,780[6]	4	240[6]	4	240[6]
Monterey all traffic	1	63	3780	4	240	4	240
Total	**2**	**126**	**7,560**	**8**	**480**	**8**	**480**

1 - Well stimulation treatments are expected in Fresno and Monterey Counties.
2 - Assumes 63 round trips based on Table 4.4-2.
3 - Assumes 50 miles roundtrip, except for fields.
4 - Assumes two chemical trucks and two waste trucks per well.
5 - Assumes four auxiliary trucks for pumps, mixers, blenders and crane per well.
6 - Roundtrip miles within these oil fields. Roundtrip miles for all oil and gas fields assumed at 10 miles based on the average field size.

Table 4.4-5 shows the maximum annual number of trips and roundtrip miles for workers, as well as trucks for sand chiefs and water storage tanks. The well stimulation activities were assumed at 7 days to estimate the roundtrips for workers. Fifteen roundtrips per day were assumed for the workers, and additional personnel such as the owner/operator were assumed at five roundtrips per day. Roundtrip miles for workers were assumed at 50 miles roundtrip. Four sand chiefs and 15 water tanks were assumed per well, and at 50 miles per roundtrip. The overall number of incremental roundtrips and miles traveled per year per county, as shown in Tables 4.4-3 through 4-4-5, would not represent a major increase over the level of activity in the setting.

Table 4.4-5. Annual Number of Trips and Roundtrip Miles for Well Workers, Water Tanks, and Sand Chiefs

Study County[1]	Stimulation Wells per Year	Roundtrips for Workers[2]	Roundtrip Miles for Workers[3]	Water Tank Truck Roundtrips[4]	Water Tank Truck Roundtrip Miles[3]	Sand Chief Truck Roundtrips[5]	Sand Chief Truck Roundtrip Miles[3]
Fresno / Coalinga	1	140	7,000	15	750	4	200
Fresno all traffic	1	140	7,000	15	750	4	200
Monterey / San Ardo	1	140	7,000	15	750	4	200
Monterey all traffic	1	140	7,000	15	750	4	200
Total	**2**	**280**	**14,000**	**30**	**1500**	**8**	**400**

1 - Well stimulation is expected in Fresno and Monterey Counties.
2 - The number of trips per day was assumed at 20 and well operations were assumed at 7 days.
3 - Roundtrip miles were assumed at 50 miles, except for fields.
4 - Assumes 15 water tanks per well.
5 - Assumes 4 sand chiefs per well.

Table 4.4-6 summarizes the annual mileage for WST activities based on two completions per year for all counties. The average mileage per trip is approximately 64 miles based on the total vehicle round trips from Tables 4.4-3 thru 4.4-5.

Transportation of Crude Oil and Gas by Pipeline

The California State Fire Marshal's Hazardous Liquid Pipeline Risk Assessment report (CSFM, 1993) indicates that over a 10-year period (1981-1990) there were no injuries or fatalities associated with crude oil pipeline spills in California; no fatalities occurred with the recent crude oil spill due to a pipeline leak in Santa Barbara (May 19, 2015).

Failure of crude oil and produced gas pipelines results in an impact zone that is primarily a function of the pipeline operating pressure and the hydrogen sulfide content, rather than the throughput, with the effects minimized by safety features and activities conducted in response. The frequency of a release (leak or rupture) is primarily a function of the construction of the pipeline, the inspection and maintenance, operational practices, as well as third-party damage. The volume of the subsequent release is a function of the training of the operators as well as the design, construction and maintenance of the leak detection system. Pipeline leaks are most commonly a result of corrosion/erosion, or third-party intrusion (e.g., San Bruno and San Bernardino incidents) to the pipeline. It should be noted that current technology cannot detect small pin-hole leaks in pipelines, which can be the source of long-term releases going undetected especially related to buried pipelines.

Table 4.4-6. Annual Mileage for WST Completions

Vehicle use	Miles
Proppant	6,300
Stimulate water	7,560
Chemicals	480
Auxiliaries	480
Water tanks	1,500
Sand chiefs	400
Workers	14,000
Total	30,720

The RFD Scenario (in Section 5.3 of Appendix B) projects that 10 miles of new transmission pipelines could be constructed in the study period. The report does not specify whether the connecting pipelines would carry oil or gas. A produced gas pipeline is potentially more hazardous to the public due to its flammable and possibly toxic (hydrogen sulfide) characteristics. As discussed with the Assumptions, the hydrogen sulfide concentration for some produced gas in the CCFO Planning Area may be sufficiently low so as to not pose an acute health risk to the public.

Unconfined vapor cloud explosion (UVCE) and flash fire are potential hazards of produced gas. The occurrence of an UVCE depends on the amount of natural gas liquids (NGLs) in the gas. An UVCE is not likely if the NGL concentration is under 10 percent and there is not confinement. The flash fire hazard is present when the gas release does not immediately ignite and a flammable gas cloud spreads and ultimately ignites. The thermal radiation from a flash fire is intense for someone nearby and can cause serious burns and potentially a fatality.

The total length of the expected new pipelines is relatively short, which reduces the potential for a loss of integrity scenario. Also, thermal recovery wells (generally required in the CCFO Planning Area) have little associated gas, so it is more probable that the new pipelines will be for crude oil transfer. As discussed above, the BLM may consider limiting public access to some areas within the leases that are considered higher risk, such as piping handling sour gas.

Other Risks and Hazards

There could be health effects associated with air emissions from project-related vehicles, firearm accidents, natural disasters and fugitive dust from roads and from the application of dust control treatments. Fugitive dust could reduce other visibility in localized areas and could increase the potential for vehicle accidents in the Planning Area.

The potential for firearms-related accidents would be expected to occur primarily during hunting season. The increased activity during drilling and field development would be likely to discourage hunting in the immediate vicinity of oil and gas exploration and development during that period. Consequently, the risk of firearms-related accidents should be minimal. During project operations, the relatively few personnel on-site would experience only highly localized risk of firearms-related accidents from recreational target shooting or hunting activities.

Under any alternative, future oil leases located within Fort Hunter Liggett will require Conditions of Approval or stipulations that all ground disturbance areas (access roads and drill pads) shall be screened and, if necessary, cleared of munitions and explosives of concern.

The risk of wildland fires could increase in areas associated with oil and gas construction activities, due to vehicle collisions, industrial development, and the presence of fuels, storage tanks, natural gas pipelines, and gas production equipment. Fire suppression equipment, fencing and netting of pits, a no-smoking policy, shutdown devices, and other safety measures typically incorporated into gas drilling and production activities would reduce the risk to public health and safety. There could be an increased risk of wildland fires ignition where construction activities place welding and other equipment in or near vegetation. Adherence to relevant safety regulations by operators and enforcement by the respective agencies would reduce the probability of wildland fires ignitions.

Both workers and the public could be exposed to naturally occurring hazardous materials that are found in the soil throughout the CCFO Planning Area, 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). Oil and gas production activities would result in soil disturbance and could mobilize these naturally occurring hazardous materials. Workers and the public potentially could be exposed to these mobilized hazardous materials either through direct contact or through inhalation of airborne particles.

4.4.3 Impacts of Alternative A (No Action)

Alternative A would utilize the 2015 RFD Scenario while continuing current management under the existing 2007 HFO RMP (BLM, 2007).

Release of Hazardous Materials

Drilling, field development and production activities associated with oil and gas exploration and development require use of a variety of chemicals and other materials, some of which would be classified as hazardous, including drilling muds and additives for completion and EOR and hydraulic fracturing activities. These fluids could contain various contaminants such as salts, acids, mercury, cadmium, arsenic, and hydrocarbons, among others, which, if not managed correctly, could leach into soil and directly impact groundwater quality by down-hole releases. The runoff of contaminants into surface water could potentially impact surface water and/or groundwater quality. Potential impacts associated with hazardous materials include human contact, inhalation or ingestion and the effects of exposure, spills, or accidental fires on soils, surface and groundwater resources, and wildlife. Operators of well stimulation treatments would be required to file information to BLM that is required by the BLM final rule, if upheld, and to DOGGR that is required by SB 4.

Development in ROWs (e.g., along road shoulders) and in designated corridors could affect public health and safety by inadvertently providing access to areas that could contain hazardous materials or authorizing surface-disturbing activity near these areas. Public health and safety would continue to be protected because site-specific authorizations or designations would not be issued in areas that would jeopardize remediation activities.

Soil or groundwater contamination could result from accidental spill or release of hazardous materials during oil and gas exploration and development, facility operations or during maintenance of the pipelines and other utilities. Spills or releases could result in contamination to soil and/or groundwater and exposure of maintenance workers and the public to hazardous materials. In the event of a hazardous materials release, BMPs (Appendix D) would reduce the potential for contamination and exposure of workers or the public to hazardous materials.

In general, the population centers in the foreseeable development areas are not intermingled with the oil and gas properties. The towns of San Ardo and Bradly in Monterey County are a respectable distance from the producing areas. The petroleum fields are closer in the case of Coalinga in Fresno County, but in the absence of significant gas production, the effect would still be minor.

The risk of human contact with hazardous materials would be limited predominantly to operators and contractor employees. A Hazard Communication Program, Spill Prevention Control and Countermeasures Plans, and other mitigation measures would reduce the risk of human contact, spills, and accidental fires, and provide protocols and employee training to deal with these events should they occur (Appendix D).

Managing some acreage of the BLM-administered mineral estate as closed to oil and gas exploration and development would reduce occupational hazards, exposure to hazardous materials and vehicle traffic associated with oil and gas exploration and development in these areas. In addition, the potential for hazardous material exposure would be reduced or eliminated in areas managed with No Surface Occupancy (NSO) stipulations. Please see Chapter 2, Section 2.5.1, for a description of lease stipulations, including the NSO stipulation.

Hazardous material impacts would be avoided or reduced by the implementation of the BMPs outlined in Appendix D. Federal and State operating and reporting requirements (e.g., BLM's final rule on hydraulic fracturing) include provisions to clean up and mitigate spills or releases of chemicals, products, or wastes. The BLM policy requires identification of the chemicals that would be used, stored, and produced during construction and operations. Hazardous Substances Management Plans would be developed and implemented by the oil and gas companies to prevent spills and illegal dumping of hazardous substances, pesticides, and wastes. It is assumed that the storage, use, and transport of these materials and the disposal of generated wastes would comply with all pertinent Federal regulations. BLM SOPs and DOGGR regulations include well abandonment practices to mitigate loss of containment of depleted wells.

Reclamation of areas disturbed by oil and gas exploration and development would reduce erosion, stabilize sites and improve vegetation cover. Reclamation would reduce exposure and movement of contaminated soils. Reclamation activities could also restore watershed function and indirectly help maintain water quality and reduce effects to public health.

Transportation by Pipeline

In areas containing surface or near-surface pipelines, individuals could be exposed to hazardous materials if there were a leak or a failure. The risk of leak or failure could be higher in the vicinity of road crossings or areas likely to be disturbed by road maintenance activities. Compliance with signing requirements for pipeline ROWs and posting markers at frequent intervals along the pipelines would reduce the likelihood of pipeline ruptures caused by third party excavation equipment. The remoteness of many projects and the low level of anticipated non-project-related construction and excavation would reduce the risk to public health and safety. Routine monitoring would reduce the probability of effects to health and safety from ruptures by facilitating the prompt detection of leaks.

Managing areas as closed to oil and gas exploration and development or with NSO stipulations could shift the location of pipelines and other utilities to other areas. This could concentrate the placement of pipelines and utilities and increase the risk of hazardous materials exposure in concentrated areas. Concentrating the placement of oil and gas activities and development also could decrease the emergency response time and leak detection time, and could reduce the number or size of hazardous material releases if co-location results in additional personnel inspecting and reviewing pipelines and utilities or more quickly becoming aware of leaks, spills, releases, or emergencies.

The RFD Scenario considers the addition of 10 miles of new interconnecting pipelines, which will most likely be located in existing ROWs (e.g., along road shoulders) to minimize surface land disruption. As indicated above, such pipelines (including road crossing) could expose the public to contacting hazardous material releases, including hydrogen sulfide in the case of a sour gas line.

Occupational Hazards

Health and safety impacts to operators, contract workers, and other public land users could result from industrial accidents. Increased oil and gas exploration and development would result in an increased potential for accidental releases and/or worker incidents. Drilling operation plans approved by the BLM would address the potential for the accidental release of hazardous materials. Adherence to relevant safety regulations by oil and gas operators and enforcement by the respective agencies would reduce the probability of accidents

The estimated oil and gas round trip traffic volume from well pad exploration and development is presented in Tables 4.4-4 and 4.4-5. The traffic volume from oil and gas vehicles on resource roads, local roads, collector roads, county road and State highways could increase the potential for accidents on roads with both public and oil- and gas-related motor vehicle traffic. Reducing fugitive dust on these roads would help maintain visibility for drivers and could indirectly reduce the potential for vehicle accidents in localized areas. The estimated vehicle round trips per well pad during construction and production would range from 0, when no oil and gas activity is occurring, to 795 round trips per well for drilling and completion of a well pad (BLM, 2015, pg. 4-598). Considering WST as a type of completion activity, WST activities could add another 172 round trips assuming some worker miles are already accounted for in the construction/production trips. Assuming approximately two new wells per year, the average annual total round trips for both counties is slightly more than 1,935 per year. Using an average of 64 miles per trip (estimated from Table 4.4-6), this gives a total of 2.29 million miles for the total life of the RFD Scenario.

The 2010 through 2012 average accident rate from the Department of Transportation's National Highway Traffic Safety Administration (NHTSA) for Fact Sheet Heavy Trucks was used (NHTSA, 2014). Since accident data for light trucks was not located, and since light trucks were a relatively small amount of the truck traffic, its rate was assumed to be similar to heavy trucks.

Since the accident rate is given as 24 accidents per 100 million miles, there was only enough traffic in the alternatives to have a fraction of one accident for all counties. Spread over two or more counties, the accident rate is negligible over the life of the plan. Using the truck accident rate, there was not enough estimated vehicle mileage to forecast an accident for any of the alternatives during the life of the RFD Scenario.

Impacts Mitigated by Stipulations and Recent Regulations

The acreage open in Alternative A for oil and gas development would not be specifically subject to BLM CSU stipulations that apply for all other alternatives. The primary CSU stipulation applicable to this assessment of public impacts is CSU-Well Stimulation Treatment contained in Appendix C. Alternative A utilizes the existing 2007 HFO RMP to ensure that authorized activities on public lands comply with applicable Federal, State, and local laws, policies, guidance, and procedures. Hence, while BLM CSU stipulations are not specifically applied, DOGGR regulations regarding well stimulation treatments would be invoked, which would have the same effect as the CSU stipulation for well stimulation treatment.

Given the following attributes, minor impacts would be likely due to the:

- low level of foreseeable oil and gas development per RFD Scenario;
- generally heavy, sweet crude characteristics with limited produced gas;
- low population densities around BLM acreage; and
- 2007 BLM HFO RMP practices and Federal and State regulatory requirements.

Mitigation

Mitigation Measures PS-1 through PS-6 include the types of measures that could be implemented to lessen the degree of potential adverse public safety impacts from development of oil and gas leases under

Alternative A. During review of whether to accept or deny project proposals, BLM managers can decide to attach additional stipulations or measures, such as the following, to minimize or avoid potential health and safety effects.

PS-1 **Prepare and Submit SWPPP and SPP.** A Storm Water Pollution Prevention Plan (SWPPP) would be required for grading and ground disturbance activities exceeding 1 acre. The SWPPP should include a project-specific Spill Prevention Plan (SPP, per CCFO BMPs and SOPs) covering grading for access roads and drill pads, well drilling, and well stimulation.

PS-2 **Prepare and Submit SPCC Plan.** Well field staging yards and storage tank batteries containing greater than 1,320 gallons will require a Spill Prevention, Control, and Countermeasures (SPCC) Plan.

PS-3 **Pipeline Safety.** New interconnecting pipeline should be design to allow passage of internal inspection tools (smart pigs) to detect internal and external anomalies.

PS-4 **High Consequence Areas.** Remotely operated isolation valves should be provided for any designated High Consequence Areas (HCAs) defined per USDOT PHMSA criteria.

PS-5 **Hydrogen Sulfide and Flammable Gas Hazards.** For High Consequence Areas (HCAs) resulting from produced gas hazards, H_2S and/or flammable gas detection should be considered to protect the public. In addition to the normal transmission pipeline ROW warning posts, signage indicating a hydrogen sulfide hazard should be posted where public access is allowed.

PS-6 **Pipeline Integrity.** Crash barriers should be provided along roads where pipelines are exposed.

Leases Subject to Settlement Agreement – Subalternative 1

The 14 non-NSO leases as identified in Case No. 11-06174 and Case No. 13-1749 would be issued. These leases are located in a historically nonproductive wildcat area west of San Ardo field (DOGGR, 2007) and in or near the Vallecitos oil field. Well drilling and other field development activities in these leases or new facilities in the Vallecitos field may occur. Although these leases either have not been granted 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.

Leases Subject to Settlement Agreement – Subalternative 2

The two non-NSO leases as identified in Case No. 11-06174 should not have been issued, and the 12 prospective non-NSO leases as identified in Case No. 13-1749 would not be issued. As such, no resource impact would occur.

4.4.4 Impacts of Alternative B

This alternative is the most restrictive of all the alternatives for closures of some Federal mineral estate to oil and gas leasing and development. The acreage open to oil and gas leasing and development is reduced from 683,800 acres of a little less than 39,000 areas. This elimination of available acreage would result in co-location of oil and gas activities and facilities into a much smaller area. The effect would be to concentrate the risk of hazards impacting the public to specific localities. This would tend to confine the impacts to the public due to upset conditions to areas of existing oil and gas production and active fields. The open areas could experience development by up to 32 new wells and would have the same potential for hazardous material releases as Alternative A. However, the expected emergency response times should be shortest (best) in this alternative due to the relative co-location of oil and gas activities. This could lead to more NSO stipulations or closures of land to the public.

Alternatives B thru E, when compared with Alternative A, would include more areas for closures or areas with NSO stipulations. The greater areas of closures could result in the concentration of oil and gas exploration and development activities in areas managed with standard lease terms and conditions and CSU stipulations. As such, the potential for hazardous material exposure in localized areas could increase marginally under Alternatives B thru E compared with Alternative A, depending on the options for closing Federal mineral estate to development.

Alternatives B thru E would include CSU stipulations on Federal mineral estate open to leasing. Stipulation CSU-WST (Appendix C) requires operators meet BLM data requirements by providing it with information required by California State Senate Bill 4 (SB 4). Applicable SB 4 information includes, but is not limited to, the permit application, Water Management Plan, Water Monitoring Plan, and, if available, the State-approved SB 4 permit.

The other impacts and mitigations are expected to be the same as for Alternative A.

Mitigation

Mitigation Measures PS-1 through PS-6 at the end of Section 4.4.3 include the types of measures that could be implemented to lessen the degree of potential adverse public safety impacts from oil and gas leases associated with Alternative B.

Leases Subject to Settlement Agreement

The 14 non-NSO leases would not be likely to experience the full scope of the RFD Scenarios. However, the hazardous material and public safety impacts and mitigation are the same as Alternative A.

4.4.5 Impacts of Alternative C

Alternative C strikes a balance between land open (368,800 acres of high oil and gas occurrence potential), and closed (394,400 acres of moderate to low potential) to oil and gas leasing and development. This alternative also has almost 30,000 acres of open acreage with a NSO stipulation. The open areas could experience development by up to 37 new wells and would have the same potential for hazardous material releases as Alternative A. Under certain local geological circumstances, any oil and gas resources on this acreage might be accessed by directional drilling for leases without NSO stipulations. The open areas would have CSU stipulations. The impacts to the public due to upset conditions are not expected to be significantly different from Alternative A.

Mitigation

Mitigation Measures PS-1 through PS-6 at the end of Section 4.4.3 include the types of measures that could be implemented to lessen the degree of potential adverse public safety impacts from oil and gas leases associated with Alternative C.

Leases Subject to Settlement Agreement

The 14 non-NSO leases would not be likely to experience the full scope of the RFD Scenarios. However, the hazardous material and public safety impacts and mitigation are the same as Alternative A.

4.4.6 Impacts of Alternative D

Alternative D is similar to Alternative B with a large portion of the acreage (655,400 acres) being closed to oil and gas leasing and development. Being less restrictive, Alternative D would be beneficial as there would be less concentration of oil and gas activities to a relatively small percentage of the CCFO Planning Area acreage. This alternative also has 16,400 NSO acres. The open areas could experience development by up to 37 new wells and would have the same potential for hazardous material releases as Alternative A. The impacts to the public due to upset conditions are not expected to be significantly different from Alternative A.

Mitigation

Mitigation Measures PS-1 through PS-6 at the end of Section 4.4.3 include the types of measures that could be implemented to lessen the degree of potential adverse public safety impacts from oil and gas leases associated with Alternative D.

Leases Subject to Settlement Agreement

The 14 non-NSO leases would not be likely to experience the full scope of the RFD Scenarios. However, the hazardous material and public safety impacts and mitigation are the same as Alternative A.

4.4.7 Impacts of Alternative E

This alternative increases the acreage closed to oil and gas leasing and development by approximately 32,000 acres more than Alternative A, but leaves close to a half million acres still open. This alternative has the most acreage (206,400 acres) with NSO restrictions. The open areas could experience development by up to 37 new wells and would have the same potential for hazardous material releases as Alternative A. The impacts to the public due to upset conditions are not expected to be significantly different from Alternative A.

Mitigation

Mitigation Measures PS-1 through PS-6 at the end of Section 4.4.3 include the types of measures that could be implemented to lessen the degree of potential adverse public safety impacts from oil and gas leases associated with Alternative E.

Leases Subject to Settlement Agreement

The 14 non-NSO leases would not be likely to experience the full scope of the RFD Scenarios. However, the hazardous material and public safety impacts and mitigation are the same as Alternative A.

4.5 Air Quality and Atmospheric Conditions

This section addresses impacts to air quality from activities allowed under the RMPA alternatives. The primary air quality impacts that can be reasonably expected to occur are emissions of combustion products and particulate matter from oil and gas development and production. This section describes the types of potential impacts the RMPA alternatives could have on air resources in the BLM Central Coast Field Office (CCFO) Planning Area, and it addresses the types of mitigation that could be implemented to lessen the degree of the impacts, where applicable.

4.5.1 Introduction

Approach to Impact Assessment

The RMPA alternatives would allow oil and gas development in some areas of the CCFO Planning Area. Oil and gas development involves extracting materials from the earth using various methods, and these are described in the Reasonably Foreseeable Development (RFD) Scenario (see Appendix B).

Extraction of petroleum resources generally requires preparing the site, drilling, installing well equipment, and storing or transporting the resource off-site. These processes produce air pollution in the form of engine exhaust emissions and fugitive dust from the transport of materials and the movement of vehicles over unpaved areas. Additional air pollution may be produced at extraction sites that include a facility for treatment or processing of the extracted oil and gas or byproducts of oil and gas extraction. Also, fugitive emissions of hydrocarbons would include volatile organic compounds (VOC), along with methane and hydrogen sulfide (H_2S) entrained in the oil and gas, and these emissions may occur at wellheads through leaking valves or behind casing in idle oil and gas wells.

Before initiating any type of oil and gas development, the entity proposing the development may need to apply for and obtain approval for air permits from the air district where the activity would be located. Each local air district issues permits that must be obtained before constructing and operating new stationary sources of air pollution. Facilities that do not include stationary sources of air pollution may not require an air permit. The permit rules provide for an evaluation of air quality impacts for the proposed activity, and the activity must be deemed acceptable by the administering APCD before an air permit would be approved.

There is one management goal relevant to Air Quality and Atmospheric Conditions from the 2007 HFO RMP that is restated here:

- The goal for air quality management under the Resource Management Plan (RMP) is to ensure that BLM authorizations and management activities comply with local, State, and Federal air quality regulations, requirements, State Implementation Plans (SIPs), and Regional Air Board standards and goals.

The Area-wide Air Quality Management Actions from the 2007 HFO RMP include:

- AIR-COM1. Incorporate mitigation for activities and projects on BLM lands in order to comply with applicable Federal, State, and local air quality regulations.
- AIR-COM2. Manage motorized vehicle travel on dirt roads to minimize air pollution from dust and exhaust by restricting vehicle types and seasons when vehicles could be used.

Three measures to protect air quality, which include one Additional Mitigation Measure, are identified as Management Guidance in the Oil and Gas Stipulations (Appendix D of the 2007 HFO RMP):

- Measures to Protect Air Quality: (A) All oil and gas exploration and development activities that require off-road vehicle use or surface disturbance would be required to obtain an air quality emission permit or verification that such permits are not appropriate from the regional air quality control board.

- Measures to Protect Air Quality: (B) All oil and gas exploration and development activities resulting in surface disturbance or requiring the use of motorized vehicles would be required to suppress fugitive dust emissions from paved and unpaved surfaces in accordance with local APCD regulations.
- Additional Mitigation Measure: (A) Air modeling studies per the requirements of the Monterey Bay Unified Air Pollution Control District Rule 207 would be required before any emissions are allowed on leases in the Pinnacles National Park.

BLM Best Management Practices/Standard Operating Procedures for air quality (Appendix D) could reduce emissions of dust and other air pollutants during oil and gas production by implementing techniques for controlling road dust and for reducing, capturing, and/or controlling vapors, leaks, fugitives, and other emissions related to energy development.

Types of Impacts

Oil and gas development activities could result in emissions causing air quality impacts if they:

- Exceed any air quality standard, contribute substantially to an existing or projected air quality violation, or result in a cumulatively considerable net increase of any criteria pollutant for which the geographic area is in nonattainment under an applicable Federal or State ambient air quality standard (including releasing emissions that exceed quantitative thresholds for ozone precursors);
- Exceed *de minimis* threshold values for pollutants in nonattainment or maintenance areas;
- Conflict with or obstruct implementation of an applicable air quality plan;
- Expose sensitive receptors to substantial pollutant concentrations; or
- Affect long-term air quality as a result of operation and/or maintenance activities.

Assumptions

All activities must comply with applicable laws and regulations and may be subject to review for air pollutant emissions by the local air permitting authority. The potential air pollutant emissions from oil and gas development would occur in the following context:

- The operator of air pollutant emissions sources would coordinate with the local air permitting authority to seek necessary entitlements for oil and gas development including the completion of all necessary project-level environmental review requirements. Based on the results of the environmental review, the operator of emissions sources would implement all feasible mitigation measures identified in the environmental document to reduce or substantially lessen any significant air quality impacts of the project.
- The operator of emissions sources would apply for, secure, and comply with all appropriate air quality permits for project activities from the local agencies with air quality jurisdiction and from other applicable agencies, if appropriate, prior to mobilization.
- The operator of emissions sources would comply with the Clean Air Act and the California Clean Air Act, including the applicable determinations for project-specific Best Available Control Technologies within the New Source Review (NSR) process, New Source Performance Standards, and National Emission Standards for Hazardous Air Pollutants.
- The operator of emissions sources would comply with local plans, policies, ordinances, rules, and regulations regarding air quality-related emissions and associated exposure (e.g., avoiding nuisances related to fugitive dust particulate matter or odors, providing payment into off-site mitigation funds if determined to be necessary as a result of a project-level environmental review or NSR process).

- Any project that is anticipated to result in emissions that constitute a "major source" would be reviewed for potential impacts to sensitive receptors, including mandatory Federal Class I Areas. This would be completed at the site-specific NEPA stage.
- Downstream use of oil and gas, oil processing at refineries, and natural gas transmission and distribution are separate activities that would not be substantially affected by the RFD Scenario, aside from the need to carry produced oil and gas to the existing transmission pipeline network over a distance that is likely to be less than 10 miles.

4.5.2 Impacts Common to All Alternatives

The RFD Scenario (i.e., between zero and 37 development wells with approximately 206 acres of surface disturbance over the next 15 to 20 years on Federal mineral estate in the Planning Area) would occur under all of the alternatives.

For all alternatives, oil and gas exploration and development could occur anywhere that is open to oil and gas leasing within the CCFO Planning Area, although the most likely areas of development are on Federal mineral estate either in the North Central Coast air basin or in the San Joaquin Valley air basin. All oil and gas development activities would be subject to either the jurisdiction of either the MBUAPCD or SJVAPCD, depending on the location. The history of activity for oil and gas exploration and development on Federal mineral estate within the CCFO Planning Area portion of the San Francisco Bay Area air basin is limited, and for this reason, little or no new oil and gas activity or emissions is anticipated in the BAAQMD portion of the CCFO Planning Area.

For all alternatives, 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.

Air Pollution Sources Associated with RFD Scenario

Anticipated emissions from oil and gas development include direct emissions of oxides of nitrogen (NOx), sulfur oxides (SOx), volatile organic compounds (VOC) and reactive organic gases (ROG), which are precursor emissions for ozone and PM2.5, carbon monoxide (CO), respirable particulate matter (PM10) and fine particulate matter (PM2.5). These emissions are associated with combustion sources such as diesel drill rig engines, drill pad construction equipment (i.e., dozers, backhoes, graders, etc.), temporary production flaring, remedial well work, equipment trucks, hauling of liquids, drill rig crew trucks/vehicles, portable lift equipment, portable electric power generators, portable testing equipment and temporary production facilities. Diesel emissions also occur from equipment used during well stimulation treatments, and materials handling causes emissions of PM10 and PM2.5. The steam generators used during enhanced oil recovery are also an important source of emissions from fuel combustion.

Vented gases and fugitive leaks that occur during all phases of well development and production are sources of ROG/VOC and methane, although these can often be detected and cost-effectively reduced, captured, recovered, or controlled by flaring.

In addition, PM10 is released during the drill pad construction phase and from the daily ingress and egress of vehicles on unpaved access roads. The primary emission sources during any new construction at the drill sites and on Rights of Way would be from heavy equipment exhaust and fugitive dust generation. Other emission sources occur during the operation and maintenance of the leases and Rights of Way. Other sources related to oil and gas production include oil facilities, gas facilities, operator vehicle traffic, and diesel or gas-powered oil well pumping units.

Adverse health impacts would be correlated to any potential increases in the ambient concentrations of criteria air pollutants caused by equipment and sources typical of oil and gas development. Ozone pre-

cursors that are a result of venting or fugitive losses (ROG) and equipment or mobile source exhaust (ROG and NOx) contribute to: aggravation of respiratory and cardiovascular diseases; reduced lung function; increased cough and chest discomfort. The fugitive dust emissions (PM10 and PM2.5) contribute to: reduced lung function; aggravation of respiratory and cardiovascular diseases; increases in mortality rate; reduced lung function growth in children. Dust emissions could also exacerbate the potential exposure of people to Valley Fever.

Oil and gas development under the RFD Scenario could introduce localized sources of odors by releasing sulfur-containing compounds that occur in the natural resources, primarily H_2S, and odorous organic compounds (including pentane and hexane) as ROG. These may be released as vented and fugitive emissions. Methane itself is odorless, but the odorous H_2S and organic compounds can escape to the air easily from produced oil, produced water, vented natural gas, and leaks. No other notable source of odors would occur because the use of diesel-fueled construction equipment would be limited by mandatory use of ultra-low sulfur diesel fuel. Under all alternatives, the sources of odors would occur only at well development sites, and so would not be likely to negatively affect a substantial number of people, depending on concentration, wind direction, and proximity to residential area or public facility.

Estimated Air Pollutant Emissions for RFD Scenario

Each alternative includes the 2015 RFD Scenario (i.e., 37 wells and 206 acres of surface disturbance). For informational purposes, reasonable emissions estimates for any year within the life of this plan are based on three wells per year being constructed and three wells undergoing well stimulation treatments on Federal mineral estate in the CCFO Planning Area. In the last 20 years, two Applications for Permit to Drill on existing BLM leases in the CCFO Planning Area have been submitted and then withdrawn. While construction of three wells per year would be higher than this trend, the two Applications for Permit to Drill were submitted in the last two years, and depending on economic conditions, a greater or fewer number of applications could be submitted any year. After the construction activities and emissions are completed, the new wells would transition into long-term operations and maintenance, when the oil and gas production activities and emissions would commence and then continue. The production-phase emissions assume all 37 wells transition to long-term operations and maintenance.

Table 4.5-1 quantifies the maximum anticipated levels of criteria air pollutant emissions during the years of wells being constructed on Federal mineral estate in the CCFO Planning Area, and Table 4.5-2 quantifies the emissions from long-term operations and/or maintenance activities upon full buildout of the RFD Scenario. These emissions would most likely be in the jurisdiction of either the MBUAPCD or SJVAPCD, depending on the location of the leases.

Table 4.5-1. Development Phase Planning Area Emissions for 2015 RFD Scenario (tons per year)

Development Activity (new well construction and well stimulation of 3 wells per year)	ROG	NOx	CO	SOx	PM10	PM2.5
Surface disturbance	—	—	—	—	27.2	4.1
New well development	0.09	1.46	0.42	0.00	0.05	0.05
Geophysical exploration	0.01	0.25	0.11	0.00	0.01	0.01
Well stimulation	0.15	3.10	0.49	0.00	0.09	0.09
Total (Development)	**0.25**	**4.81**	**1.01**	**0.01**	**27.34**	**4.22**
San Joaquin Valley Air Basin *de minimis* Threshold	**10**	**10**	**100**	**100**	**100**	**100**

Note: RFD Scenario emissions would most likely be in the jurisdiction of either the MBUAPCD or SJVAPCD, depending on the location of the leases. No *de minimis* thresholds apply within the North Central Coast air basin and MBUAPCD.

Table 4.5-2. Production Phase Planning Area Emissions for 2015 RFD Scenario (tons per year)

Operations and Maintenance Activity (long-term, upon buildout of 37 wells in RFD Scenario)	ROG	NOx	CO	SOx	PM10	PM2.5
Oil and gas production, combustion sources	0.13	3.59	0.21	1.04	1.77	1.77
Oil and gas production, vents and fugitives	9.23	—	—	—	—	—
Total (Production)	**9.37**	**3.59**	**0.21**	**1.04**	**1.77**	**1.77**
Total (Development and Production)	**9.62**	**8.40**	**1.22**	**1.04**	**29.11**	**5.99**
San Joaquin Valley Air Basin *de minimis* Threshold	**10**	**10**	**100**	**100**	**100**	**100**

Note: RFD Scenario emissions would most likely be in the jurisdiction of either the MBUAPCD or SJVAPCD, depending on the location of the leases. No *de minimis* thresholds apply within the North Central Coast air basin and MBUAPCD.

The air pollutant emissions would be expected to occur at levels that are below *de minimis* thresholds for pollutants in nonattainment or maintenance areas and below levels that would contribute substantially to an existing or projected air quality violation. The emissions would be predominately due to sources near well pads and along roadways accessing well sites on new Federal oil and gas leases with few, if any, scattered rural residences nearby. The sources would be focused to within 206 acres of surface in the RFD Scenario in all alternatives. Accordingly, the potential to contribute to an existing or projected air quality violation would be expected to be minor and localized, depending on the area open to leasing in each alternative. Long-term air quality impacts resulting from emissions of operations and/or maintenance activities upon full buildout of the RFD Scenario would be minor.

BLM requires that the lessee/operator ensure that all operations are properly permitted with the local air districts, and that the operations are in compliance with all mobile and stationary source guidelines. Required control measures include such items as dust control using application of water or pre-soaking and limiting traffic speed on unpaved roads. They also include measures such as use of low-emission construction equipment, and/or use of the existing electric distribution facilities, where available, rather than temporary power generators.

State and/or local air quality regulations applicable to the oil and gas development activities would reduce impacts through permit conditions or other restrictions on activities that control emissions to within levels acceptable to the local administering APCD. Examples of the restrictions include complying with rules and regulations for reducing, capturing, and/or controlling vapors, leaks, fugitives, and other emissions listed in this report in Section 3.5.2.

New Source Review and Prevention of Significant Deterioration

The Federal CAA requires NSR facility permitting for construction or modification of specified stationary sources for sources of designated nonattainment pollutants, and the Prevention of Significant Deterioration (PSD) program applies to new or modified major stationary sources of pollutants that occur in areas likely to attain the NAAQS. No major stationary sources of air pollution would be likely to occur as a result of the RMPA or under the 2015 RFD Scenario. While no actions or projects related to oil and gas leasing and development are anticipated to require a PSD permit as major stationary sources, minor sources can be expected to trigger the district-level New Source Review permitting process within either the MBUAPCD or SJVAPCD.

The types of facilities that would qualify as a stationary source and require an air permit from the local air permitting authority include: oil production and process equipment; oil/water separators; organic liquid storage tanks; waste gas flares; stationary engines and combustion turbines; and steam generators and boilers. Proposed BLM authorized actions that would result in substantial air pollutant emissions would be reviewed for potential PSD and NSR requirements and would need to secure all relevant air quality permits before operating.

Federal Class I Areas

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. In the 2015 RFD Scenario, the development-phase sources, construction-type activities, and long-term operations and maintenance would not require use of any major stationary sources that could permanently affect regional air quality or long-range visibility. Therefore, air quality impacts to mandatory Federal Class I Areas, including deposition of pollutants to soil and water, visibility, and other air quality related values (AQRVs) would be expected to be minor.

The BLM, as a Federal land manager, has an "affirmative responsibility to protect the air quality and related values (including visibility)" of any Federal Class I Area that it administers, and to consider whether a proposed major emitting facility will have an adverse impact on those values. The BLM has a responsibility to consider potential air quality impacts on the public lands through the New Source Review permitting process, especially within mandatory Federal Class I Areas. Any project that is anticipated to result in emissions that constitute a "major source" would be reviewed for potential impacts to sensitive receptors, including mandatory Class I Areas. This would be completed at the site-specific NEPA stage.

General Conformity

As described in Section 3.5.2, a general conformity determination is required for any Federal action within any Federal nonattainment and/or maintenance area. Proposed BLM authorized actions in the CCFO Planning Area trigger this requirement if calendar year emissions would exceed 10 tons per year of VOC or NOx within the San Joaquin Valley air basin or exceed 100 tons per year of these pollutants in the San Francisco Bay Area air basin, or 100 tons per year of PM10 or PM2.5 in either air basin. No general conformity *de minimis* thresholds apply within the North Central Coast air basin.

The Clean Air Act and its implementing rules (40 CFR 93, Subpart B) state that Federal agencies must make a determination that proposed actions in Federal non-attainment and maintenance areas conform to the applicable implementation plan before the action is taken. In addition, the action cannot cause or contribute to any new violation of the NAAQS, cannot increase the frequency or severity of any existing violation of any NAAQS, or delay timely attainment of any standard or any required interim emission reduction or other milestones.

The BLM has developed a ten-step process to comply with the Federal conformity requirements. These ten steps are: (1) Determine spatial and jurisdiction applicability; (2) Describe SIP status and content; (3) Develop any necessary background information; (4) Develop air quality impact analysis; (5) Compare activity to applicable SIP provisions and rules; (6) Develop conclusion statement; (7) Prepare a formal determination; (8) Conduct an agency/public review; (9) Submit the determination to appropriate regulatory agencies; and (10) Archive the results. Steps 1-6 have been completed as part of this EIS. In accordance with (40 CFR 93.153 (b)(1&2)). Steps 7-10 of this process will not be completed for the RMPA because the total direct and indirect emissions from plan alternatives are likely to be less than *de minimis* levels (see Table 4.5-1 and Table 4.5-2).

4.5.3 Impacts of Alternative A (No Action)

Alternative A would utilize the 2015 RFD Scenario, but would continue current management of air quality as set forth under the existing 2007 HFO RMP (BLM, 2007).

Alternative A would continue the current management goals, objectives, and direction as specified in the 2007 HFO RMP. Alternative A has approximately 683,800 acres currently open to oil and gas leasing and development. Activities and existing trends causing air quality impacts under the management actions for Energy and Minerals in Alternative A would continue as in the current conditions (Section 3.5.4). Stipulations would require oil and gas development activities to comply with applicable air quality regulations.

This would be consistent with the management goals for Air Quality and Atmospheric Conditions from the 2007 HFO RMP.

Oil and gas development in Alternative A would result in the types of air pollution sources and estimated levels of emissions that are described in Section 4.5.2, Impacts Common to All Alternatives. Emissions under Alternative A would be at the same levels as shown for the 2015 RFD Scenario in Table 4.5-1 and Table 4.5-2. The potential to contribute to an existing or projected air quality violation would be minor and localized, and the long-term air quality impacts resulting from emissions upon full buildout of the RFD Scenario would be minor.

Alternative A could result in emissions being located near a sensitive receptor because it would have most Federal mineral estate open to oil and gas leasing, with only certain areas currently closed under the 2007 HFO RMP (Section 2.6.1). This alternative would close fewer acres than other alternatives. Some of the areas open to oil and gas leasing would be near sensitive receptors. As such, Alternative A would have the greatest potential among the alternatives for causing a localized air quality impact to sensitive receptors.

Sensitive receptors would be affected by increased concentrations of air pollutants including hazardous air pollutants from construction activities and oil and gas production, depending on the proximity of the sensitive use. Existing surface uses that could occur near and be incompatible with oil and gas development include urban areas or population centers. Sensitive receptors include, but are not limited to, hospitals, schools, daycare facilities, elderly and convalescent facilities. Occupants of these existing uses or facilities are generally more susceptible to adverse effects of air pollution. Under Alternative A (No Action), these existing uses or facilities could experience unavoidable adverse impacts if oil and gas development is concentrated in one area and allowed to substantially increase air pollutant concentrations near existing sensitive receptors.

Mitigation

Mitigation Measures AQ-1 through AQ-3 include the types of measures that could be implemented to lessen the degree of potential adverse air quality impacts from development of oil and gas leases under Alternative A. During review of whether to accept or deny project proposals, BLM managers can decide to attach additional stipulations or measures, such as the following, to minimize or avoid air quality impacts.

AQ-1 **Control or Suppress Fugitive Dust.** Comply with a Fugitive Dust Control Plan that addresses emissions of fugitive dust during all stages of oil and gas development, including the implementation of the standard and enhanced dust control strategies identified by the local air district. The Fugitive Dust Control Plan would reduce PM10 and PM2.5 during construction and operations. Examples of such measures include:

- limiting the speeds of construction vehicles on unpaved surfaces to 15 miles per hour,
- posting visible speed limit signs at construction site entrances,
- during grading, use water, as necessary, on disturbed areas in construction sites to control visible plumes,
- suspending excavation and grading activities when winds exceed 20 miles per hour,
- limiting the size of area subject to excavation, grading, or other construction disturbance at any one time to avoid excessive dust,
- applying non-toxic soil stabilizers or soil weighting agents according to manufacturers' specifications to all construction areas that have been previously graded and are inactive for ten days or more,
- covering or treating soil storage piles with appropriate dust suppressant compounds,

- using wind erosion control techniques (such as windbreaks, water, dust suppressants, and/or vegetation) where soils are disturbed in construction, access and maintenance routes, and materials stock pile areas
- covering all trucks hauling dirt, sand, soil, or other loose materials,
- using enclosures, covers, flexible intermediate bulk containers, or rigid intermediate bulk containers for the storage, handling, and transfer of bulk dry materials such as sand, gravel and other dry additives used in well stimulation treatments,
- expeditiously removing the accumulation of mud or dirt from adjacent public streets at least twice every 24 hours when construction activities are occurring,
- inspecting and washing construction equipment vehicle tires, as necessary, so they are free of dirt before entering paved roadways, if applicable,
- providing gravel ramps of at least 20 feet in length at tire washing/cleaning stations, and ensuring construction vehicles exit construction sites through treated entrance roadways, unless an alternative route has been approved by appropriate lead agencies, if applicable,
- using sandbags or equivalent effective measures to prevent runoff to roadways in construction areas adjacent to paved roadways; ensure consistency with the project's Storm Water Pollution Prevention Plan, if such a plan is required for the project, and
- limiting operating hours and engine run-time for heavy equipment.

AQ-2 **Control Off-Road Vehicle Engine Exhaust.** Use off-road equipment with low-emission engines during all stages of oil and gas development. Potential strategies include relying on electricity from the distribution grid for power instead of using portable generators and requiring all off-road diesel engines to meet the most stringent of applicable Federal or State standards. Use equipment meeting at a minimum the Tier 3 (with proper diesel particulate controls), or better (Tier 4) California Emission Standards for Off-Road Compression-Ignition Engines as specified in California Code of Regulations (CCR) Title 13, Division 3, Chapter 9, Article 4, Sec. 2423(b)(1). Consider using electric vehicles where possible. In addition, if not already supplied with a factory-equipped diesel particulate filter, all construction equipment shall be outfitted with Verified Diesel Emissions Control Strategies (VDECS) devices certified by ARB. Any emissions control device used shall achieve emissions reductions that are no less than what could be achieved by a Level 3 VDECS diesel emissions control strategy for a similarly sized engine as defined by ARB regulations. Plan construction scheduling to minimize vehicle trips. Limit idling of heavy equipment to less than 5 minutes and verify through inspections. Maintain and tune engines per manufacturer's specifications to perform at ARB and/or U.S. EPA certification levels, prevent tampering, and conduct unscheduled inspections to ensure these measures are followed.

AQ-3 **Offset Emissions to Reduce Residual Impacts.** Use offsets or emission reduction credits to further reduce the residual impact of emissions from stationary sources, portable equipment and mobile sources related to oil and gas development. This may include participating in a proposed or established program for offsetting criteria air pollutants consistent with local air pollution control district or air quality management district recommendations.

Leases Subject to Settlement Agreement – Subalternative 1

The 14 non-NSO leases as identified in Case No. 11-06174 and Case No. 13-1749 would be issued. Oil and gas leasing and development within the leases subject to the settlement agreement would create emissions within the North Central Coast air basin and in the jurisdiction of the MBUAPCD. Air quality impacts would occur within the North Central Coast air basin as described for Alternative A in general.

Leases Subject to Settlement Agreement – Subalternative 2

The two non-NSO leases as identified in Case No. 11-06174 should not have been issued, and the 12 prospective non-NSO leases as identified in Case No. 13-1749 would not be issued. As such, no resource impact would occur.

4.5.4 Impacts of Alternative B

Alternative B air quality impacts in the Planning Area are analyzed below. Alternative B would open areas within the boundaries of oil and gas fields, plus a buffer. Alternative B would close all areas outside of oil and gas fields plus a buffer, which would result in about 39,000 acres open to oil and gas leasing and development. In contrast with the 2015 RFD Scenario, Alternative B would not have 5 exploratory wells, and ground disturbance would be 179 acres because development is limited to the existing oil and gas fields, plus buffer.

The available lands would be subject to stipulations that would require oil and gas development activities to comply with applicable air quality regulations and to minimize or eliminate conflict between oil and gas development and existing surface uses. This would be consistent with the management goals for Air Quality and Atmospheric Conditions from the 2007 HFO RMP.

Oil and gas development in Alternative B would result in the types of air pollution sources and estimated levels of emissions that are described in Section 4.5.2, Impacts Common to All Alternatives. Emissions under Alternative B would be at the same levels as shown for the 2015 RFD Scenario in Table 4.5-1 and Table 4.5-2. The potential to contribute to an existing or projected air quality violation would be minor and localized, and the long-term air quality impacts resulting from emissions upon full buildout of the RFD Scenario would be minor.

Alternative B would have a limited potential to result in emissions being located near a sensitive receptor. This alternative would close more acres than other alternatives. As such, Alternative B would have the least potential among the alternatives for causing a localized air quality impact to sensitive receptors.

The CSU Existing Surface Use/Management stipulation would be applied to areas where the BLM authorized officer determines that pre-existing surface management uses/conditions would be incompatible with or preclude oil and gas operations. This CSU stipulation ensures that proposed activity would be reviewed cooperatively with the surface manager to determine if it is compatible with the existing uses/ conditions, and if not, the activity would be moved or possibly even denied/rejected. This would minimize or eliminate the potential for emissions from oil and gas development to cause substantial air pollutant concentrations and a potentially adverse impact to existing sensitive receptors.

The air quality impacts under the management actions for Energy and Minerals in Alternative B would be generally confined by requiring sources to be within existing oil and gas fields plus a buffer. By confining oil and gas leasing to the existing fields plus the buffer, Alternative B would be likely to avoid exposing sensitive receptors to substantial pollutant concentrations.

Mitigation

Mitigation Measures AQ-1 through AQ-3 at the end of Section 4.5.3 include the types of measures that could be implemented to lessen the degree of potential adverse air quality impacts from oil and gas leases and development associated with Alternative B.

Leases Subject to Settlement Agreement

Oil and gas leasing and development within the leases subject to the settlement agreement would create emissions within the North Central Coast air basin and in the jurisdiction of the MBUAPCD. Air quality impacts would occur within the North Central Coast air basin as described for Alternative B in general.

4.5.5 Impacts of Alternative C

Alternative C air quality impacts in the Planning Area are analyzed below. Alternative C would open areas within high oil and gas potential areas or within the boundaries of oil and gas fields, plus a buffer, with the exception of core population areas of the giant kangaroo rat in the vicinity of Panoche, Griswold, Tumey, and Ciervo Hills, which are closed to leasing. Alternative C would close areas that do not have high oil and gas occurrence potential.

The available lands would be subject to stipulations that would require oil and gas development activities to comply with applicable air quality regulations and to minimize or eliminate conflict between oil and gas development and existing surface uses. This would be consistent with the management goals for Air Quality and Atmospheric Conditions from the 2007 HFO RMP.

Oil and gas development in Alternative C would result in the types of air pollution sources and estimated levels of emissions that are described in Section 4.5.2, Impacts Common to All Alternatives. Emissions under Alternative C would be at the same levels as shown for the 2015 RFD Scenario in Table 4.5-1 and Table 4.5-2. The potential to contribute to an existing or projected air quality violation would be minor and localized, and the long-term air quality impacts resulting from emissions upon full buildout of the RFD Scenario would be minor.

Alternative C would have a potential to result in emissions being located near a sensitive receptor. However, the CSU Existing Surface Use/Management stipulation would be applied to available areas to ensure that proposed activity would be reviewed cooperatively with the surface manager to determine if it is compatible with the existing uses/conditions, and if not, the activity would be moved or possibly even denied/rejected. This would minimize or eliminate the potential for emissions from oil and gas development to cause substantial air pollutant concentrations and a potentially adverse impact to existing sensitive receptors.

Mitigation

Mitigation Measures AQ-1 through AQ-3 at the end of Section 4.5.3 include the types of measures that could be implemented to lessen the degree of potential adverse air quality impacts from oil and gas leases and development associated with Alternative C.

Leases Subject to Settlement Agreement

Oil and gas leasing and development within the leases subject to the settlement agreement would create emissions within the North Central Coast air basin and in the jurisdiction of the MBUAPCD. Air quality impacts would occur within the North Central Coast air basin as described for Alternative C in general.

4.5.6 Impacts of Alternative D

Alternative D air quality impacts in the Planning Area are analyzed below. Alternative D would open areas of Federal mineral estate underlying BLM surface estate. Alternative D would close all BLM split estate lands and the Ciervo Panoche Natural Area.

The available lands would be subject to stipulations that would require oil and gas development activities to comply with applicable air quality regulations and to minimize or eliminate conflict between oil and gas development and existing surface uses. This would be consistent with the management goals for Air Quality and Atmospheric Conditions from the 2007 HFO RMP.

Oil and gas development in Alternative D would result in the types of air pollution sources and estimated levels of emissions that are described in Section 4.5.2, Impacts Common to All Alternatives. Emissions under Alternative D would be at the same levels as shown for the 2015 RFD Scenario in Table 4.5-1 and Table 4.5-2. The potential to contribute to an existing or projected air quality violation would be minor

and localized, and the long-term air quality impacts resulting from emissions upon full buildout of the RFD Scenario would be minor.

Alternative D would have a limited potential to result in emissions being located near a sensitive receptor. The CSU Existing Surface Use/Management stipulation would be applied to available areas to ensure that proposed activity would be reviewed to determine if it is compatible with the existing uses/conditions. This would minimize or eliminate the potential for emissions from oil and gas development to cause substantial air pollutant concentrations and a potentially adverse impact to existing sensitive receptors.

The air quality impacts under the management actions for Energy and Minerals in Alternative D would be generally confined by requiring sources to be within BLM surface estate. By confining oil and gas leasing to the BLM surface estate, Alternative D would be likely to avoid exposing sensitive receptors to substantial pollutant concentrations.

Mitigation

Mitigation Measures AQ-1 through AQ-3 at the end of Section 4.5.3 include the types of measures that could be implemented to lessen the degree of potential adverse air quality impacts from oil and gas leases and development associated with Alternative D.

Leases Subject to Settlement Agreement

Oil and gas leasing and development within the leases subject to the settlement agreement would create emissions within the North Central Coast air basin and in the jurisdiction of the MBUAPCD. Air quality impacts would occur within the North Central Coast air basin as described for Alternative D in general.

4.5.7 Impacts of Alternative E

Alternative E air quality impacts in the Planning Area are analyzed below. Alternative E would open areas of Federal mineral estate outside of a California DWR Bulletin 118 Groundwater Basin and Subbasin.

The available lands would be subject to stipulations that would require oil and gas development activities to comply with applicable air quality regulations and to minimize or eliminate conflict between oil and gas development and existing surface uses. This would be consistent with the management goals for Air Quality and Atmospheric Conditions from the 2007 HFO RMP.

Oil and gas development in Alternative E would result in the types of air pollution sources and estimated levels of emissions that are described in Section 4.5.2, Impacts Common to All Alternatives. Emissions under Alternative E would be at the same levels as shown for the 2015 RFD Scenario in Table 4.5-1 and Table 4.5-2. The potential to contribute to an existing or projected air quality violation would be minor and localized, and the long-term air quality impacts resulting from emissions upon full buildout of the RFD Scenario would be minor.

Alternative E would have a potential to result in emissions being located near a sensitive receptor. However, the CSU Existing Surface Use/Management stipulation would be applied to available areas to ensure that proposed activity would be reviewed cooperatively with the surface manager to determine if it is compatible with the existing uses/conditions, and if not, the activity would be moved or possibly even denied/rejected. This would minimize or eliminate the potential for emissions from oil and gas development to cause substantial air pollutant concentrations and a potentially adverse impact to existing sensitive receptors.

Mitigation

Mitigation Measures AQ-1 through AQ-3 at the end of Section 4.5.3 include the types of measures that could be implemented to lessen the degree of potential adverse air quality impacts from oil and gas leases and development associated with Alternative E.

Leases Subject to Settlement Agreement

Oil and gas leasing and development within the leases subject to the settlement agreement would create emissions within the North Central Coast air basin and in the jurisdiction of the MBUAPCD. Air quality impacts would occur within the North Central Coast air basin as described for Alternative E in general.

4.6 Climate Change/Greenhouse Gas Emissions

This section addresses impacts to GHG emissions (a proxy for impacts to climate change) from activities allowed under the RMPA alternatives. The primary GHG impacts that can be reasonably expected to occur are emissions from the combustion of fossil fuels and from releases of CO_2 and methane due to oil and gas development and production. Discussions of impacts to other resources that are affected by climate change appear in the respective sections in Chapter 4.

4.6.1 Introduction

Approach to Impact Assessment

The RMPA alternatives would allow oil and gas development in some areas of the BLM Central Coast Field Office (CCFO) Planning Area. Oil and gas development involves extracting materials from the earth using various methods, and these are described in the Reasonably Foreseeable Development (RFD) Scenario (see Appendix B).

Extraction of petroleum resources generally requires preparing the site, drilling, installing well equipment, and storing or transporting the resource off-site. These processes directly produce GHG in engine exhaust emissions and cause CO_2 and methane to be released as a result of treatment or processing of the extracted oil and gas or the byproducts of oil and gas extraction.

Before initiating any type of oil and gas development, the entity proposing the development may need to apply for and obtain approval for air permits from the air district, and air permits may include provisions for controlling GHG emissions, namely methane, as part of a program to reduce leaks or vents of organic compounds.

BLM Best Management Practices/Standard Operating Procedures for Air Quality (Appendix D) could reduce emissions of GHG during oil and gas production by implementing techniques to control vapors, leaks, fugitives, and other emissions that contain CO_2 and methane.

Types of Impacts

Oil and gas development activities would directly result in GHG emissions. The directly emitted GHG may result in an indirect or cumulative impact to climate change if the emissions conflict with any applicable plan, policy, regulation, or goals adopted for the purpose of reducing GHG emissions. Those plans, policies, regulations and goals are listed in this report in Section 3.6.2.

Assumptions

All activities must comply with applicable laws and regulations and may be subject to review for certain types of GHG emissions by the local air permitting authority. The potential GHG emissions from oil and gas development would occur in the following context:

- The oil and gas produced by the development described in the RFD Scenario would be delivered into California's existing energy supply system, which would not need to be modified to accommodate the incremental production. California is implementing and will continue to implement numerous State laws, policies, and programs specifically designed to reduce the demand and need for conventional energy from oil and gas resources.
- The California Air Resources Board (ARB) requires any operator of GHG sources in the Petroleum and Natural Gas Systems source category to quantify and report CO_2, CH_4, and N_2O emissions, when stationary combustion and process emissions equal or exceed 10,000 metric tons CO2e or their stationary combustion, process, fugitive, and vented emissions equal or exceed 25,000 metric tons of CO2e, from seventeen source types on a well-pad or associated with a well-pad (17 CCR 95152(c)).

- Operators of GHG sources in the category of Petroleum and Natural Gas Systems became covered by the Cap-and-Trade Program on January 1, 2013 (17 CCR 95852.2(b)), along with other large industrial facilities, electric generating utilities, and electricity importers.
- Downstream use of oil and gas, oil processing at refineries, and natural gas transmission and distribution are separate activities that would not be substantially affected by the RFD Scenario, aside from the need to carry produced oil and gas to the existing transmission pipeline network over a distance that is likely to be less than 10 miles. The GHG emissions from end-use of oil and gas produced by leasing and development activity in the CCFO Planning Area would be indirect effects of the production because the emissions would occur at a different time and farther removed in distance from the leasing and development activity.

The discussion of cumulative impacts appears in Section 5.3.5. Globally, GHG emissions contribute, by their nature, on a cumulative basis to the adverse environmental impacts of global climate change. Because the primary environmental effect of GHG emissions would be to exacerbate global climate change and the numerous side-effects on the environment and humans, the area of influence for GHG impacts is global. However, those effects of climate change would also be manifested on resources and ecosystems in California, as summarized in the discussions of Climate Change Indicators and Evidence as part of the Current Conditions and Trends, Section 3.6.4.

4.6.2 Impacts Common to All Alternatives

The RFD Scenario (i.e., between zero and 37 development wells with approximately 206 acres of surface disturbance over the next 15 to 20 years on Federal mineral estate in the Planning Area) would occur under all of the alternatives. However, a maximum of 32 wells is considered for Alternative B because leasing is allowed only within current oil and gas fields plus a 0.5-mile buffer defined by DOGGR, which would not allow for any exploratory wells.

For all alternatives, oil and gas exploration and development could occur anywhere that is open to oil and gas leasing within the CCFO Planning Area, although the most likely areas of development are either in the North Central Coast air basin or in the San Joaquin Valley air basin. Little or no new oil and gas activity is anticipated in the BAAQMD portion of the CCFO Planning Area.

For all alternatives, leases subject to the settlement agreement occur in the North Central Coast air basin and in the jurisdiction of the MBUAPCD, and 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.

GHG Sources Associated with RFD Scenario

Anticipated GHG emissions from oil and gas development include direct emissions of CO_2 due to fuel combustion by all equipment and vehicles, including drill rig engines, drill pad construction equipment, temporary production flaring, remedial well work, equipment trucks, hauling of liquids, drill rig crew trucks/vehicles, portable lift equipment, portable testing equipment and temporary production facilities. Combustion emissions also occur from equipment used during well stimulation treatments and from boilers or steam generators used during enhanced oil recovery (EOR).

Vented gases and fugitive leaks that occur during all phases of well development and production are sources of volatile organic compounds (VOC) and reactive organic gases (ROG), which are regulated as air pollutants (Section 3.5 and Section 4.5), and methane, although these can often be detected and cost-effectively reduced, captured, recovered, or controlled by flaring.

Estimated GHG Emissions for 2015 RFD Scenario

Each alternative includes the 2015 RFD Scenario (i.e., 37 wells and 206 acres of surface disturbance). For informational purposes, reasonable emissions estimates for any year within the life of this plan were calculated and are based on three wells per year being constructed and three wells undergoing well stimu-

lation treatments on Federal mineral estate in the CCFO Planning Area. After the construction activities and emissions are completed, the new wells would transition into long-term operations and maintenance, when the oil and gas production activities and emissions would commence and then continue. The production-phase emissions assume all 37 wells transition to long-term operations and maintenance.

Table 4.6-1 quantifies the anticipated levels of GHG emissions during the years of wells being developed on Federal mineral estate, and Table 4.6-2 quantifies the GHG emissions from long-term operation and/or maintenance activities upon full buildout of the RFD Scenario. Boilers or steam generators used during EOR would cause the majority of GHG emissions during the production phase. These emissions would most likely be in the jurisdiction of either the MBUAPCD or SJVAPCD, depending on the location of the leases.

Table 4.6-1. Development Phase GHG Emissions for 2015 RFD Scenario (metric tons per year)

Development Activity (new well construction and well stimulation of three wells per year)	CO2e (MTCO2e per year)
New Well Development with Surface Disturbance	200.1
Geophysical Exploration	57.3
Well Stimulation	327.0
Total (Development)	**584.4**

Table 4.6-2. Production Phase GHG Emissions for 2015 RFD Scenario (metric tons per year)

Operations and Maintenance Activity (long-term, upon buildout of 37 wells in RFD Scenario)	CO2e (MTCO2e per year)
Oil and Gas Production, combustion sources	18,500.0
Oil and Gas Production, vents and fugitives	(included above)
Total (Production)	**18,500**
Total (Development and Production)	**19,084**

The directly emitted GHG would occur at levels that are below the 25,000 MTCO2e annual threshold for mandatory reporting of GHG in the U.S. EPA Mandatory Reporting Program (40 CFR Part 98). If combustion or process emissions for an individual production facility were to exceed 10,000 MTCO2e per calendar year, then the ARB mandatory reporting requirements would become applicable to that facility.

Additional GHG emissions would occur as an indirect effect during end-use of oil and gas produced by leasing and development activity in the CCFO Planning Area. A rough estimate of possible indirect CO_2 emissions is provided below based on the RFD Scenario and other publicly available information. For informational purposes, we have summarized these possible indirect emissions by estimating 318,718 barrels of crude oil anticipated to be produced annually based on the historic production capabilities of active wells in existing fields within the CCFO Planning Area. Using the assumptions outlined below, Table 4.6-3 quantifies 141,062 metric tons of CO_2 of GHG emissions from end use of crude oil that could possibly be produced annually by full buildout of the RFD Scenario.

Table 4.6-3. Estimated Indirect End Use GHG Emissions for 2015 RFD Scenario

Reference	CO_2 Emission Factor	Resulting Estimate of End Use Emissions	CO2e (MTCO2e per year)
IPCC	73,300 kg/TJ	325,723,502 CO_2 lb/yr	147,747
EIA, 2011	10.29 kg/gallon	303,669,069 CO_2 lb/yr	137,743
EPA, 2016	74.54 kg/MMBtu	303,566,371 CO_2 lb/yr	137,697
Estimated Indirect CO_2 Emissions		**310,986,314 CO_2 lb/yr**	**141,062**

Sources:
Intergovernmental Panel on Climate Change (IPCC), 2006 IPCC Guidelines for National Greenhouse Gas Inventories Volume 2, Energy, 2006, Table 2.2 Default Emission Factors for Stationary Combustion in the Energy Industries (kg of greenhouse gas per TJ on a Net Calorific Basis).
U.S. EIA, 2011. Voluntary Reporting of Greenhouse Gases Program. Fuel Emission Coefficients Table 1 (CO2 for Stationary Combustion).
U.S. EPA, 2016. Mandatory Greenhouse Gas Reporting Regulation. 40 CFR Part 98, Subpart C, Table C-1. (Default HHV, CO2 factors).

With respect to the rough estimate of indirect CO_2 emissions, it should be noted that it is difficult to discern with certainty what end uses for the fuels extracted from a particular lease might be reasonably foreseeable. For instance, some end uses of fossil fuels extracted from Federal leases include: combustion of transportation fuels, fuel oils for heating or industrial use, as well as production of asphalt and road oil, and the feedstocks used to make chemicals, plastics, and synthetic materials. The estimate is based on an approximation of these end uses on a national basis using the references cited. While the BLM based these estimates on national data about typical end use of produced oil and gas, it is important to note that the BLM does not exercise control over the specific end use of the oil and gas produced from any individual Federal lease.

The GHG emissions from oil and gas development and production, if allowed by leasing, would occur along with indirect emissions from end-users of the fuels. However, these direct and indirect emissions would not be likely to conflict with any applicable plan, policy, regulation, or goals adopted for the purpose of reducing GHG emissions. California's regulatory setting, including reporting of GHG and the Cap-and-Trade Program (Section 3.6.2, Regulatory Framework), provides oversight and management of GHG directly emitted during development and production and indirectly emitted by end users of the petroleum products. The GHG emissions and the associated direct and indirect impacts would be minor.

A Federal Interagency Working Group on the Social Cost of Carbon (SCC) 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. The aim of SCC analysis would be to model the effects of the proposed action on the welfare of future generations at a global scale caused by additional carbon emissions occurring in the present.

The BLM finds that including monetary estimates of the social cost of carbon in its NEPA analysis for this proposed action, which is not a rulemaking, would not be useful. There are several challenges involved in attempting to apply the social cost of carbon protocol to the analysis for this project. For example:

- The GHG emissions estimates, and thus the social costs associated with these emissions, are the same across all alternatives.
- Monetizing only certain benefits or costs can lead to an unbalanced assessment. A comprehensive regional economic impact analysis is often used to estimate impacts on economic activity, expressed as projected changes in employment, personal income, or economic output. The NEPA analysis for the proposed action does not provide such estimates, which are not monetized as benefits or costs.

- The social cost of carbon estimates developed by the IWG focus on the effects of CO_2 emissions. These effects must be balanced with the costs and benefits of reducing other GHG emissions across all stages of oil and gas production, such as with controls for methane, which would have different short-term and long-term effects. Again, monetizing only certain effects can lead to an unbalanced assessment.

Oil and gas development activities would not disrupt the statewide emissions reduction goals set by the Global Warming Solutions Act of 2006 (AB 32) and subsequent programs. State climate change programs and/or local air quality regulations applicable to oil and gas development activities would require reporting and controlling GHG through permit conditions or participation by the operators in mandatory programs for GHG management. For larger operators, compliance with Cap-and-Trade Program provisions would ensure that California's overall GHG emissions remain consistent with statewide-targeted levels.

Suppliers of transportation fuels and the end-use of oil and gas as a transportation fuel in California would need to comply with California's Low Carbon Fuel Standard (LCFS). Under this program, transportation fuel suppliers must demonstrate that the mix of fuels they provide meet the carbon intensity standards of the LCFS, where the carbon intensity is a measure of the GHG emissions associated with the various production, distribution, and use steps in the "life-cycle" of the fuel. This ensures that downstream use of oil and gas as a transportation fuel would meet the LCFS. Additionally, fuel suppliers, including refiners, pipeline companies and railroads, generally bear the compliance obligation in the Cap-and-Trade Program for the GHG from end-use of the petroleum products for fuel users not otherwise covered. This means that the combustion emissions of the fuel delivered to all end-users are covered in the Cap-and-Trade Program.

4.6.3 Impacts of Alternative A (No Action)

Alternative A would utilize the 2015 RFD Scenario while continuing current management under the existing 2007 HFO RMP (BLM, 2007). The 2007 HFO RMP did not define goals, objectives, or management actions for GHG or Climate Change.

Oil and gas leasing and development activities under the management actions for Energy and Minerals in Alternative A would result in direct and indirect impacts from GHG emissions that would be minor and at the same level as described in Section 4.6.2, Impacts Common to All Alternatives.

Mitigation

The BLM would require Best Management Practices/Standard Operating Procedures for Air Quality (Appendix D). These could reduce emissions of GHG during oil and gas production by implementing techniques to control vapors, leaks, fugitives, and other emissions that contain CO_2 and methane. No additional mitigation is recommended for Alternative A.

As BLM evaluates potential mitigation of GHG emissions and the interaction of a proposed action with climate change, it will also carefully evaluate the quality of that mitigation to ensure it is additional, verifiable, durable, enforceable, and will be implemented. BLM will consider the potential for mitigation measures to reduce or mitigate GHG emissions and climate change effects when those measures are reasonable and consistent with achieving the purpose and need for the proposed action. Such mitigation measures could include enhanced energy efficiency, lower GHG-emitting technology, carbon capture, carbon sequestration (e.g., forest, agricultural soils, and coastal habitat restoration), sustainable land management practices, and capturing or beneficially using GHG emissions such as methane. Finally, BLM recognizes the value of monitoring to ensure that mitigation is carried out as provided in a record of decision.

Leases Subject to Settlement Agreement – Subalternative 1

The 14 non-NSO leases as identified in Case No. 11-06174 and Case No. 13-1749 would be issued. The leases subject to the settlement agreement would result in GHG emissions as described in Section 4.6.2, Impacts Common to All Alternatives that would occur in the North Central Coast air basin, in the jurisdiction of the MBUAPCD.

Leases Subject to Settlement Agreement – Subalternative 2

The two non-NSO leases as identified in Case No. 11-06174 should not have been issued, and the 12 prospective non-NSO leases as identified in Case No. 13-1749 would not be issued. As such, no resource impact would occur.

4.6.4 Impacts of Alternative B

Oil and gas development and GHG emissions would occur at less than the maximum levels projected with the 2015 RFD Scenario, because Alternative B would not have 5 exploratory wells, and ground disturbance would be up to 179 acres. Alternative B would include only areas within the boundaries of oil and gas fields, plus a buffer, so all impacts assumed from the maximum of 5 exploratory wells would not occur.

Oil and gas leasing and development activities under the management actions for Energy and Minerals in Alternative B would result in direct and indirect impacts from GHG emissions that would be minor and at the same level as described in Section 4.6.2, Impacts Common to All Alternatives.

Mitigation

The BLM would require Best Management Practices/Standard Operating Procedures for Air Quality (Appendix D). These could reduce emissions of GHG during oil and gas production by implementing techniques to control vapors, leaks, fugitives, and other emissions that contain CO_2 and methane. No additional mitigation is recommended for Alternative B.

As BLM evaluates potential mitigation of GHG emissions and the interaction of a proposed action with climate change, it will also carefully evaluate the quality of that mitigation to ensure it is additional, verifiable, durable, enforceable, and will be implemented. BLM will consider the potential for mitigation measures to reduce or mitigate GHG emissions and climate change effects when those measures are reasonable and consistent with achieving the purpose and need for the proposed action. Such mitigation measures could include enhanced energy efficiency, lower GHG-emitting technology, carbon capture, carbon sequestration (e.g., forest, agricultural soils, and coastal habitat restoration), sustainable land management practices, and capturing or beneficially using GHG emissions such as methane. Finally, BLM recognizes the value of monitoring to ensure that mitigation is carried out as provided in a record of decision.

Leases Subject to Settlement Agreement

The leases subject to the settlement agreement would result in GHG emissions as described in Section 4.6.2, Impacts Common to All Alternatives that would occur in the North Central Coast air basin, in the jurisdiction of the MBUAPCD.

4.6.5 Impacts of Alternative C

Oil and gas development and GHG emissions would occur at up to the levels projected with the 2015 RFD Scenario. Although Alternative C would include only areas within high oil and gas potential areas or within the boundaries of oil and gas fields, plus a buffer, virtually all development is expected to occur in these areas.

Oil and gas leasing and development activities under the management actions for Energy and Minerals in Alternative C would result in direct and indirect impacts from GHG emissions that would be minor and at the same level as described in Section 4.6.2, Impacts Common to All Alternatives.

Mitigation

The BLM would require Best Management Practices/Standard Operating Procedures for Air Quality (Appendix D). These could reduce emissions of GHG during oil and gas production by implementing techniques to control vapors, leaks, fugitives, and other emissions that contain CO_2 and methane. No additional mitigation is recommended for Alternative C.

As BLM evaluates potential mitigation of GHG emissions and the interaction of a proposed action with climate change, it will also carefully evaluate the quality of that mitigation to ensure it is additional, verifiable, durable, enforceable, and will be implemented. BLM will consider the potential for mitigation measures to reduce or mitigate GHG emissions and climate change effects when those measures are reasonable and consistent with achieving the purpose and need for the proposed action. Such mitigation measures could include enhanced energy efficiency, lower GHG-emitting technology, carbon capture, carbon sequestration (e.g., forest, agricultural soils, and coastal habitat restoration), sustainable land management practices, and capturing or beneficially using GHG emissions such as methane. Finally, BLM recognizes the value of monitoring to ensure that mitigation is carried out as provided in a record of decision.

Leases Subject to Settlement Agreement

The leases subject to the settlement agreement would result in GHG emissions as described in Section 4.6.2, Impacts Common to All Alternatives that would occur in the North Central Coast air basin, in the jurisdiction of the MBUAPCD.

4.6.6 Impacts of Alternative D

Oil and gas development and GHG emissions would occur at the levels projected with the 2015 RFD Scenario, although Alternative D would include only areas of Federal mineral estate underlying BLM surface estate.

Oil and gas leasing and development activities under the management actions for Energy and Minerals in Alternative D would result in direct and indirect impacts from GHG emissions that would be minor and at the same level as described in Section 4.6.2, Impacts Common to All Alternatives.

Mitigation

The BLM would require Best Management Practices/Standard Operating Procedures for Air Quality (Appendix D). These could reduce emissions of GHG during oil and gas production by implementing techniques to control vapors, leaks, fugitives, and other emissions that contain CO_2 and methane. No additional mitigation is recommended for Alternative D.

As BLM evaluates potential mitigation of GHG emissions and the interaction of a proposed action with climate change, it will also carefully evaluate the quality of that mitigation to ensure it is additional, verifiable, durable, enforceable, and will be implemented. BLM will consider the potential for mitigation measures to reduce or mitigate GHG emissions and climate change effects when those measures are reasonable and consistent with achieving the purpose and need for the proposed action. Such mitigation measures could include enhanced energy efficiency, lower GHG-emitting technology, carbon capture, carbon sequestration (e.g., forest, agricultural soils, and coastal habitat restoration), sustainable land management practices, and capturing or beneficially using GHG emissions such as methane. Finally, BLM recognizes the value of monitoring to ensure that mitigation is carried out as provided in a record of decision.

Leases Subject to Settlement Agreement

The leases subject to the settlement agreement would result in GHG emissions as described in Section 4.6.2, Impacts Common to All Alternatives that would occur in the North Central Coast air basin, in the jurisdiction of the MBUAPCD.

4.6.7 Impacts of Alternative E

Oil and gas development and GHG emissions would occur at the levels projected with the 2015 RFD Scenario, although Alternative E would include areas of Federal mineral estate outside of a California DWR Bulletin 118 Groundwater Basin and Sub-basin.

Oil and gas leasing and development activities under the management actions for Energy and Minerals in Alternative E would result in direct and indirect impacts from GHG emissions that would be minor and at the same level as described in Section 4.6.2, Impacts Common to All Alternatives.

Mitigation

The BLM would require Best Management Practices/Standard Operating Procedures for Air Quality (Appendix D). These could reduce emissions of GHG during oil and gas production by implementing techniques to control vapors, leaks, fugitives, and other emissions that contain CO_2 and methane. No additional mitigation is recommended for Alternative E.

As BLM evaluates potential mitigation of GHG emissions and the interaction of a proposed action with climate change, it will also carefully evaluate the quality of that mitigation to ensure it is additional, verifiable, durable, enforceable, and will be implemented. BLM will consider the potential for mitigation measures to reduce or mitigate GHG emissions and climate change effects when those measures are reasonable and consistent with achieving the purpose and need for the proposed action. Such mitigation measures could include enhanced energy efficiency, lower GHG-emitting technology, carbon capture, carbon sequestration (e.g., forest, agricultural soils, and coastal habitat restoration), sustainable land management practices, and capturing or beneficially using GHG emissions such as methane. Finally, BLM recognizes the value of monitoring to ensure that mitigation is carried out as provided in a record of decision.

Leases Subject to Settlement Agreement

The leases subject to the settlement agreement would result in GHG emissions as described in Section 4.6.2, Impacts Common to All Alternatives that would occur in the North Central Coast air basin, in the jurisdiction of the MBUAPCD.

4.7 Groundwater Resources

Potential impacts of oil and gas production on groundwater resources are described in this section for each of the Draft RMP alternatives. The approach to the impact analysis is discussed in Section 4.7.1. Potential impacts to groundwater resources that are common to all alternatives are discussed in Section 4.7.2. Potential impacts and mitigation associated with each of the five alternatives, including the No Action alternative, are described in Sections 4.7.3 through 4.7.7.

4.7.1 Introduction

Approach to Impact Assessment

The impacts analysis evaluates both quantity and quality of groundwater resources with a focus on usable water, defined in the BLM final rule on hydraulic fracturing as waters containing less than 10,000 mg/L TDS outside of an exempt aquifer (see 43 CFR Part 3160.0-5 for the complete definition). The terms *usable water* and *usable groundwater* are used interchangeably in the EIS sections on groundwater resources. For all alternatives, the RFD Scenario is assumed, which includes up to 37 new oil and gas wells to be drilled in the CCFO Planning Area. Also assumed in the RFD Scenario is that all wells may be treated with well stimulation techniques (including hydraulic fracturing). The RFD Scenario includes 32 of the wells that would be likely drilled in existing oil and gas fields but could potentially be drilled anywhere in the CCFO Planning Area and up to five wells likely outside of existing oil and gas fields. Because Alternative B only includes Federal mineral estate within oil and gas fields, a maximum of 32 wells is assumed for Alternative B; remaining alternatives are assumed to contain the maximum 37 wells.

Although the alternatives vary as to which parcels of BLM mineral estate will be open to oil and gas leases, this approach will make a conservative, worst-case assumption that the total number of wells can be drilled on any Federal mineral estate available in the associated alternative. For Alternative B, up to 32 wells can be drilled on any Federal mineral estate within an oil and gas field; for all remaining alternatives, up to 37 wells can be drilled on any Federal mineral estate open under that alternative. Recent oil and gas development has been concentrated in four existing fields: Coalinga and Jacalitos fields in western Fresno County and San Ardo and Lynch Canyon fields in Monterey County. BLM administers Federal mineral estate in all of these fields except the Lynch Canyon field.

The analysis is conducted to ensure that outcomes are consistent with the proposed RMP management goals provided in the 2007 RMP for the CCFO Planning Area (BLM, 2007). For water resources, the RMP goals include (1) maintain, restore, or improve water quality and quantity to sustain the designated beneficial uses on Federal mineral estate and (2) ensure that surface and groundwater quality comply with the Clean Water Act (CWA) and with California State standards. The first goal is consistent with the State's Porter Cologne Act (see Section 3.7.2) and the basin plans developed by the State Water Resources Control Board (SWRCB). The second goal addresses the State's Anti-degradation Policy. Also incorporated into the analysis are the BLM objectives to achieve those goals, along with the area-wide management actions related to groundwater (BLM, 2007).

The approach for analyzing impacts on groundwater quantity includes a review of published information of water use for oil and gas drilling and well stimulation. The total amount of water needed for the 2015 RFD Scenario is tabulated and compared to groundwater resources in the CCFO Planning Area. The approach to the impacts analysis for groundwater quality focuses on the pathways by which flowback and/or formation fluids could reach usable groundwater. The chemical composition of well stimulation fluids and associated formation fluids is considered. To meet RMP management goals and to comply with water quality standards in California, usable groundwater is assumed to be impacted if well stimulation fluids and associated formation fluids are likely to migrate into the usable groundwater zone via any of the identified pathways.

BLM regulations titled "Oil and Gas; Hydraulic Fracturing on Federal and Indian Lands; Final Rule," were issued in March 2015 and contain numerous protective measures that address groundwater impacts from hydraulic fracturing. 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). Therefore, this impacts assessment describes potential risk of hydraulic fracturing to impact groundwater with and without implementation of the BLM final rule.

Assumptions and Key Studies

- For purposes of the impact analysis for groundwater in this EIS/RMPA, 10,000 mg/L TDS is the water quality threshold for evaluating potential impacts on groundwater resources.
- The impacts analysis is based primarily on the impacts identified in CCST's 2014 report on well stimulation technologies, prepared 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, pg. 17).
- The impact analysis also considers information from recent studies conducted by the EPA (2015) and USGS (Taylor et al., 2014), as well as a recent proposal prepared for the State Water Resources Control Board by USGS (Taylor et al., 2014). In addition to these studies, this analysis incorporates information provided in the Final Environmental Impact Report, Analysis of Oil and Gas Well Stimulation Treatments in California, prepared in compliance with SB 4 (DOC, 2015).
- Data on oil and gas fields in the CCFO Planning Area were derived from unpublished data developed by DOGGR (see Appendix J in DOC, 2015) and DOGGR publications (DOC, 1998).

4.7.2 Impacts Common to All Alternatives

The following is a summary of impacts to groundwater resources that are common to all alternatives.

Groundwater Quantity

CCST indicates that in California, water use for hydraulic fracturing is less than in other states and is a fraction of statewide water use. Nonetheless, water use in California can impact local water supplies, especially during drought conditions (CCST, 2014, pg. 34). Although it is not possible to make specific determinations at this time as to where or when these kinds of impacts may occur, climate change could also affect water supply, such that water usage for well stimulation would exacerbate the impacts of climate change on groundwater quantity and water supply within the CCFO Planning Area. EPA notes that impacts related to water use are based on local water availability (EPA, 2015). CCST compiled water use data for 1,760 hydraulic fracturing events in California from FracFocus, Central Valley Regional Water Quality Control Board (CVRWQCB), South Coast Air Quality Management District (SCAQMD), and DOGGR's well stimulation disclosures from 2011 through June 2014. During that time period, water use per hydraulic fracturing treatment ranged from a minimum of 4,200 gallons (approximately 0.1 AF) per well to a maximum of 4,860,000 gallons (approximately 14.9 AF) per well, with an average use of 140,000 gallons (approximately 0.4 AF) (CCST, 2015a, pg. 121). CCST estimates that between 125 and 175 wells in California are hydraulically fractured per month (CCST, 2015a, pg. 149). Using the average water use of 140,000 gallons per well, statewide water use for hydraulic fracturing ranges from approximately 640 acre-feet per year (AFY) (assuming 125 wells per month) to approximately 900 AFY (assuming 175 wells per month). As described in Section 3.7.4, only one hydraulic fracturing event compiled by CCST (2015a, Appendix O) was conducted in the CCFO Planning Area. A well in the Guijarral Hills field, in Fresno County, was hydraulically fractured in December 2013 and 2,123,268 gallons of water was used (CCST, 2015a, Appendix O). CCST did not provide the water source, but the field is within portions of the Westside

subbasin (5-22.09) and Pleasant Valley subbasin (5-22.10), and therefore it is possible that groundwater from one of these subbasins was used.

Table 4.7-1. Water Use per Well for Drilling and Well Stimulation Treatments

Operations	Estimated Water Use per Well (AF)
Conventional well drilling operations[1]	0.39 – 0.77
Conventional well stimulation treatments[2]	0.40
Total Conventional Well Operations	**0.79 – 1.17**
Exploratory well drilling operations[1]	5 – 10
Water-intensive well stimulation treatments[1]	10 – 20
Total Water-Intensive Well Operations	**15 – 30**

1 - SB 4 Final EIR (see Table 10.14-6, DOC, 2015).
2 - CCST, 2015a, pg. 121.

Data provided by CCST are based on records for hydraulic fracturing treatments in California over the last few years. These conventional treatments typically involve a vertical well with only one to three stages of well stimulation treatments. Depending on advances in technology and future determination of favorable geologic conditions, future well stimulation may involve deep and long horizontal wells with up to 20 stages of well stimulation treatments for each well to reach unconventional oil reservoirs. Estimates of water use for these more water-intensive well stimulation treatments were developed for the SB 4 Final EIR (see Table 10.14-6, DOC, 2015). As summarized in the Final EIR, an upper estimate of water use for 20 stages of an exploratory well stimulation treatment may range from approximately 3,258,510 gallons to 6,517,020 gallons per well (10 AF to 20 AF). As described above, the one hydraulic fracturing treatment completed in the CCFO Planning Area within the last few years used approximately 2.1 million gallons of water (CCST, 2015a, Appendix O). Therefore, using these water use estimates for water-intensive well stimulation treatments is appropriate for the CCFO Planning Area.

Water is also used for drilling new wells. Exact amounts of water vary substantially with well design, depth, and location. Water use for drilling a typical oil well in California is approximately 4,200 gallons (approximately 0.1 AF) per day per well (Section 7.3.3, DOC, 2015). Although the number of days needed to drill and complete a well varies considerably, many of the existing fields with BLM mineral estate contain relatively shallow wells (less than 5,000 feet deep). Based on this depth, it is assumed that the drilling and completion process would take no more than 30 days to 60 days, resulting in a conservative estimated water use of 126,000 gallons (0.39 AF) to 252,000 gallons (0.77 AF). This amount may be substantially larger for an exploratory horizontal well; a high-end range for an exploratory well is estimated to be from about 1,600,000 gallons to 3,250,000 gallons (5 AF to 10 AF) (see Table 10.14-6, DOC, 2015).

Based on well stimulation notices filed through the middle of January 2014, CCST indicates that 96 percent (238 of 249) of the planned well stimulation treatments will use fresh water for hydraulic fracturing (CCST, 2014, pg. 186). Fresh water may be obtained from surface water or groundwater. The actual water source(s) (e.g., surface water or groundwater) to be used for drilling and well stimulation in the CCFO Planning Area is unknown and is likely to vary according to location. Consistent with a conservative approach, groundwater is assumed to be used for all drilling and well stimulation activities for the maximum of 37 wells in the 2015 RFD Scenario. Assuming groundwater use for both drilling and well stimulation, the estimated total water use per well for conventional wells (relatively shallow, vertical wells with a few stages of well stimulation) ranges from 0.79 AF to 1.17 AF, as shown in Table 4.7-1. The estimated total water use for water-intensive wells (deep horizontal wells with up to 20 stages of well stimulation) ranges from 15 AF to 30 AF per well.

To provide end members for a range of total water use for the RFD scenario, two assumptions regarding the number of conventional and water-intensive wells were considered. RFD Scenario 1 assumes that all 37 wells will be conventional vertical wells with well stimulation treatments involving one to three stages. For RFD Scenario 2, all 37 wells are assumed to be water-intensive horizontal wells with well stimulation treatments involving up to 20 stages. Using estimates per well on Table 4.7-1, total water use estimates for the two types of well stimulation operations are summarized in Table 4.7-2.

Assuming that all wells use groundwater, 37 conventional well operations would require an estimated 29 AF to 43 AF of groundwater (Table 4.7-2); 37 water-intensive well operations would require an estimated 555 AF to 1,110 AF of groundwater (Table 4.7-2). Water-intensive operations would use between approximately 19 to 26 times more water than conventional well operations. A combination of conventional and water-intensive wells would have a total groundwater use within this range. All of these estimates represent groundwater use over a time period of 15 to 20 years (as assumed in the RFD Scenario). Assuming a 20-year period, total groundwater use would range from 1.5 AFY to 55.5 AFY.

Table 4.7-2. Total Water Use Estimates for the RFD Scenario

RFD Scenario 1	Estimated Water Use per Well (AF)	Number of Wells[3]	Total Estimated Water Use (AF)
Conventional well operations[2]	0.79 – 1.17	37	29.23 – 43.29
Water-Intensive well operations[1]	15 – 30	0	0
Total water use, RFD Scenario 1[3]			29.23 – 43.29
RFD Scenario 2			
Conventional well operations[2]	0.79 – 1.17	0	0
Water-Intensive well operations[1]	15 – 30	37	555 – 1,110
Total water use, RFD Scenario 2[3]			555 – 1,110

1 - SB 4 Final EIR (see Table 10.14-6, DOC, 2015).
2 - CCST, 2015a, pg. 121.
3 - RFD Scenario (Except Alternative B, which has 32 wells; see discussion below).

For Alternative B, the number of wells is reduced slightly from 37 to 32, which also reduces the amount of water use estimated above. Applying a similar methodology as described above to 32 wells results in a total groundwater use ranging from 1.5 AFY to 48 AFY.

Potential impacts of groundwater withdrawals identified by CCST include decreases in river flows, land subsidence, reductions in aquifer storage, and increased pumping costs or the need to deepen or drill new wells (CCST, 2014, pg. 187). Water quantity impacts depend on local conditions, and therefore, require a site-specific analysis (CCST, 2014, pg. 187). Water demand for a well stimulation event occurs over a short period of time. Therefore, groundwater resources can be stressed if well stimulation occurs during the driest times of the year or if multiple well stimulation jobs are being conducted at the same time in the same geographic area. The volumes of water are often less important than the rates and timing of the withdrawals. An impact analysis of groundwater quantity in the Final EIR for SB 4 noted that many groundwater basins had already been critically impacted according to rankings by CDWR, including basins/subbasins with overdraft conditions. As noted in the Final EIR, any increase in groundwater use in a basin/subbasin in overdraft would contribute to overdraft conditions, a process considered to be a substantial impact if not mitigated.

Although all of these potential impacts are applicable to groundwater resources in the CCFO Planning Area, the details of the RFD Scenario indicate that the maximum amount of groundwater use would be 1,110 AF (361,696,830 gallons) for the 37 wells. Compared to the resources present in any of the groundwater basins, this small amount would not likely result in any discernable impact. Whether any impacts to groundwater quantity could occur would depend on site-specific conditions that cannot be quantified at this time. Nonetheless, the potential for groundwater quantity impacts is common to all five alternatives.

Groundwater Quality

CCST identified over 300 chemicals or chemical mixtures used for hydraulic fracturing in California (CCST, 2015b, pg. 70). The chemical additives used in well stimulation activities can include the same or similar type of additives used in water- and steam-flooding enhanced recovery operations which are applied in volumes higher than in well stimulation (Taylor et al., 2014). The environmental toxicity of approximately two-thirds of these chemicals is unknown because of a lack of publicly available information (CCST, 2015b, pg. 162). Thirty-three of the chemicals were found to be hazardous to aquatic species and could pose a threat to the environment if released (CCST, 2015b, pg. 162). Many of the chemicals are equivalent to the toxicity of household products, which is not insignificant, and numerous chemicals are non-toxic (CCST, 2014, pg. 194). However, CCST is clear that a more complete assessment of the hazards associated with well stimulation fluids in California is necessary (CCST, 2014, pg. 193; CCST, 2015b, pages 153-166). CCST notes that their analysis is limited and full disclosure of the chemicals used during hydraulic fracturing is required in order to understand the potential environmental quality impacts (CCST, 2014, pg. 194; CCST, 2015b, pg. 162).

CCST also compared chemicals associated with well stimulation fluids used in California with those used in other parts of the country and concluded that the composition of fluids used in California were significantly different. This difference was attributed to the prevalence of gel-based fluids in California that require smaller amounts of water but also contain higher concentrations of chemicals. Given that most of the hydraulic fracturing in California occurs in relatively shallow wells, this often results in fluids with concentrated chemicals being used in close vertical proximity (less than 2,000 feet) to usable groundwater (CCST, 2014, pages 219-220).

CCST notes that the chemical constituents of produced water from stimulated wells in California has not been studied (CCST, 2015b, pg. 163). However, starting in July 2015, operators are required to sample produced water initially following well stimulation and then again after 30 days of production (CCST, 2015b, pg. 91) Therefore, produced water quality from stimulated wells will be better understood in the future.

It is understood that produced water reflects the water quality of the formation (CCST, 2015b, pg. 97). Oil and gas formations can contain methane, salts, trace metals, naturally occurring radioactive materials (NORM), and organic materials that can return to the surface with flowback and produced waters. TDS concentrations of flowback and produced water in California from well stimulation operations may be lower than in other regions because well depths are shallower than in other parts of the United States (CCST, 2014, pg. 205). Trace metals concentrations in the Monterey Formation are high, and therefore flowback and produced waters in California are expected to have higher than average trace metal concentrations (CCST, 2014, pg. 205). CCST notes that there is a lack of data on NORM content in flowback and produced water in California and regards this as a major data gap in evaluating impacts from well stimulation treatments (CCST, 2014, pg. 207). It is known that elements such as uranium, radium, and radon gas are present at low concentrations in soil and groundwater. The Monterey Formation is six times more enriched in uranium than the World Shale Average; however, the uranium content of crude oil in California is not "typically high" (CCST, 2014, pg. 206). No information about organic constituents in flowback and produced water from well stimulation treatments was identified by CCST. However, organic constituents in produced water from conventional oil and gas operations typically include polycyclic aromatic hydrocarbons (PAHs), phenols, and volatile organic compounds (VOCs) such as BTEX and naphthalene (CCST, 2014, pg. 207).

Notwithstanding these limitations and data gaps, the chemical composition of flowback (and associated formation fluids) indicates that groundwater quality could be impacted if these fluids were released or migrated into usable groundwater. This is evidenced by constituents with concentrations above drinking water standards or the presence of other constituents (e.g., methane or salts) that could degrade groundwater

quality. The impact analysis focuses on potential pathways for these fluids to reach usable groundwater as described below.

Potential Release Pathways

Potential release pathways include both surface and subsurface releases.

Surface spills and leaks can occur during the transport of chemicals, during pre-stimulation chemical mixing, or during well stimulation treatment (CCST, 2014, pg. 210). These releases can be caused by a number of mechanisms, including tank ruptures, piping failures, blowouts, equipment failures, overfills, fires, vandalism, accidents or improper operations (CCST, 2014, pg. 210). Based on spill data from Pennsylvania and Colorado, the EPA estimates that 100 to 3,700 surface spills could occur annually in the United States, under the assumption that 25,000 to 30,000 wells are hydraulically fractured each year (EPA, 2015).

The storage and disposal of flowback and produced water at the surface can also result in accidental surface releases to the environment. Between January 2009 and February 2014, there were over 400 reported surface spills at oil and gas fields in California caused primarily by tank corrosion and sensor failures which released close to 3 million gallons of flowback/produced water (CCST, 2014, pg. 211). There is also evidence that the disposal of flowback and/or produced water in unlined pits has led to groundwater impacts in the United States and in California (CCST, 2015b, pg. 112). As of April 2015, there were 933 unlined pits identified in California, 62 percent of which were active (CCST, 2015b, pg. 110). Approximately one-third of the active pits were operating without appropriate permits from the Central Valley Regional Water Quality Control Board (CVRWQCB) (CCST, 2015b, pg. 110). Illegal discharges have occurred as illustrated by the $60,000 fine issued by the CVRWQCB to Vintage Production California LLC for discharging saline water, formation fluids, and hydraulic fracturing fluids into an unlined sump for 12 days (CCST, 2014, pg. 215).

Section 3162.3-3(2)(h) of the BLM final rule on hydraulic fracturing requires that all flowback be stored in rigid enclosed, covered, or netted and screened aboveground tanks unless the applicant demonstrates that the use of these tanks is infeasible for environmental, public health or safety reasons. In this case, the applicant could use lined pits under certain conditions including a distance of 50 feet from usable groundwater. Section 1786 of the SB 4 Well Stimulation Treatment Regulations prohibits the disposal of flowback water to sumps or pits in California and requires that flowback water be stored in containers. Therefore, both SB 4 and the BLM final rule require storage of flowback in containers. However, the BLM final rule is more stringent than the SB 4 regulations, because it requires that the containers be enclosed. The potential for a surface release of flowback to occur is greater if the container is not enclosed. Although the BLM final rule requires a closed container, which is a more protective container than required under SB 4, SB 4 requires secondary containment and mitigation that would reduce any impacts from surface spills. Section 1786 of the SB 4 Well Stimulation Treatment Regulations also requires that operators be in compliance with all applicable testing, inspection, and maintenance requirements for production facilities that are storing and handling well stimulation fluids.

Another potential surface release mechanism is the reuse of produced water for irrigated agriculture. Although this has not been conducted within the CCFO Planning Area, there is growing interest in this practice. Produced water from five oil and gas fields in the San Joaquin Valley (Deer Creek, Jasmin, Kern River, Kern Front, and Mount Poso), two of which have undergone hydraulic fracturing (Kern River and Mount Poso), have been used to irrigate crops. The potential reuse of produced water from well stimulation is problematic because of the chemicals in well stimulation fluid that are known to be toxic in addition to those chemicals whose toxicity is unknown (CCST, 2015b, pg. 114).

CCST identifies potential subsurface pathways for well stimulation fluids. One potential subsurface pathway is that well stimulation may create a fracture that connects to a higher permeable zone or to existing

faults or abandoned wells (CCST, 2014, pg. 217; CCST, 2015b, pg. 117) that would allow for migration of well stimulation fluid. CCST (2014, pg. 219; and 2015b, pg. 121) notes a study that suggests a minimum separation of 2,000 feet is recommended between shale reservoirs and overlying groundwater resources. In California, however, many wells undergoing well stimulation are less than 2,000 feet deep. CCST, therefore, concludes that the potential for induced fractures to reach groundwater aquifers may be higher in California than in other states (CCST, 2014, pg. 220). Nationwide, the EPA indicates that 20 percent of the 23,000 wells hydraulically fractured in 2009 and 2010 had less than a 2,000-foot separation between the point of shallowest hydraulic fracturing and protected water (EPA, 2015).

The BLM final rule and the SB 4 regulations both require an analysis of suspected faults prior to well stimulation to identify and analyze any potential for hydraulic fracturing fluid to migrate outside of the zone being fractured. The BLM final rule requires a map of suspected faults or fractures within 0.5-mile of the wellbore. SB 4 regulations require a review of all geologic features, including known faults that are active or inactive, within five times the axial dimensional stimulation area (ADSA)[1]. If the ADSA is less than 0.1-mile (528 feet), which is often the case in California, then the geologic review would be less than 0.5-mile, and risks to groundwater from fluid migration to existing fractures may be greater if the BLM final rule were overturned.

Another potential subsurface pathway for well stimulation fluids is migration in the well or well annuli between the casing and the formation. Failure of cement and casing strings may allow pressurized gas and fluids from the producing zones to migrate upwards along the well and into usable groundwater. Poor well construction and uncemented casing are cited as the most important mechanisms leading to gas and fluid migration (CCST, 2014, pg. 224). The USGS summaries of published scientific work (Taylor et al., 2014) highlights this conclusion. Additionally, the USGS notes that the pathways by which fluids associated with well stimulation practices can affect potentially usable groundwater can be the same as those by which all oil and gas operations, including enhanced oil recovery practices, can have effects (Taylor et al., 2014). The USGS notes that published research has identified leaky wellbores as the most common pathway for contaminants from oil and gas activities to migrate to groundwater resources (Taylor et al., 2014). The USGS further notes that of the 168 active oil and gas fields in California greater than two square miles in size, 31 contain more than 100 wellbores per square mile (Taylor et al., 2014). A large number of potential contaminant pathways would exist if only a small percentage of wellbores were compromised (Taylor et al., 2014). In fact, over one million wells may have been drilled in the United States before well construction was regulated; the status and location of many of these wells are unknown (EPA, 2015). The EPA estimates that 6 percent of 23,000 oil and gas wells across the U.S. were drilled more than 10 years before they were hydraulically fractured in 2009 and 2010, and that these older wells may not have been constructed to withstand the stresses associated with hydraulic fracturing (EPA, 2015). The EPA goes further to note that using older wells for hydraulic fracturing "could be of concern" (EPA, 2015).

Abandoned wells are a potential subsurface pathway for well stimulation fluids. CCST (2015b, pg. 122) indicates that there are more inactive wells in California than active wells. Based on data from DOGGR, there are approximately 221,000 wells in California, approximately 116,000 (52 percent) of which have been abandoned according to State standards (CCST, 2015b, pg. 122). There are 1,800 wells that were not abandoned properly and whose location is approximate and 388 wells whose status is unknown because they were constructed before 1976 (CCST, 2015b, pg. 122). SB 4 requires operators to locate abandoned wells, but does not require operators to test the condition of the abandoned wells. CCST describes a U.S. Government Accountability Office (GAO) report conducted in 1989 about Class II injection wells across the country in which cases of groundwater contamination were caused by the communication between the

[1] ADSA refers to the Axial Dimensional Stimulation Area and is defined in SB 4 as the estimated axial dimensions, expressed as maximum length, width, height, and azimuth, of the area(s) stimulated by a well stimulation treatment (14 CCR, Chapter 4, Section 1781(f)).

injection well and improperly abandoned wells. GAO indicates that 70 percent of injection wells were constructed before 1976, when permitting requirements began to require a search for abandoned wells within one quarter mile of a newly proposed injection well bore (CCST, 2014, pg. 225). Wells constructed before 1976 were grandfathered into the program without requiring knowledge of nearby abandoned wells. To convert a formerly oil producing well into an injection well, the BLM would approve a Sundry Form 3160-5. In California, most of the disposal of flowback fluids occurs in Class II injection wells that inject fluids back into the hydrocarbon zones for enhanced oil recovery (EOR).

Despite the increased focus on well stimulation by the scientific research community within the last few years, the CCST reports state that the scientific understanding of well stimulation impacts is not currently well established (CCST, 2014, pg. 231; CCST, 2015b; pages 166-167). CCST (2015b, pg. 167) states that there is not enough data to either confirm or deny that surface and groundwater resources have been impacted by well stimulation. The EPA notes that the evaluation of potential impacts is inhibited by the lack of water quality data before and after a well is hydraulically fractured, lack of long-term studies, presence of other sources of contamination which make proving a direct link to hydraulic fracturing difficult, and lack of information on hydraulic fracturing activities (EPA, 2015).

The SB 4 Final EIR (DOC, 2015) focused on potential subsurface pathways along wells or wellbores, including the well subject to well stimulation and other existing wells/wellbores within the zone of influence (generally referred to in SB 4 regulations as the ADSA). These wells or wellbores, if not effectively sealed, could potentially serve as a conduit for upward migration of well stimulation fluids (including gas) into usable groundwater. Specifically, the analysis noted that wells in oil and gas fields are drilled through groundwater resources that may overlie the hydrocarbon zones, and, as such, provide a continuous physical connection between well stimulation target zones and usable groundwater. If a pathway from the target zone to usable groundwater is completed along a wellbore, fluid travel times and volumes are not restricted by confining layers in the same manner as would occur naturally in the absence of the wellbore.

Both the BLM final rule and the SB 4 regulations have requirements for well seals to prevent the migration of gas and fluids from the produced zone to usable groundwater. The BLM final rule requires that at least a 200-foot well seal be placed between the hydraulic fracturing zone and the deepest usable water. The SB 4 regulations require cement placement in surface casing from the base of the casing to the surface and preferably through the freshwater zone (3,000 mg/L). The State's Final EIR (DOC, 2015) includes a mitigation measure (MM-GW-4b) requiring a 500-foot well seal across the base of usable water if the hydraulic fracturing zone is below the base of the usable water. If the hydraulic fracturing zone is within usable water, then this mitigation measure requires a well seal along the entire casing string, from the bottom of the well to the surface. Therefore, the SB 4 regulations along with the Final EIR mitigation measures are more protective than the BLM final rule. Consequently, if the BLM final rule is overturned, groundwater impacts from the migration of gas or fluids from producing zone to usable water would be protected.

Based on the material provided in these collective analyses and the number of wells in most oil and gas fields, wells appear to represent the most probable potential subsurface pathway for well stimulation liquids and gases to reach protected groundwater. Further, the primary factor affecting the well-related pathway is the mechanical integrity of the well, and in particular, the placement and effectiveness of cement seals in the annulus between the well casing and the geologic formation.

Potential impacts to usable groundwater quality associated with migration of well stimulation fluids and formation fluids (including gas) along surface and subsurface pathways are applicable to all alternatives associated with the RMP/EIS.

Impacts Mitigated by Recent Regulations

Numerous recent regulations regarding well stimulation and hydraulic fracturing address these potential impacts and, at least in part, serve to mitigate the impacts discussed above on groundwater quantity and quality. Regulations include both California regulations for well stimulation treatment permits and the final rule for hydraulic fracturing on Federal and Indian lands (BLM, 2015). However, as noted above, the BLM will be unable to enforce their final rule until a final decision is made in a legal challenge.

State regulations include the Well Stimulation Treatment Regulations adopted by DOGGR in July 2015 in compliance with SB 4. These regulations contain numerous protective measures for groundwater quality based on isolating the well stimulation target zone from groundwater resources. A summary of the key protective measures in the regulations was provided in the Final EIR (DOC, 2015, see Section 10.14.5 Impact Analysis and Mitigation Measures for Groundwater Resources). Also included in the Final EIR were mitigation measures to work in combination with SB 4 regulations to mitigate potential impacts to both groundwater quantity and groundwater quality on a programmatic basis. The proposed mitigation measures — along with the permanent SB 4 regulations — are considered to mitigate potential impacts to groundwater from well stimulation treatments.

In addition, SB 4 requires groundwater monitoring to track the performance of the regulations and mitigation in protecting groundwater resources. Model Criteria for groundwater monitoring in areas of oil and gas stimulation were finalized in July 2015. These Model Criteria were used to implement a regional groundwater monitoring program which began in January 2016.

The BLM final rule contains numerous protective measures that address groundwater impacts from hydraulic fracturing. Many of these measures are complementary or duplicative of requirements in the SB 4 regulations (e.g., requirements for mechanical integrity testing of wells). However, as discussed previously, there are some measures that are more stringent than SB 4 regulations. In addition, the rule includes a performance standard requiring "the operator to isolate all usable water and mineral-bearing formations and protect them from contamination" (Section 3162.5-2). The final rule stipulates data and information required for approval of hydraulic fracturing, requires monitoring and verification of cementing operations prior to hydraulic fracturing, provides details of mandatory mechanical integrity testing prior to hydraulic fracturing, requires monitoring and recording of pressure on well annuli during stimulation, contains requirements for a water disposal plan and management of recovered fluids, and lists information that must be provided after the hydraulic fracturing has been completed.

Collectively, the DOGGR regulations, mitigation measures provided in the Final EIR, and the BLM final rule serve to reduce potential impacts to the quantity or quality of usable groundwater. However, if the BLM final rule is overturned, then the risk of impacts to groundwater resources may increase because the BLM final rule has more stringent requirements for the storage of flowback and the evaluation of faults prior to well stimulation. The regulations are applicable to all alternatives associated with the RMP/EIS.

4.7.3 Impacts of Alternative A (No Action)

Under Alternative A, the No Action Alternative, the areas currently open for oil and gas leasing would remain open and the areas closed under the 2007 RMP would remain closed. Areas that remain closed include designated wilderness, wilderness study areas (WSAs), Fort Ord National Monument, and Clear Creek Serpentine Area of Critical Environmental Concern (ACEC). Figure 4.7-1 illustrates the Federal mineral estate that is open, open with no surface occupancy (NSO) restrictions, and closed to oil and gas leasing under Alternative A.

Groundwater basins on Federal mineral estate that is open and open with NSO restrictions can potentially be impacted under this alternative. Federal mineral estate that is open with NSO restrictions can be impacted by directional or horizontal drilling from nearby surface lands.

As shown on Table 4.7-3, portions of all 20 groundwater basins containing Federal mineral estate are open to oil and gas leasing in Alternative A. These groundwater basins are in seven counties within the CCFO Planning Area: Alameda, Contra Costa, Fresno, Merced, Monterey, San Benito, and Santa Cruz. As summarized on Table 4.7-3, four of these groundwater basins/subbasins were assigned a high CASGEM priority ranking and are on the List of Critically Overdrafted Groundwater Basins, released January 2016: Delta-Mendota (5-22.07), Westside (5-22.09), Paso Robles (3-4.06), and Pajaro Valley (3-2). A description of each of the groundwater basins is provided in Section 3.7.4. As described in the 2015 RFD Scenario, up to 37 oil and gas wells will be drilled in the next 15 to 20 years, 32 of which are expected to be within existing oil and gas fields and 3 to 5 outside of existing oil and gas fields. As summarized in Table 4.7-3, oil and gas fields intersect groundwater basins in Contra Costa, Fresno, Monterey, and San Benito Counties.

All of the impacts associated with groundwater quantity and quality described in Section 4.7.2 are applicable to Alternative A. In addition, no new impacts to usable groundwater are identified that are specific only to this alternative. However, the four critically overdrafted groundwater basins/subbasins assigned a high CASGEM priority ranking that contain open Federal mineral estate under this alternative would be particularly vulnerable to groundwater quality and quantity impacts. Alternative A is the only alternative that has open mineral estate in all 20 groundwater basins with Federal mineral estate, including the four high-priority and critically overdrafted basins.

Mitigation

All of the mitigation measures discussed in Section 4.7.2 are applicable to Alternative A. No additional mitigation measures are necessary to mitigate impacts associated with this alternative. Collectively, existing regulations in the BLM final rule for hydraulic fracturing on Federal and Indian lands if not overturned (March 2015), the DOGGR SB 4 permanent regulations, and the mitigation measures in the SB 4 Final EIR (DOC, 2015) mitigate the potential impacts to quantity and quality of usable groundwater in the CCFO Planning Area.

Leases Subject to Settlement Agreement – Subalternative 1

Under Alternative A, the leases subject to the settlement agreement would be open to leasing and would be issued. As discussed in Section 3.7.4, some of the leases overlie small portions of two groundwater basins — the Salinas Valley, Paso Robles Area groundwater subbasin (3-4.06) in Monterey County and the Vallecitos Creek Valley groundwater basin (5-71) in San Benito County. The Paso Robles Area groundwater basin is assigned a high-priority ranking in the CASGEM program and would be particularly vulnerable to groundwater quality and quantity impacts.

Leases Subject to Settlement Agreement – Subalternative 2

The two non-NSO leases as identified in Case No. 11-06174 should not have been issued, and the 12 prospective non-NSO leases as identified in Case No. 13-1749 would not be issued. As such, no resource impact would occur.

4.7.4 Impacts of Alternative B

Under Alternative B, Federal mineral estate within the boundaries of oil and gas fields, plus the DOGGR 0.5-mile buffer, would be open for oil and gas leasing and the remaining areas would be closed. Controlled surface use (CSU) stipulations would apply to all land open to oil and gas leasing. Figure 4.7-2 illustrates the Federal mineral estate that are open, open with no surface occupancy (NSO) restrictions, and closed to oil and gas leasing under Alternative B.

Table 4.7-3. Groundwater Basins with Federal Mineral Estate Associated with Each Alternative

DWR Groundwater Basin / Subbasin				CDWR Priority Ranking[2]	Alternatives: Groundwater Basins that Contain Open Federal Mineral Estate[3]				
Basin Name	Subbasin Name	Number	County[1]		A	B	C	D	E
Santa Clara Valley	Niles Cone	2-9.01	Alameda	medium	X	—	—	—	—
Clayton Valley	—	2-5	Contra Costa	very low	X	X	X	—	—
San Joaquin Valley	Tracy	5-22.15		medium	X	X	X	—	—
San Joaquin Valley	Delta-Mendota	5-22.07	Fresno	high*	X	—	X	X	—
	Pleasant Valley	5-22.10		low	X	X	X	X	—
	Westside	5-22.09		high*	X	X	X	X	—
Cholame Valley	—	3-5	Monterey	very low	X	—	X	—	—
Lockwood Valley	—	3-6		very low	X	—	X	—	—
Peach Tree Valley	—	3-32		very low	X	—	—	—	—
Salinas Valley	Forebay Aquifer	3-4.04		medium	X	X	X	X	—
	Upper Valley Aquifer	3-4.05		medium	X	—	X	—	—
	Paso Robles Area	3-4.06		high*	X	—	X	X	—
Bitterwater Valley	—	3-30	San Benito	very low	X	—	X	—	—
San Benito River Valley	—	3-28		very low	X	—	—	—	—
Gilroy–Hollister Valley	San Juan Bautista Area	3-3.04		medium	X	—	X	—	—
Hernandez Valley	—	3-31		very low	X	—	—	X	—
Panoche Valley	—	5-23		very low	X	—	X	X	—
Vallecitos Creek Valley	—	5-71		very low	X	X	X	X	—
Santa Cruz Purisima Formation	—	3-21	Santa Cruz	medium	X	—	—	—	—
Pajaro Valley	—	3-2		high*	X	—	—	—	—

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.
3 - Also includes Federal mineral estate that is Open with Restrictions (No Surface Occupancy).
*On Draft List of Critically Overdrafted Groundwater Basins.

Approximately 96 percent of the Federal mineral estate is closed to oil and gas leasing under Alternative B. Up to 32 development wells are expected to be drilled in the next 15 to 20 years under Alternative B. Well drilling will be conducted within the boundaries and buffer of existing oil and gas fields. Because water-intensive wells could also be drilled within an oil and gas field, no changes are made for assumptions on water use per well for potential impacts to groundwater quantity. As shown in Table 4.7-3, 6 of the 20 groundwater basins that intersect Federal mineral estate are open to oil and gas leasing. These groundwater basins are in four counties: Contra Costa, Fresno, Monterey, and San Benito. As summarized on Table 4.7-3, Westside subbasin is the only groundwater basin with open Federal mineral estate that has a high-priority ranking under the CASGEM program. This subbasin would be particularly vulnerable to groundwater quality and quantity impacts under this alternative. However, Alternative B involves fewer groundwater basins than any other alternative except Alternative E. Further, of the six basins involved, only three are associated with either a medium- or high-priority ranking under the CASGEM program. A description of each of the groundwater basins is provided in Section 3.7.4.

All of the impacts associated with groundwater quantity and quality described in Section 4.7.2 are applicable to Alternative B. In addition, no new impacts to usable groundwater are identified that are specific only to this alternative.

Mitigation

All of the mitigation measures discussed in Section 4.7.2 are applicable to Alternative B. No additional mitigation measures are necessary to mitigate impacts associated with this alternative. Collectively, existing regulations in the BLM final rule for hydraulic fracturing on Federal and Indian lands if upheld by the court, (March 2015), the DOGGR SB 4 permanent regulations, and the mitigation measures in the SB 4 Final EIR (DOC, 2015) mitigate the potential impacts to quantity and quality of usable groundwater in the CCFO Planning Area.

Leases Subject to Settlement Agreement

Under Alternative B, only a small portion of the leases subject to the settlement agreement would be open to oil and gas leasing. The leases subject to the settlement agreement in Monterey County would not overlie oil and gas fields, and therefore, would be closed to oil and gas leasing under this alternative. In San Benito County, the leases that are within or overlap portions of the Vallecitos oil and gas field would be open to oil and gas leasing. Portions of these open leases intersect the Vallecitos Creek Valley groundwater basin (5-71).

4.7.5 Impacts of Alternative C

Under Alternative C, Federal mineral estate in high oil and gas potential areas or within the boundaries and 0.5-mile buffer of oil and gas fields would be open to oil and gas leasing, with the exception of core population areas of the giant kangaroo rat in the vicinity of Panoche, Griswold, Tumey, and Ciervo Hills which are closed to leasing. Areas closed under the 2007 RMP would remain closed. CSU stipulations would apply to all land open to oil and gas leasing. NSO stipulations would apply to some lands open to leasing, including: (1) threatened and endangered species critical habitat; (2) BLM developed recreation and administrative sites; and (3) special status split estate lands (e.g., state parks, county parks, conservation easements, land trusts, and scenic designations). Figure 4.7-3 illustrates the Federal mineral estate that are open, open with NSO restrictions, and closed to oil and gas leasing under Alternative C.

Slightly more than half (54 percent) of the Federal estate is open to oil and gas leasing. Under Alternative C, up to 37 wells projected to be drilled in the next 15 to 20 years will be drilled in areas of high oil and gas potential or with the boundaries and buffer of oil and gas fields.

As shown on Table 4.7-3, 14 of the 20 groundwater basins that contain Federal mineral estate in the CCFO are subject to oil and gas leasing. These groundwater basins are in Contra Costa, Fresno, Merced, Monterey, and San Benito Counties. As summarized on Table 4.7-3, there are three groundwater subbasins with

open Federal mineral estate that have a high-priority ranking from the CASGEM program: Delta-Mendota (5-22.07), Westside (5-22.09), and Paso Robles (3-4.06). These subbasins would be particularly vulnerable to groundwater quality and quantity impacts under this alternative. A description of each of the groundwater basins is provided in Section 3.7.4. Alternative C involves fewer groundwater basins than Alternative A but more than Alternative B.

All of the impacts associated with groundwater quantity and quality described in Section 4.7.2 are applicable to Alternative C. In addition, no new impacts to usable groundwater are identified that are specific only to this alternative.

Mitigation

All of the mitigation measures discussed in Section 4.7.2 are applicable to Alternative C. No additional mitigation measures are necessary to mitigate impacts associated with this alternative. Collectively, existing regulations in the BLM's final rule for hydraulic fracturing on Federal and Indian lands if upheld by the court (March 2015), the DOGGR SB 4 regulations, and the mitigation measures in the SB 4 Final EIR (DOC, 2015) mitigate the potential impacts to quantity and quality of usable groundwater in the CCFO Planning Area.

Leases Subject to Settlement Agreement

Under Alternative C, most of the leases subject to the settlement agreement would be open to oil and gas leasing because of the occurrence of leases within high oil and gas potential areas. The leases subject to the settlement agreement in San Benito County would be, for the most part, either within the Vallecitos oil and gas field or within high oil and gas potential areas, and therefore would be open for oil and gas leasing. A corner of one of the leases, however, is outside of the high oil and gas potential area and this portion, therefore, would be closed to oil and gas leasing. Small portions of the open leases intersect the Vallecitos Creek Valley groundwater basin (5-71) in San Benito County or the Salinas Valley, Paso Robles Area subbasin (3-4.06) in Monterey County. The Paso Robles Area groundwater basin was assigned a high CASGEM priority ranking and would be particularly vulnerable to groundwater quality and quantity impacts.

4.7.6 Impacts of Alternative D

Under Alternative D, Federal mineral estate underlying BLM surface estate would be open for oil and gas leasing, while BLM split estate lands and Ciervo Panoche Natural Area would be closed. Areas closed under the 2007 RMP would remain closed. CSU stipulations would apply to all land open to oil and gas leasing. NSO stipulations would apply to ACEC and Recreation and Public Purpose (R&PP) lands. Figure 4.7-4 illustrates the Federal mineral estate that are open, open with NSO restrictions, and closed to oil and gas leasing under Alternative D.

Approximately 15 percent of the Federal mineral estate in the CCFO Planning Area would be open to oil and gas leasing under this alternative. As shown on Table 4.7-3, 8 of the 20 groundwater basins that intersect Federal mineral estate in the CCFO study area would be open to oil and gas leasing. These groundwater basins are in Fresno, Merced, Monterey, and San Benito Counties. As summarized on Table 4.7-3, there are three groundwater subbasins assigned a high CASGEM priority ranking that intersect open Federal mineral estate: Delta-Mendota (5-22.07), Westside (5-22.09), and Paso Robles (3-4.06). These subbasins would be particularly vulnerable to groundwater quality and quantity impacts under this alternative. A description of each groundwater basin is provided in Section 3.7.4. Alternative D involves the same number of groundwater basins as Alternative C, fewer groundwater basins than Alternative A, and more than Alternative B.

All of the impacts associated with groundwater quantity and quality described in Section 4.7.2 are applicable to Alternative C. In addition, no new impacts to usable groundwater are identified that are specific only to this alternative.

Mitigation

All of the mitigation measures discussed in Section 4.7.2 are applicable to Alternative D. No additional mitigation measures are necessary to mitigate impacts associated with this alternative. Collectively, existing regulations in the BLM final rule for hydraulic fracturing on Federal and Indian lands if not overturned (March 2015), the DOGGR SB 4 regulations, and the mitigation measures in the SB 4 Final EIR (DOC, 2015) mitigate the potential impacts to quantity and quality of usable groundwater in the CCFO Planning Area.

Leases Subject to Settlement Agreement

Under Alternative D, most of the leases subject to the settlement agreement in both Monterey and San Benito Counties would be closed, but some would be open. In Monterey County, none of the open leases intersect groundwater basins. In San Benito County, portions of some of the leases intersect the Vallecitos Creek Valley groundwater basin (5-71). As summarized on Table 4.7-3, oil and gas fields intersect groundwater basins on open Federal mineral estate in Fresno, Monterey, and San Benito Counties.

4.7.7 Impacts of Alternative E

Under Alternative E, Federal mineral estate outside of groundwater basins would be open for oil and gas leasing, while Federal mineral estate within groundwater basins would be closed. Areas closed under the 2007 RMP would remain closed. CSU stipulations would apply to all land open to oil and gas leasing. NSO stipulations would apply to some open lands: (1) 12-digit Hydrologic Unit Codes (HUCs) intersecting EPA impaired, perennial surface waters; (2) 12-digit HUCs intersecting non-impaired, perennial surface waters that intersect split estate; (3) 12-digit HUC subwatersheds with the highest aquatic intactness score; (4) 0.25 miles from non-impaired perennial surface waters; and (5) 0.25 miles from eligible Wild and Scenic Rivers. Figure 4.7-5 illustrates the Federal mineral estate that are open, open with NSO restrictions, and closed to oil and gas leasing under Alternative E.

Approximately 88 percent of the Federal mineral estate in the Central Coast Field Office study area would be open to oil and gas leasing under this alternative. By definition of the alternative, none of the open Federal mineral estate would intersect groundwater basins. Future well drilling would occur outside of groundwater basins.

All of the impacts associated with groundwater quantity and quality described in Section 4.7.2 are applicable to Alternative E, and no new impacts have been identified. However, the potential impacts to groundwater resources are considered to be less for wells outside of a groundwater basin. It is recognized that the risk is not completely eliminated because these areas may provide surface and subsurface recharge into an adjacent groundwater basin. Usable groundwater with beneficial uses can also exist outside of the designated groundwater basins. Nonetheless, the potential for impacts is considered higher for activities within a groundwater basin, making this alternative the most protective alternative for groundwater resources.

Mitigation

All of the mitigation measures discussed in Section 4.7.2 are applicable to Alternative E. No additional mitigation measures are necessary to mitigate impacts associated with this alternative. Collectively, existing regulations in the BLM final rule for hydraulic fracturing on Federal and Indian lands if not overturned (March 2015), the DOGGR SB 4 regulations, and the mitigation measures in the SB 4 Final EIR (DOC, 2015) mitigate the potential impacts to quantity and quality of usable groundwater in the CCFO Planning Area.

Leases Subject to Settlement Agreement

Under Alternative E, the portions of the leases subject to the settlement agreement that do not intersect groundwater basins are open to oil and gas leasing. Therefore, most of the leases in both Monterey and San Benito Counties are open to oil and gas leasing. Portions of the open leases intersect the Vallecitos oil and gas field in San Benito County. However, portions that overlie the groundwater basin are excluded.

4.8 Surface Water Resources

This section describes surface water impacts of the five alternatives. The section begins with a description of impacts common to all alternatives. All alternatives would involve the development of oil wells under the 2015 RFD Scenario. The primary differences between alternatives are the areas open to oil development, and the locations of these areas. The description of specific impacts for each alternative indicates where the impacts are most likely to occur.

4.8.1 Introduction

Approach to Impact Assessment

All of the alternatives would involve the development of the 2015 RFD Scenario. For all but Alternative B, up to 37 exploratory and development wells would be developed within the Federal mineral estate lands, with the potential for the use of well stimulation and enhanced oil recovery techniques. Alternative B has an RFD Scenario of up to 32 wells.

As a result of ground disturbance associated with the development of new production facilities and associated access and infrastructure, construction-related impacts could occur to surface water quality, sediment and erosion, flooding and water supply. Post-construction operation and production activities could also impact surface water quality, sediment and erosion, flooding, and water supply.

Areas subject to NSO stipulations are assumed to generate no surface water impacts except as may occur from subsurface use, covered in Section 4.7, Groundwater Resources. NSO restrictions are intended to minimize or eliminate adverse effects on unique or significant natural resources that are incompatible with fluid mineral development. No new surface disturbing activity is allowed unless the action is determined to not impair the values present.

Relevant management actions to protect surface water resources in the 2007 RMP include:

- **SOIL-COM1.** Require an approved erosion control strategy and topsoil segregation/restoration plan for proposals involving surface disturbance on slopes of 20 to 40 percent. Such construction must be properly surveyed and designed by a certified engineer and approved by the BLM before construction and maintenance. No surface disturbance on slopes greater than 40 percent would be allowed unless it is determined that it would cause a greater impact to pursue other alternatives.
- **SOIL-COM2.** Require a topsoil segregation/restoration plan be submitted to and approved by the BLM before construction and maintenance actions that would disturb the surface of soils considered to have poor topsoil suitability or restoration potential.
- **SOIL-COM3.** Close roads and trails to public use during periods of extreme wet weather in areas where sustained public use may compromise the integrity of the road or trail surface.
- **SOIL-COM4.** Implement soil loss assessment procedures for road and trail maintenance.
- **SOIL-COM5.** Implement best management practices (BMPs) for non-point source pollution control.
- **WAT-COM1.** Implement BMPs at the activity-plan or project level to prevent degradation of water quality.
- **WAT-COM2.** Maintain existing developed water sources (i.e., spring developments and reservoirs). Develop new sources on a case-by-case basis through project-level planning.
- **WAT-COM3.** Maintain adjudicated water rights; inventory water sources not adjudicated or water rights sought, where applicable.

- **WAT-COM4.** Manage CWA 303(d)-listed impaired water bodies to meet properly functioning condition (PFC) objectives relative to beneficial uses and total maximum daily loads (TMDLs).
- **WAT-COM5.** Maintain stable watershed conditions and implement passive and active restoration projects to protect beneficial uses of water and meet TMDLs.
- **WAT-COM6.** Work with Regional Water Quality Control Boards, Coordinated Resource Management Planning groups, and other private landowners or non-profit organizations to prioritize watershed improvement projects and establish monitoring programs to prevent water bodies from reaching impairment levels that would result in listing under CWA 303(d).
- **WAT-COM7.** Limit authorized uses and management activities to those that do not cause irreversible, irreparable impacts to water quality and watershed function.
- **WAT-COM8.** Periodically monitor water quality in seasonal pools and perennial ponds containing known or suspected threatened and endangered (T & E) species. Identify water quality issues and initiate repairs, within environmental constraints.
- **WAT-B2.** Submit request to the California State Department of Water Resources to establish Federal water reserves on acquired lands to ensure water availability for multiple use management and for functioning, healthy, riparian, and upland systems.
- **WAT-C1.** Manage all fluvial systems functioning at risk to meet PFCs.
- **WAT-COM9.** Upon completion, fulfill aquatic, wetland, and riparian habitat management and restoration requirements outlined in the Fort Ord Habitat Conservation Plan.

BLM Best Management Practices (BMPs) and Oil and Gas Standard Operating Procedures for water resources (listed in Appendix D) aim to control water pollution and reduce the potential for water contamination by implementing the following:

- Erosion and sediment control measures.
- Restoration of damaged wetlands or riparian areas where restoration of such systems will abate polluted runoff.
- Road construction/reconstruction, use, and management conducted to reduce sediment generation and delivery.
- Onsite confinement of runoff to reduce impacts of mechanical site preparation.
- Revegetation and restoration of disturbed areas.
- Prohibition of chemical applications or storage within 100 feet of perennial streams or channels with beneficial use(s) recognized by the State, or directly into intermittent streams or channels with beneficial use(s) recognized by the State.
- Compliance with the California General Construction Storm Water Permit, meaning all projects 1 acre in size or more require a Stormwater Pollution Prevention Plan.

In March 2015, the BLM issued a final rule regarding hydraulic fracturing on Federal and Indian lands intended to reduce risks to resources and the environment. 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). The impact assessment describes the potential risk of hydraulic fracturing to surface water with and without implementation of the BLM final rule.

4.8.2 Impacts Common to All Alternatives

Surface Water Quality

Construction of new wells and ancillary facilities will involve the use of heavy equipment to build, clear, and grade access roads, electric transmission lines, and pipelines. Disturbance of soil during construction has the potential to reduce surface water quality through the introduction of disturbed sediments into local streams or other water bodies. Sediments could be deposited directly into streams by construction, or be subsequently washed in by runoff from the disturbed areas. Accidental spills or disposal of potentially harmful materials used during construction and, if applicable, well stimulation or enhanced oil recovery, could occur as a result of on-site refueling and equipment maintenance activities, leaks from defective or poorly maintained equipment, or other construction-related activities. (Upset conditions are addressed in Section 4.4, Hazardous Materials and Public Safety.) Examples of potential construction-related pollutants include diesel fuel, gasoline, lubrication oil, hydraulic fluids, anti-freeze, transmission fluid, lubricating grease, drilling mud, well stimulation fluid additives (of which little is known of some of the chemical constituents (CCST, 2014; pg. 189-190)), flowback fluids and overflush from well stimulation treatments, and trash. Pollutants could reach surface waters directly, be transported by runoff into a water body, or enter surface water through flooding of the well site. Under the RFD Scenario of 37 wells, the total disturbance area subject to construction impacts would be approximately 206 acres.

All beneficial uses of surface waters within the Central Coast Oil and Gas Leasing and Development Resource Management Plan area could be affected by water quality degradation. For example, most surface waters in the area include some or all of the following designated beneficial uses: Wildlife Habitat, Cold Freshwater Habitat, Warm Freshwater Habitat, Migration of Aquatic Organisms, Spawning, Reproduction, and/or Early, Development, Commercial and Sport Fishing, Water Contact Recreation, and Non-contact Water Recreation. Degradation of surface water quality, and alteration of stream geomorphology and riparian structure, could occur with oil well development in and near surface waters and thereby affect these and other beneficial uses listed in Section 3.8.4 and in the RWQCB Basin Plans.

Oil and gas production activities have the potential for contamination of surface water, mainly through ongoing maintenance activities, with similar effects as construction, and through spills of oil, produced water and other fluids used in the operations process. (See Section 4.4, Hazardous Materials and Public Safety.) An approximate indication of expected future spills can be derived from reported spills in the past. Spills are reported to the California Office of Emergency Services (OES). From 1993 to 2014, about 7,833 spills were reported in oil fields statewide. About 12 percent of these were reported as in or potentially affecting inland surface waters (CALOES, 2015). Oil field spills reported to OES averaged roughly 39 barrels, with a median of about 6 barrels. Roughly 95% had been contained at the time of reporting.

Approximately one spill per year for every 142 active oil wells can be anticipated, based on past spills in the CCFO Planning Area of Monterey and San Benito Counties during a representative year (2013). This spill rate is based on DOGGR data of 711 active oil wells in those two counties that year (DOGGR, 2013) and five OES-reported spills in oil fields for that year and those counties (CALOES, 2015). These spills could induce water quality impacts to in-stream beneficial uses related to habitat, fish and wildlife, and recreation, as well as to downstream municipal and domestic uses if contaminants reach streams or reservoirs that are used for water supply.

Clean Water Act (CWA) and State of California regulations, applicable under all alternatives, as described in Section 3.8.2, protect surface water beneficial uses by regulating point source and certain non-point source discharges to surface water. Construction-related and industrial (production-related) discharges to surface waters would require implementation of CWA-compliant pollutant controls using best available technology (BAT) economically achievable for toxic pollutants and non-conventional pollutants and best conventional pollutant control technology (BCT) for conventional pollutants. Examples of BAT and

BCT control technologies 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. The BLM demonstrates compliance with the Clean Water Act and State water quality objectives by implementing BMPs that are consistent with measures required by the State.

Compliance with the Clean Water Act would include compliance with Section 404 regulating discharges into the Waters of the U.S., including wetlands. Jurisdictional determinations under Section 404 will be required on a project level. Compliance involves avoidance, minimization and mitigation of any impacts. This issue is addressed further in Section 4.10 of this report.

California Code of Regulations Title 14, administered by DOGGR, has oilfield-specific surface water protections. Additional regulations, including Clean Water Act Sections 401 and 404, and Sections 1600–1616 of the California Fish and Game Code, protect the natural riparian and ecological functions of surface waters through requiring avoidance and minimization of impacts to surface waters, and mitigation for impacts that are unavoidable. These surface water protections under the Clean Water Act establish the basic regulatory standards for preventing and mitigating adverse impacts of surface water impairments attributable to oil field activities.

In the event of well stimulation, water quality impacts are similar to those described above, with the addition of the potential for well stimulation and flowback fluids, including fluid additives, to be introduced to surface waters either by direct disposal or by accidental spill. Fluid additives may include a variety of compounds that, if introduced to surface waters, could damage beneficial uses.

BLM rules for hydraulic fracturing and well stimulation activities (described in Section 3.8.2) include measures for surface water protection and storage, use and disposal of stimulation fluids, and setbacks from intermittent and perennial streams.

For all oil and gas development, relevant Central Coast BMPs and SOPs require:

- Protecting the existing water quality improvement functions of wetlands and riparian areas as a component of NPS programs. Damaged wetlands or riparian areas are to be restored where restoration of such systems will abate polluted runoff.
- Point discharge of potential water pollutants onto the ground surface is to be prevented.
- Do not apply or store chemicals within 100 feet of perennial streams or channels with beneficial use(s) recognized by the State.
- Operators are required to obtain all required State and Federal permits for the protection of groundwater and surface water quality.
- Depleted wells are to be plugged and abandoned in a timely manner. This includes plugging the well bore with cement, removing all materials and equipment, and recontouring/revegetation as specified in the conditions of approval.
- Sufficiently impervious secondary containment, such as containment dikes, containment walls, and drip pans, should be constructed and maintained around all qualifying petroleum facilities, including tank batteries and separation and treating areas consistent with the Environmental Protection Agency's Spill Prevention, Control, and Countermeasure regulation (40 CFR 112). The appropriate containment and/or diversionary structure would be sufficiently impervious to oil, glycol, produced water, or other fluid and would be used at the site so that any spill or leakage would not drain, infiltrate, or otherwise escape to the ground, surface, or navigable waters before clean-up is completed.
- Proper containment of oil and produced water in tanks, drilling fluids in reserve pits, and locating staging areas away from drainages would prevent potential contaminants from entering surface waters.

- Chemical containers should not be stored on bare ground or exposed to the sun or moisture. Labels must be readable. Chemical containers should be maintained in good condition and placed within secondary containment in case of a spill or high velocity puncture. All secondary containment must be designed to preclude entry from wildlife and livestock.
- Consider the use of a closed loop drilling system. In the absence of a closed loop system, tanks and pits must be designed to preclude the entry of wildlife and livestock.
- Produced water from oil and gas operations would be disposed of in accordance with the requirements of Onshore Oil and Gas Order #7. Oil and Gas Order #7 requires that the operator not dispose of produced water unless and until approval is obtained from the authorized officer. All produced water must be disposed of by (1) injection into the substance; (2) into pits; or (3) other acceptable methods approved by the authorized officer, including surface discharge under NPDES permit. Injection is generally the preferred method of disposal. This order also includes specifications on the design, construction and maintenance of pits and injection wells.

In addition, Central Coast BMPs and SOPs for sediment, listed under the next heading, are relevant to water quality.

Well stimulation rules developed by DOGGR under SB 4 (Section 3.8.2) also have surface water protections which include spill prevention and countermeasure plans, water management plans, product and waste storage and disposal requirements, secondary containment requirements, notification, containment and clean-up requirements for accidental spills, and restoration requirements.

For alternatives other than Alternative A (No Action Alternative), CSU stipulations (Appendix C) require that on well stimulation projects the BLM be provided with the same information required by DOGGR for well stimulation treatment activities in permit applications under SB 4. Under the CSU stipulations, BLM may require the operator to move the proposed well more than 200 meters (656 feet), modify, or delay the well completion activity in order to minimize the potential for adverse impacts to water resources.

The BLM rule on hydraulic fracturing covers hydraulic fracturing activities only. SB 4 (14 CCR Section 1783.1) applies to hydraulic fracturing and any other well stimulation treatment designed to enhance the permeability of the oil-bearing formation. Well stimulation treatments under SB 4 include, but are not limited to, hydraulic fracturing treatments and acid well stimulation treatments. Well stimulation treatments do not include steam flooding, water flooding, or cyclic steaming. Additionally, such treatments do not include routine well cleanout work, routine well maintenance, routine removal of formation damage due to drilling, bottom hole pressure surveys, or routine activities that do not affect the integrity of the well or the formation. If the BLM final rule is overturned, SB 4 rules would cover hydraulic fracturing activities on Federal mineral estate.

Well stimulation projects subject to the BLM rule on hydraulic fracturing must prepare spill control and emergency response plans to reduce the impacts of accidental spills and leaks, as well as containment in rigid above-ground tanks of all recovered fluids (including flowback and produced water). SB 4 (14 CCR Section 1783.1) also requires the operators Spill Contingency Plan to identify where handling of well stimulation fluid and additives has been addressed. Therefore, if the BLM final rule is overturned, the effect regarding storage would be substantially similar under SB 4.

The BLM final rule on hydraulic fracturing and the California SB 4 rules regulate the storage and containment of well stimulation treatment chemicals at the well site. The BLM final rule requires that recovered fluids be stored in enclosed, above-ground tanks and not be stored in sumps or pits, with very limited exception. SB 4 regulations require that recovered fluids be stored in containers but does not specifically require that the containers be enclosed. SB 4 does not allow the fluids to be stored in sumps or pits. Therefore, both SB 4 and the BLM final rule require storage of flowback in containers. However,

the BLM final rule is more stringent than the SB 4 regulations because it requires that the containers be enclosed. The potential for a surface release of flowback to occur is greater if the container is not enclosed. Although the BLM final rule requires a closed container, which is a more protective container than required under SB 4, SB 4 requires secondary containment for any production facilities in place for 30 days or more and a Spill Contingency Plan to be implemented immediately in the event of an unauthorized release. Additionally, as with the BLM final rule, SB 4 would not allow recovered fluids to be stored in sumps or pits. These measures would reduce the likelihood of contamination of surface waters.

The BLM final rule on hydraulic fracturing (see 43 CFR Part Section 3162.3-3) and California SB 4 (14 CCR Section 1788) require, among other public disclosures, a complete list of the chemicals and the maximum concentration of each and every chemical constituent of the well stimulation fluids used, so that a complete health study can be conducted. The BLM final rule requires this public disclosure within 30 days, and SB 4 requires the public disclosure within 60 days, otherwise the requirements are substantially similar. If the BLM final rule were overturned, this disclosure would continue to occur in California under SB 4. Additionally, SB 4 requires trade secret information be publicly disclosed with limited exception. Furthermore, operators are required to sample, analyze and submit the analysis to the DOGGR for all flowback fluid.

Drilling, field development and production activities associated with oil and gas exploration and development require use of a variety of chemicals and other materials, some of which would, if released to surface waters, be a source of contamination. These include drilling muds and additives which contain various contaminants such as salts, acids, mercury, cadmium, arsenic, and hydrocarbons, among others, which, if not managed correctly could, through runoff, affect surface water quality. Potential impacts of these contaminants include human contact, inhalation or ingestion and the effects of exposure, spills, or accidental fires on surface water resources. Operators of well stimulation treatments would be required to file information to BLM under the BLM final rule, as well as to DOGGR as required by SB 4, resulting in similar effects to surface water quality.

Sediment and Erosion

Erosion and siltation impacts could occur primarily through ground disturbance associated with construction of new oil and gas well pads, access roads, transmission lines, pipelines, and other infrastructure. Construction of 37 wells would disturb up to 206 acres of land, including access roads, causing potential exposure to erosion or transport off site and into surface waters, or, in the case of construction in or near streams, flow encroachments and alterations that could increase the potential or frequency of in-stream erosion. Erosion effects would be variable depending on terrain, with higher erosive potential in areas of steep terrain.

BLM rules for onshore oil and gas operations (Section 3.8.2) require operators to exercise care and diligence to avoid damage to surface or subsurface resources, which include soils that may be subject to erosion. Relevant Central Coast BMPs and SOPs require:

- Unused or unnecessary areas are to be recontoured and revegetated to reduce fugitive dust emissions from bare or eroded soils, which would reduce soil erosion impacts.
- Soil disturbance is to be limited by limiting developments to the smallest area possible and by using previously disturbed areas and existing roads to the extent practicable.
- Surface disturbance is to be minimized and disturbed areas on steep slopes designed to prevent surface water from concentrating to reduce erosion and sedimentation.
- Access is to be restricted and authorized projects suspended during wet weather when soil resources will be detrimentally affected by rutting, compaction, and increased erosion.

- Operators are to follow guidelines for site reclamation in the Oil and Gas BMP section to protect soils, including topsoil conservation, scarifying or disking soil, recontouring the area, redistributing topsoil and providing ground cover through seeding or other methods.
- No soil should be imported from off-site to limit introduction of weeds.
- Erosion and sediment control measures such as mulching, placement of certified weed free hay bales and other drainage control features, construction of rolling dips, and seasonal limits on operations reduce or eliminate erosion and sediment transport or incidental sediment discharge.
- Road construction/reconstruction is to be conducted so as to reduce sediment generation and delivery. This can be accomplished by, among other means, following designs for road systems, incorporating adequate drainage structures, properly installing stream crossings, avoiding road construction in streamside management areas, removing debris from streams, and stabilizing areas of disturbed soil such as road fills.
- Roads are to be managed to prevent sedimentation, minimize erosion, maintain stability, and reduce the risk that drainage structures and stream crossings will fail or become less effective. Components of this measure include inspections and maintenance actions to prevent erosion of road surfaces and to ensure the effectiveness of stream-crossing structures.
- Runoff is to be confined onsite to reduce impacts of mechanical site preparation and revegetation operations, particularly in areas that have steep slopes or highly erodible soils, or where the site is located in close proximity to a water body.
- Areas disturbed during road construction are to be revegetated rapidly, in particular where mineral soil is exposed or agitated.
- Construction activities that disturb one or more acres of soil or less than one acre but are part of a larger common plan of development or sale having the potential to disturb one or more acres (includes clearing, grading, and ground disturbances such as stockpiling or excavation) are required to obtain coverage under the General Permit for Discharges of Stormwater Associated with Construction Activity (General Construction Storm Water Permit), Order 2009-0009-DWQ) and manage construction in accordance with permit requirements.
- Prevent and repair soils subject to water erosion.
- Roads, well pads, and facilities for exploratory wells are to be designed to impact and fragment the least acreage practicable. New facilities must be designed to maintain natural drainage and runoff patterns. Noncommercial wells are to be restored as soon as appropriate using BLM restoration methods.
- Natural contours and overland flow patterns should be maintained to the maximum extent possible. Channelization or diversion of natural flows should be avoided to the maximum extent practical.

State of California regulations, administered by the SWRCB and DOGGR and described in Section 3.8.2, include measures for erosion protection during construction by requiring Stormwater Pollution Prevention Plans for construction, and restoration of well sites after abandonment. The Clean Water Act Sections 401 and 404, and Sections 1600–1616 of the California Fish and Game Code, provide additional protection by requiring avoidance and minimization of impacts to surface waters, and mitigation for impacts that are unavoidable.

Stream erosion has the potential to impact water quality if the erosion results in oil production pipeline breaks or other damage to storage areas or equipment that could result in spills (Section 4.4, Hazardous Materials and Public Safety).

Flooding

Oil well development has the potential to induce flood hazards, either to adjacent property or by increasing flood peaks and volumes through clearing and grading for new wells, access roads and other infrastructure. Overall, flood hazard impacts are expected to be minimal for all alternatives. Most of the Federal mineral estate lands are outside of designated floodplains. Some of the well structures, pads and other infrastructure may be located in areas of local flooding, but few new permanent structures would be involved, and the wells, pipelines and other equipment that may be on the sites and be inundated are not generally subject to high damage if flooded. Flow diversions from well pad construction or increased flood peaks with clearing and grading would be minor and local due to the small size of the well pads and other infrastructure.

Flooding has the potential to impact water quality if the flooding overflows contaminated areas, or sumps, or results in pipeline breaks and spills of contained material (Section 4.4, Hazardous Materials and Public Safety).

Water Use and Supply

Construction of new oil wells requires water mainly for drilling and construction dust control, and can be up to 0.39 to 0.77 acre-feet per well for conventional well drilling operations (See Table 4.7-1). Total water use under the RFD scenario would be approximately 12.5 to 24.6 acre-feet for conventional well drilling, not including any additional water that may be used for well stimulation. Exploratory well drilling operations would potentially use more water, between 5 to 10 acre-feet per well. In the event of well stimulation, water use could be an additional 0.4 acre-feet for each well (Table 4.7-1). Water intensive well stimulation treatments could use additional water, up to 10 to 20 acre-feet per well. Water for well drilling and stimulation could be from surface water sources or groundwater, but due to the cost and difficulty of obtaining the rights to remove surface water from streams, it typically is purchased from a local supplier and would likely come from groundwater or surface water imported from outside the area.

Total water use is estimated for two RFD scenarios (See Section 4.7.2). RFD Scenario 1 assumes that all 37 wells will be conventional vertical wells with well stimulation treatments involving one to three stages. For RFD Scenario 2, all 37 wells are assumed to be water intensive horizontal wells with well stimulation treatments involving up to 20 stages. Total water use is estimated at 29.2 to 43.3 acre-feet for RFD Scenario 1, and 555 to 1,100 acre-feet for RFD Scenario 2. Assuming a 20-year development period, total water use would range from 1.5 to 55.5 acre-feet per year for the 37-well RFD Scenario, and 1.5 to 48 acre-feet per year for the 32 wells in Alternative B.

Local short-term surface water stresses in the form of decreases in river flow could occur from groundwater pumping for the RFD Scenario. These impacts would require a site-specific analysis to evaluate. In a regional context of overall water use and supply, a total water use of 1.5 to 55.5 acre-feet per year represents only a small fraction of annual water use in the area and is unlikely to have a noticeable effect on regional water use. The Salinas Valley alone annually uses approximately 8,500 to 317,000 times the expected annual water use by the 37 wells in the RFD Scenario (MCWRA, 2006). This issue, as it relates to groundwater use, is discussed further in Section 4.7.2 of this report.

In the unlikely event direct diversion from local surface sources is used as a water supply, the use of the water should already be reflected in water planning and environmental restoration efforts undertaken by the State Water Resources Control Board and other regional and local entities. The use would also be subject to State water law principles requiring all water users to limit their water use to what is reasonable, beneficial, and not wasteful and, in the case of a new appropriative right, subject to water availability (DOC, 2015). Most surface water used by suppliers in the area of the Federal mineral estate is imported from other areas, so it is unlikely any direct use impact would occur to surface waters within the CCFO Planning Area.

Climate change could also reduce water availability, such that the use of water for well stimulation could place a burden on existing systems and other existing water users in the area. Although it is not possible to make specific determinations at this time as to where or when these kinds of impacts may occur, water usage for well stimulation could exacerbate the impacts of climate change especially on agricultural users, who use a substantial majority of water, by increasing irrigation requirements, as well as altering water availability. Well stimulation water use within the Federal mineral estate area could add to local shortages such that there would be a need for new or expanded water entitlements, or the need for new or expanded water treatment facilities, particularly should climate change occur.

The BLM final rule on hydraulic fracturing requires that the source, location, access route and transportation method for water supply be provided to BLM. The California SB 4 rules require that the source and location of water supply be disclosed as part of a water management plan and as part of post-treatment public disclosures. No difference in impact is anticipated in the event the BLM final rule is overturned.

Aquatic Intactness

For oil and gas development, the primary impacts to aquatic intactness are similar to those previously described for water quality, sediment and erosion, and water use. Thus, impacts from decreased water quality, and increase of sedimentation or erosion, or additional water use generally will cause a decline in aquatic intactness. Additional impacts from oil and gas development are varied and if present would generally result from well drilling activities as opposed to well operation or well stimulation. The removal of shading vegetation can cause an increase to stream temperature. Although unlikely due to regulation under CWA Section 404 and the State's Lake and Streambed Alternation Program, unmitigated structures placed in streams can create barriers for aquatic species passage.

4.8.3 Impacts of Alternative A (No Action)

Under Alternative A, all Federal mineral estate lands currently open for exploration would remain open to oil and gas leasing and lands currently closed would remain closed. Up to 37 wells would be developed under the RFD Scenario.

Stipulations and management actions under the 2007 HFO RMP (BLM, 2007; Appendix D) would apply to the open areas. Relevant to surface waters and the general impacts described in Section 4.8.2, these stipulations require reasonable measures to protect water resources, minimization of surface disturbances and effects on water resources, reclamation of lease sites, and, on slopes that exceed 10% within the selenium-bearing Moreno shale, the design of slope-failure measures, protective measures for off-site sediment transport, and reclamation and revegetation measures must be prepared by a licensed professional engineer. Oil sump construction and storage of oil in oil-well cellars is not permitted in floodplains.

Under Alternative A, lands outside of existing oil fields would be open for exploration and exploitation. Most of this land is now in a natural, undisturbed condition. Therefore, the impacts described below could occur in previously undisturbed areas.

Surface Water Quality

Water quality impacts are as described in Section 4.8.2, with the potential for these impacts to occur anywhere within the lands that would be open to oil exploration and production. All of the watersheds shown in Figure 3.8-1, except San Pablo Bay, could potentially be affected. The location of Federal mineral estate is such that the Salinas, Pajaro, Upper Los Gatos–Avenal, Panoche–San Luis Reservoir and, to a lesser extent, the San Francisco Bay and Coyote watersheds, are most likely to be affected by downstream transport of water quality contaminants. Major rivers and reservoirs include the Salinas River and tributaries, the San Benito/Pajaro Rivers and tributaries, the Panoche and other streams entering the Central Valley, the San Luis Reservoir, Lake San Antonio, Hernandez Reservoir, and San Luis Reservoir.

Several of the downstream waterbodies are impaired, but, with the exception of sedimentation/siltation, for reasons unrelated to the oil industry. Although there is a potential for transport of spilled materials to reach downstream waters and reservoirs, there is little potential for substantial contamination or alteration of beneficial uses or exacerbation of existing impairments for the reasons that, based on past spill records, spills in the RFD Scenario are expected to be rare and of insufficient volume to travel the long distances to downstream surface waters. (See Section 4.4, Hazardous Materials and Public Safety.) Existing regulations require immediate containment and clean-up, further reducing the potential for downstream contamination. Most water quality impacts would occur in the minor streams in the hilly terrain of the Federal mineral estate.

Sediment and Erosion

Sediment and erosion impacts are as described in Section 4.8.2, with the potential for these impacts to occur anywhere within the open lands. All of the watersheds shown in Figure 3.8-1, except San Pablo Bay, could potentially be affected.

The same downstream waters described above for Water Quality could potentially be affected by sediment disturbed from construction of well pads and access roads and transported downstream by stream flows. The total amount of sediment transported downstream will be minor due to the small area anticipated to be developed under the RFD Scenario. Roughly 206 acres would be disturbed, in comparison to 4.9 million acres for the Salinas, Pajaro, Upper Los Gatos–Avenal, Panoche–San Luis Reservoir, San Francisco Bay, and Coyote watersheds, which are most susceptible to impact due to the location of the Federal mineral estate. However, sedimentation/siltation and turbidity are listed contaminants for impairment of several streams in the area, including the San Benito River, Panoche River, Salinas River, Pajaro River, and Pacheco Creek (RWQCB, 2015), and any increase in sediment transport from the watersheds could contribute to the impairment.

Flooding

The characterization of flood impacts described in Section 4.8.2 applies to Alternative A. There are few designated floodplains within the open area of Alternative A. Impacts would be localized and on small watercourses in remote areas and mostly involve structures that are not prone to high flood damage.

Water Use and Supply

Water supply impacts of Alternative A are as described in Section 4.8.2.

Aquatic Intactness

Aquatic Intactness impacts of Alternative A are as described in Section 4.8.2 and could impact all of the HUC12 subwatersheds with the highest aquatic intactness scores as depicted in Figure 3.8-1 and listed in Section 3.8.4.

Mitigation

Mitigation measures are built into the BLM's established management actions, standard operating procedures, and stipulations. Existing regulations, described in Section 3.8.2, also mitigate potential impacts.

Mitigation Measure SWR-1 would provide protection to surface water reservoirs in cases where well stimulation, which has the potential for introducing stimulation fluid additives to surface water, and expanding the physical scope of well drilling to new land areas, is proposed. BLM managers may, at their discretion and as determined during application review, attach additional stipulations or measures to minimize or avoid surface water impacts by projects that will involve well stimulation.

SWR-1 **Protect Surface Water Reservoirs.** BLM managers may require the well stimulation applicant, in watersheds draining to open reservoirs used for the collection and storage of water for municipal supply, to provide an independent analysis, by a third party water quality expert, of the likely effects, including cumulative effects of other similar exploitation of the same subsurface resource, and from normal production operations subsequent to the well stimulation procedure, on the water quality in the reservoir. BLM managers may consider the information provided as well as information provided in consultation with the reservoir operator, in the determination of approval or denial of the application, and in the determination of pollution control measures.

Leases Subject to Settlement Agreement – Subalternative 1

The 14 non-NSO leases as identified in Case No. 11-06174 and Case No. 13-1749 would be issued.

Surface Water Quality. Water quality impacts are the same as those described for Alternative A in general, with the exception that potential downstream impacts are mainly limited to the Salinas River, the San Antonio River, Lake San Antonio, and Panoche River. The Upper Los Gatos–Avenal and Pajaro watersheds could be affected to a minor extent.

Sediment and Erosion. Sediment and erosion impacts are as described overall for Alternative A in general, with the potential for these impacts limited to the Salinas Watershed and the Panoche–San Luis Reservoir Watershed, and to a lesser extent the Upper Los Gatos–Avenal and Pajaro watersheds.

Flooding. The characterization of flood impacts described in Section 4.8.2 and for Alternative A in general applies to the leases. There are no designated floodplains within the area of the leases.

Water Use and Supply. Water supply impacts of the leases are the same as described in Section 4.8.2 and for Alternative A in general.

Leases Subject to Settlement Agreement – Subalternative 2

The two non-NSO leases as identified in Case No. 11-06174 should not have been issued, and the 12 prospective non-NSO leases as identified in Case No. 13-1749 would not be issued. As such, no resource impact would occur.

4.8.4 Impacts of Alternative B

Under Alternative B, the RFD scenario would be limited to mineral estate lands within existing oil and gas fields, plus a half-mile buffer, for a total of 39,000 open acres. Because it would be limited to existing oil and gas field, there would be up to 32 wells and 179 acres of disturbance. The wildcat wells would not occur under this alternative. The alternative would be subject to stipulations and standard operating procedures that would be consistent with the management goals of the 2007 HFO RMP.

Surface Water Quality

Water quality impacts are as described in Section 4.8.2, with the potential for these impacts limited to the open lands in existing oil fields, plus any downstream waters impacted by stream transport of contaminants. Based on the location of open lands, the Panoche–San Luis Reservoir, Upper Los Gatos–Avenal, and Tulare–Buena Vista Lakes watersheds would receive the majority of impacts, with a lesser potential for impacts in the Salinas, Pajaro San Francisco Coastal South, San Joaquin Delta, and Suisan Bay watersheds. All of the other watersheds shown in Figure 3.8-1 would be unaffected. Subject to these limitations in area, the Alternative B impacts are as described for Alternative A.

Sediment and Erosion

Sediment and erosion impacts are as described in Section 4.8.2, with the potential for these impacts to occur limited to existing oil fields. Watersheds potentially affected are described under Water Quality above. Subject to these limitations in area, the Alternative B impacts are as described for Alternative A.

Flooding

The characterization of flood impacts described in Section 4.8.2 applies to Alternative B. There are few designated floodplains within the open area of Alternative B. Impacts would be localized and on small watercourses in remote areas and mostly involve structures that are not prone to high flood damage.

Water Use and Supply

Water supply impacts of Alternative B are as described in Section 4.8.2.

Aquatic Intactness

Aquatic Intactness for the HUC12 subwatersheds with the highest aquatic intactness scores as depicted in Figure 3.8-1 and listed in Section 3.8.4 would not be affected.

Mitigation

Mitigation for Alternative B is the same as for Alternative A.

Leases Subject to Settlement Agreement

Surface Water Quality. Water quality impacts are the same as those described for Alternative B in general, with the exception that none of the leases in the Salinas Watershed would be open, and therefore there would be no impacts in the Salinas Watershed. All potential impacts would be restricted to the Panoche–San Luis Reservoir watershed, and a very small portion (about 220 acres) of the Upper Los Gatos–Avenal Watershed.

Sediment and Erosion. Sediment and erosion impacts are as described overall for Alternative B in general, with the potential for these impacts limited to the Salinas Watershed and the Panoche–San Luis Reservoir Watershed, and to a lesser extent the Upper Los Gatos–Avenal and Pajaro watersheds.

Flooding. The characterization of flood impacts described in Section 4.8.2 and for Alternative B in general applies to the leases. There are no designated floodplains within the area of the leases.

Water Use and Supply. Water supply impacts of the leases are the same as described for Alternative B in general.

4.8.5 Impacts of Alternative C

Under Alternative C, the RFD Scenario would be limited to high oil and gas occurrence potential areas or within the boundaries of oil and gas fields, plus a half-mile buffer with the exception of core population areas of the kangaroo rat in the vicinity of Panoche, Griswold, Tumey, and Ciervo Hills which are closed to leasing. Up to 37 wells would be developed under the RFD Scenario. Controlled Surface Use stipulations would apply to the open areas. The alternative would be subject to stipulations and standard operating procedures that would be consistent with the management goals of the 2007 HFO RMP.

Surface Water Quality

Water quality impacts are as described in Section 4.8.2, and essentially the same as for Alternative A, for the Estrella, Middle San Joaquin–Lower Chowchilla, Pajaro, Panoche–San Luis Reservoir, Salinas, Suisun Bay, Tulare–Buena Vista Lakes, and Upper Los Gatos–Avenal watersheds. There would be no

impacts on the other watersheds shown in Figure 3.8-1. Although within the impacted watersheds the area open to exploration is reduced from that of Alternative A, the RFD Scenario is the same, and general impacts are expected to be the same, but limited to a reduced area. Subject to these limitations in area, the Alternative C impacts are as described for Alternative A.

Sediment and Erosion

Sediment and erosion impacts are as described in Section 4.8.2. Watersheds potentially affected are described under Water Quality above. Subject to these limitations in area, the Alternative C impacts are as described for Alternative A.

Flooding

The characterization of flood impacts described in Section 4.8.2 applies to Alternative C. Impacts would be localized and mostly on small watercourses in remote areas and mostly involve structures that are not prone to high flood damage.

Water Use and Supply

Water supply impacts of Alternative C are as described in Section 4.8.2.

Aquatic Intactness

Aquatic Intactness impacts of Alternative C are as described in Section 4.8.2 and of the HUC12 subwatersheds with the highest aquatic intactness scores as depicted in Figure 3.8-1 and listed in Section 3.8.4, only the Upper Cantua Creek subwatershed could be impacted.

Mitigation

Mitigation for Alternative C is the same as for Alternative A.

Leases Subject to Settlement Agreement

Impacts for the leases subject to the settlement agreement are the same as described for Alternative A; including for water quality, sediment and erosion, flooding, and water supply. Although the area available for surface occupancy under Alternative C is slightly less than for Alternative A, the RFD Scenario is the same.

4.8.6 Impacts of Alternative D

Under Alternative D, Federal mineral estate underlying BLM surface estate would be open. Split estate lands would be closed. The Ciervo Panoche Natural Area would also be closed. Areas closed under the 2007 RMP would remain closed (Wilderness, WSAs, Clear Creek Serpentine ACEC, and Fort Ord National Monument). Controlled Surface Use stipulations would apply. The alternative would be subject to stipulations and standard operating procedures that would be consistent with the management goals of the 2007 HFO RMP. Up to 37 wells would be developed under the RFD Scenario.

Surface Water Quality

Water quality impacts are as described in Section 4.8.2, and as described for Alternative A, but limited to an area of 118,100 acres in the Estrella, Pajaro, Panoche–San Luis Reservoir, Salinas, Upper Los Gatos–Avenal, Middle San Joaquin/Lower Chowchilla, Alisal–Elkhorn Slough, Coyote, and Carmel watersheds. There would be no impacts on the other watersheds shown in Figure 3.8-1. Due to the location of the open lands, most of the impacts would occur in the Upper Los Gatos–Avenal, Panoche–San Luis Reservoir, and Pajaro watersheds. Downstream waters potentially affected include the San Benito/Pajaro Rivers, including Hernandez Reservoir, and the Panoche River. The San Luis Reservoir would not be affected.

Sediment and Erosion

Sediment and erosion impacts are as described in Section 4.8.2, with the potential for these impacts limited to 151,400 acres in the Estrella, Pajaro, Panoche–San Luis Reservoir, Salinas, Upper Los Gatos–Avenal, Middle San Joaquin/Lower Chowchilla, Alisal–Elkhorn Slough, and Carmel watersheds

Flooding

The characterization of flood impacts described in Section 4.8.2 applies to Alternative D. Impacts would be localized and mostly on small watercourses in remote areas and mostly involve structures that are not prone to high flood damage.

Water Use and Supply

Water supply impacts of Alternative D are as described in Section 4.8.2.

Aquatic Intactness

Aquatic Intactness impacts of Alternative D are as described in Section 4.8.2 and of the HUC12 subwatersheds with the highest aquatic intactness scores as depicted in Figure 3.8-1 and listed in Section 3.8.4, only the Upper Cantua Creek and Robinson Creek–South Fork Orestimba Creek subwatersheds could be impacted.

Mitigation

Mitigation for Alternative D is the same as for Alternative A.

Leases Subject to Settlement Agreement

Basic impacts for the leases subject to the settlement agreement are the same as described for Alternative A, including for water quality, sediment and erosion, flooding, and water supply, but due to much of the lease area being closed, the area on which these impacts could occur is much reduced.

4.8.7 Impacts of Alternative E

Under Alternative E, Federal mineral estate outside California DWR Bulletin 118 groundwater basins and sub-basins would be open, while Federal mineral estate within these basins would be closed. Areas closed under the 2007 RMP would remain closed (Wilderness, WSAs, Clear Creek Serpentine ACEC, and Fort Ord National Monument). All lands open to leasing would have CSU stipulations. NSO stipulations would be applicable within 12-digit Hydrologic Unit Codes intersecting EPA impaired, perennial surface waters; 12-digit Hydrologic Unit Codes intersecting non-impaired, perennial surface waters that intersect split estate; 12-digit HUC subwatersheds with the highest aquatic intactness score; within 0.25 miles of non-impaired, perennial surface waters; and, within 0.25 miles of eligible Wild & Scenic Rivers. The alternative would be subject to additional stipulations and standard operating procedures that would be consistent with the management goals of the 2007 HFO RMP. Up to 37 wells would be developed under the RFD Scenario.

Surface Water Quality

Water quality impacts are as described in Section 4.8.2, and as described for Alternative A, but limited to a smaller area. All watersheds shown in Figure 3.8-1 would be potentially affected except the Middle San Joaquin–Lower Chowchilla, Middle San Joaquin–Lower Merced–Lower Stanislaus, San Pablo Bay, San Francisco Coast South, San Lorenzo–Soquel, and Coyote watersheds. The NSO stipulations for hydrologic units intersecting impaired certain non-impaired waters, hydrologic units with the highest aquatic intactness, and within 0.25 miles of non-impaired perennial surface waters and eligible Wild & Scenic

Rivers would reduce, but not completely eliminate, the potential for additional contamination of those waters by increasing the distance pollutants would have to travel to reach surface waters, and increasing the response time for spill detection, control and clean-up.

Sediment and Erosion

Sediment and erosion impacts are as described in Section 4.8.2, with the potential for these impacts limited as described under Water Quality above.

Flooding

Alternative E flood impacts are as described in Section 4.8.2, but limited to the open areas for this alternative. Impacts would be localized and mostly on small watercourses in remote areas and mostly involve structures that are not prone to high flood damage.

Water Use and Supply

Water supply impacts of Alternative E are as described in Section 4.8.2.

Aquatic Intactness

Aquatic Intactness for the HUC12 subwatersheds with the highest aquatic intactness scores as depicted in Figure 3.8-1 and listed in Section 3.8.4 would not be affected.

Mitigation

Mitigation for Alternative E is the same as for Alternative A.

Leases Subject to Settlement Agreement

Basic impacts for the leases subject to the settlement agreement are the same as described for Alternative A, including for water quality, sediment and erosion, flooding, and water supply, but reduced in area due to only approximately 10,000 acres being open without NSO stipulations, compared to 17,600 in Alternative A.

4.9 Soil Resources

This section addresses the U.S. Bureau of Land Management's (BLM's) Best Management Practices (BMPs) and Standard Operating Procedures for proper management of soil resources and describes the types of impacts. Protection of soil resources involves controlling erosion and sediment transport, maintaining vegetation cover, and protecting biological and physical characteristics of soils.

4.9.1 Introduction

The management goal for soil resources established by the 2007 HFO RMP is to manage soil on BLM surface lands such that functional biological and physical characteristics that are appropriate to soil type, climate, and land form are exhibited (Rangeland Health Standards and Guidelines, 2000).

To achieve this goal the 2007 HFO RMP established the following objectives:

- Control erosion and sediment transport;
- Maintain vegetation cover at or above the level necessary to stabilize soils; and
- Protect and restore biological soil crusts on watersheds.

The 2007 HFO RMP includes the following Area-wide Management Actions to protect soil resources as follows:

- **SOIL-COM1.** Require an approved erosion control strategy and topsoil segregation/restoration plan for surface disturbance on slopes of 20 to 40 percent. Such construction must be properly surveyed and designed by a certified engineer and approved by the BLM before construction and maintenance. No surface disturbance on slopes greater than 40 percent unless it is determined that it would cause a greater impact to pursue other alternatives.
- **SOIL-COM2.** Require a topsoil segregation/restoration plan be submitted to and approved by the BLM before construction and maintenance actions that would disturb the surface of soils considered to have poor topsoil suitability or restoration potential.
- **SOIL-COM3.** Close roads and trails to public use during periods of extreme wet weather in areas where sustained public use may compromise the integrity of the road or trail surface.
- **SOIL-COM4.** Implement soil loss assessment procedures for road and trail maintenance.
- **SOIL-COM5.** Implement best management practices (BMPs) for non-point source pollution control.

BLM Best Management Practices/Standard Operating Procedures for soil resources (Appendix D) would reduce soil disturbance, restrict access during wet weather, and require site reclamation at oil and gas sites.

Additional BMPs to control stormwater runoff and erosion would be required under the Clean Water Act (CWA) National Pollutant Discharge Elimination System (NPDES) Construction General Permit. Please see Section 3.9.2 (Regulatory Framework) for a description of CWA requirements.

4.9.2 Impacts Common to All Alternatives

The RFD Scenario (i.e., between zero and 37 development wells with up to approximately 206 acres of surface disturbance over the next 15 to 20 years on Federal mineral estate in the Planning Area) would occur under all of the alternatives. This will require construction of access roads, drill pads, and pipelines and other oil field facilities, as each are included as part of the surface disturbance.

In general, regardless of erosion potential, all soils become erodible when disturbed and the drilling of new wells will require ground disturbance. Grading for access roads and drill pads will cause ground dis-

turbance that could result in soil erosion. Drilling of new oil and gas wells and geophysical surveys will create loose soil or compacted soil that leads to increased runoff and erosion. Soil erosion could lead to sedimentation of local surface waters or increased flooding. Soil erosion at oil well sites may also transport chemical contamination (caused by accidental releases) to waterways or decrease soil fertility at the spill site or deposition site.

The soil resource Management Actions established with the 2007 RMP require approved erosion control strategies and topsoil segregation/restoration plans for activities on slopes ranging from 20 to 40 percent, and no soil disturbance activities are allowed on slopes greater than 40 percent. The existing management actions will prohibit high-impact activities in sensitive areas and promote restorative measures that would minimize or avoid impacts (BLM, 2007).

Implementation of the BLM BMPs developed to protect soil resources (Appendix D, Section 1.5) will reduce soil disturbance, restrict access during wet weather, and require site reclamation at oil and gas sites. The soil protective BMPs include:

- Minimize soil disturbance by limiting developments to the smallest area possible and by using previously disturbed areas and existing roads to the extent practicable.
- Minimize surface disturbance and design disturbed areas on steep slopes to prevent surface water from concentrating to reduce erosion and sedimentation.
- Restrict access and suspend authorized projects during wet weather when soil resources will be detrimentally affected by rutting, compaction, and increased erosion.
- Minimize fire control lines, both handline and dozerline, to the width necessary to effectively stop fire spread. Rehabilitate lines by smoothing out berms and installing waterbars prior to the rainy season.
- Assess the need for soil stabilization following wildfires. Use the Emergency Stabilization and Rehabilitation process to determine and implement needed actions.
- Follow guidelines for site reclamation in the Oil and Gas BMP section to protect soils, including topsoil conservation, scarifying or disking soil, recontouring the area, redistributing topsoil and providing ground cover through seeding or other methods. No soil should be imported from off-site to limit introduction of weeds.
- Actively patrol public lands to prevent unauthorized off-road travel. If unauthorized routes are found, block access to minimize further soil disturbance and reduce the potential for erosion through rehabilitation action.

Additionally, BMPs for Water Resources Protection (Appendix D, Section 1.6.1) include:

- Design roads, well pads, and facilities for exploratory wells to impact and fragment the least acreage practicable. New facilities shall be designed to maintain natural drainage and runoff patterns. Noncommercial wells shall be restored as soon as appropriate using BLM restoration methods.
- Prevent and repair soils subject to water erosion.
- Timely plugging and abandonment of depleted wells will be required. This includes plugging the well bore with cement, removing all materials and equipment, and recontouring/revegetation as specified in the conditions of approval.

The BLM Oil and Gas Standard Operating Procedures (SOPs) specifically require surface reclamation, interim and final (Appendix D, Section 1.8.8) for any petroleum exploration and development. Reclamation is required for any disturbed surface that is not necessary for continued production operations. The site reclamation guidelines address general operations, producing well sites, non-producing wells, and final reclamation (Appendix D).

4.9.3 Impacts of Alternative A (No Action)

Alternative A would utilize the 2015 RFD Scenario while continuing current management under the existing 2007 HFO RMP (BLM, 2007). Drilling up to 37 new oil and gas wells would require grading and ground disturbance that would result in soil erosion without mitigation.

Mitigation

S-1 **Prepare and Submit SWPPP.** A Storm Water Pollution Prevention Plan (SWPPP) would be required for grading and ground disturbance activities exceeding 1 acre. The SWPPP should delineate and address the BLM's soil resource BMPs and SOPs (Appendix D).

S-2 **Prepare and Submit Reclamation Plan.** A surface reclamation plan should be developed addressing the interim or final restoration guidelines established by BLM (Appendix D, Section 1.8.8).

Leases Subject to Settlement Agreement – Subalternative 1

The 14 non-NSO leases as identified in Case No. 11-06174 and Case No. 13-1749 would be issued. These leases are located in areas with sparse vegetation and erodible soils. Well drilling, well stimulation, and possibly field development in the Vallecitos field may occur in these leases. Although these leases either have not been granted 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 lead to soil erosion. Consequently, Mitigation Measures S-1 and S-2 could be implemented to protect erodible soils before granting the lease or included as a lease stipulation.

Leases Subject to Settlement Agreement – Subalternative 2

The two non-NSO leases as identified in Case No. 11-06174 should not have been issued, and the 12 prospective non-NSO leases as identified in Case No. 13-1749 would not be issued. As such, no resource impact would occur.

4.9.4 Impacts of Alternative B

Alternative B would allow leasing in existing oil and gas fields defined by DOGGR with 754,000 acres closed to leasing. Regardless, the open areas could experience exploration by up to 32 new wells and would have the same potential for creating soil disturbance and increased soil erosion as Alternative A.

Mitigation

Mitigation Measures S-1 and S-2 would apply to Alternative B.

Leases Subject to Settlement Agreement

Under Alternative B for the 14 non-NSO leases, the soils resources impacts and mitigation are the same as Alternative A.

4.9.5 Impacts of Alternative C

Alternative C would allow leasing in high oil and gas occurrence potential areas with 394,400 acres closed to leasing. Regardless, the open areas could experience exploration by up to 37 new wells and would have the same potential for soil resources access restrictions as Alternative A.

Mitigation

Mitigation Measures S-1 and S-2 would apply to Alternative C.

Leases Subject to Settlement Agreement

Under Alternative C for the 14 non-NSO leases, the soils resources impacts and mitigation are the same as Alternative A.

4.9.6 Impacts of Alternative D

Alternative D would allow leasing in Federal mineral estate underlying BLM surface estate areas with 655,400 acres closed to leasing. The open areas could experience exploration by up to 37 new wells and would have the same potential for impacts to soil resources as Alternative A.

Mitigation

Mitigation Measures S-1 and S-2 would apply to Alternative D.

Leases Subject to Settlement Agreement

Under Alternative D for the 14 non-NSO leases, the soils resources impacts and mitigation are the same as Alternative A.

4.9.7 Impacts of Alternative E

Alternative E would allow leasing in Federal mineral estate outside of California DWR designated groundwater basins and sub-basins with 99,400 acres closed to leasing. The open areas could experience exploration by up to 37 new wells and would have the same soil resources impacts as Alternative A.

Mitigation

Mitigation Measures S-1 and S-2 would apply to Alternative E.

Leases Subject to Settlement Agreement

Under Alternative E for the 14 non-NSO leases, the soils resources impacts and mitigation are the same as Alternative A.

4.10 Biological Resources – Vegetation

4.10.1 Introduction

Biological resources include the plant and animal species and populations, natural communities, and ecosystem processes that occur within the Planning Area. A diversity of vegetation communities, habitats, and plant and animal species, including numerous special status species, occur on BLM surface lands. This section discusses impacts on vegetation communities and habitat, both common and sensitive, and applicable mitigation.

Vegetation communities may be recognized as sensitive or afforded other special conservation status due to high natural importance to many species (e.g., riparian or wetlands habitat); dependence of certain special-status species on the community as its habitat, including designated critical habitat; or rarity of the natural community, due either to inherent rarity or to human-related causes. Examples of particularly sensitive natural communities are aquatic and riparian habitats, coastal or inland wetlands, vernal pools, coastal sage scrub, and old growth forest. For purposes of this analysis, sensitive natural communities include the following:

- Habitat or vegetation that may support special-status plants, fish, or wildlife;
- Habitat or vegetation meeting criteria as wetlands according to State or Federal delineation criteria;
- Riparian habitat, including any vegetation or habitat that is distinct from surrounding upland habitat, and is dependent upon intermittent, seasonal, or perennial soil moisture from a nearby source;
- Communities recognized by CDFW as sensitive (i.e., as noted in the Natural Communities List (CDFG, 2010);
- Habitat designated by USFWS as “critical habitat” for a federally listed threatened or endangered species; or
- Habitat recognized as “essential habitat” for a federally listed species, even if the habitat is excluded from the final critical habitat designation.

BLM Vegetation Goals

The Resource Management Plan ROD (BLM, 2007) lists goals and objectives that define the desired future conditions for the vegetation resource. The goals for vegetation resources are to (1) restore, maintain, or improve ecological conditions, natural diversity, and associated watersheds of high value, high-risk native plant communities and unique plant assemblages, and (2) to restore degraded landscapes and plant communities.

To achieve this goal the following objectives are established:

- Provide a mosaic of vegetative communities to protect soil, watershed, and wildlife; maintain sustained yield of vegetation for consumptive and non-consumptive uses.
- Rehabilitate disturbed areas to stabilize soils and promote growth of desired plant communities.
- Prevent the introduction and proliferation of noxious and invasive weeds.

Methods of Analysis

The analysis of direct and indirect effects is focused on species, populations, and habitats within the Planning Area. Direct impacts are the direct or immediate effects of an action on biological resources. Examples of direct impacts to vegetation include removal or degradation of the vegetation. Indirect impacts are those effects that are caused by or will result from the action, later in time or farther removed in distance, but are still reasonably certain to occur. Examples of indirect effects to native habitat and vegetation include

erosion, sedimentation, and introduction of invasive species that may compete with native species and cause habitat degradation.

Effects to habitat may be short-term and temporary or long-term and permanent. See Section 4.1.2 for definitions of these terms specific to this document. Long-term and permanent impacts would preclude most natural vegetation and habitat function throughout the life of a proposed project, or longer. Examples of long-term impacts are removal of vegetation for well pads and access roads. Short-term and temporary impacts refer to project effects such as construction-phase disturbance, without long-term or permanent land use conversion, so that vegetation may return to a more natural condition or may be actively revegetated or enhanced within a few years.

Short-term and temporary impacts include vegetation removal for temporary staging areas or cut and fill slopes, where vegetation may recover naturally or mitigation efforts (such as revegetation or ecological restoration) may replace it within a few years following disturbance.

Potential effects of management actions to species, populations, and habitats were identified by a team of biologists. A GIS data set and overlays of resources and land uses was used to analyze effects. In the absence of quantitative data, best professional judgment was used to provide qualitative information.

Assumptions

Assumptions used in this impact analysis include the following:

- All actions undertaken as part of this RMPA would be assessed in accordance with the National Environmental Policy Act (NEPA) and the Federal Endangered Species Act. If required, consultation with the USFWS would be completed. Best Management Practices (BMPs), Standard Operating Procedures (SOPs), mitigation measures, and terms and conditions in this RMPA and subsequent NEPA documents and biological opinions will be applied and followed.
- Valid existing rights, such as existing oil and gas leases, private mineral rights, and existing land use authorizations, would be honored, but BMPs, SOPs, stipulations, mitigation measures, and terms and conditions in this RMPA and subsequent NEPA documents and biological opinions will be applied and followed.
- If additional special status species or critical habitat is designated or discovered, the objectives and decisions in this RMPA would extend to such species as well.
- Over time, species distribution may change. Management action locations would change accordingly.
- Impacts on special status species would be similar to those discussed for species with no special status. Special status species may be more restricted in distribution, reducing the likelihood that certain activities would interact with them. However, impacts on special status species could be more pronounced due to reduced population sizes and ranges and increasing threats. More emphasis would be placed on avoiding or minimizing project effects on special status species since their populations are already in decline. Similarly, more emphasis would be placed on implementing conservation actions for special status species.
- Incomplete information includes undiscovered locations of special status species that may occur on public land and Federal mineral estate. A complete survey of the Planning Area has not been conducted and is not feasible; however, it is still possible to make informed decisions regarding impacts to special status species, based upon an understanding of impacts that are known to affect species in general.

Generalized impacts from oil and gas development, including hydraulic fracturing and other well stimulation techniques, are common to all alternatives. These generalized impacts are presented below. The impact discussion presented for each alternative focuses on the particular impacts of that alternative and builds on the discussion of generalized impacts that occur under all alternatives.

Management Actions

The ROD (BLM, 2007) lists a number of land use management actions to address identified issues, management concerns, and current and projected future uses of the lands administered by the CCFO in the Planning Area. The area-wide management actions that may be relevant to oil and gas development include, but are not limited to:

- **VEG-COM2.** Include mitigation measures to protect or enhance riparian areas in all activity or project plans.
- **VEG-C1.** Rehabilitate vegetative cover following wildland fires and/or other surface-disturbing activities in a timely manner. Allow use of non-persistent (or temporary), non-native, non-invasive species to be used in re-vegetation materials.
- **VEG-C3.** Mitigate or relocate proposed activities within 250 feet of riparian vegetation if the activities have long-term negative impacts on riparian resources.
- **VEG-C6.** Expand the use of an Integrated Pest Management program to prevent the introduction and proliferation of noxious and invasive weeds on 10,000 acres within 10 years throughout the resource area.

Lease Stipulations

Lease stipulations are used to protect resource values. See discussion in Section 2.5.1. Controlled Surface Use (CSU) stipulation means that use and occupancy is allowed (unless restricted by another stipulation), but identified resource values require special operation constraints that may modify the lease rights. The specific constraints would be applied based on the biological resources present and may include provisions to address protected species; sensitive species; critical habitat; raptors; or priority species, plant communities, and habitat. No Surface Occupancy (NSO) stipulation prohibits any surface disturbance on the lease land.

BMPs and SOPs

Leasing fluid mineral resources does not confer on the lessee the right to conduct any ground disturbing activities related to exploring for or developing the resources until a subsequent environmental analysis of the actual proposed operations for the site is conducted. There are various stages of fluid minerals resource development within a lease, such as exploration, development, production, and reclamation/closeout. These activities all require additional BLM authorization. All proposed drilling or production operations for fluid minerals production to be conducted on a lease must be approved before surface disturbance is allowed. Surface disturbance is proposed in Applications for Permit to Drill (APDs), Rights-of-Way (ROWs), and Sundry Notices. During BLM NEPA review of these applications, site-specific appropriate mitigation and environmental protection measures are developed and approved prior to conducting ground disturbing activities. This sequential approval process (leasing, operations plan approval, etc.) allows BLM to consider application of restrictions at the appropriate action level. Restrictions are formulated at the proper stage when site-specific information is available.

BMPs and SOPs are 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. SOPs are the management controls and performance standards required for implementation of a specific type of action. These practices are intended to protect and enhance natural resources that could be affected by management actions. Interdisciplinary site-specific analysis is necessary to determine which management practices would be necessary to meet specific goals.

BMPs are selected and implemented as necessary, based on site-specific conditions, to meet a variety of resource objectives for specific management actions. Additional BMPs or modifications may be identified to minimize the potential for negative impacts when evaluating site-specific management actions through an interdisciplinary process. In addition, implementation and effectiveness of BMPs need to be monitored to determine whether the practices are achieving resource objectives and accomplishing desired goals, and adjustments made as necessary.

The BMPs and SOPs for this RMPA (Appendix D: Sections 1.2 through 1.6, and 1.8) include a number of measures that would reduce impacts to vegetation and habitat. The topics addressed are briefly summarized below; see Appendix D for complete text of measures.

- Minimize surface disturbance and avoid and minimize impacts to biological resources. Use previously disturbed areas to the extent practicable. Design projects to minimize habitat impacts and fragmentation.
- Conduct monitoring by BLM staff and BLM-approved biologists.
- Control fugitive dust.
- Recontour and restore disturbed sites and unneeded roads to natural conditions. Develop restoration plans and requirements. Conduct restoration monitoring.
- Conduct biological surveys prior to disturbance and at the appropriate time of year to detect sensitive species and important biological resources. Conduct surveys in compliance with agency protocols.
- Control vehicle speeds to reduce potential for roadkill, to minimize dust, and to protect sensitive animals and habitats. Use existing roads to the greatest extent practicable. Prohibit unapproved off-road travel.
- Design stream crossings to minimize adverse impacts to soils, water quality, and riparian vegetation. Maintain natural drainage patterns.
- Contain oil spills. Promptly notify the appropriate agencies of oil spill events. Prevent discharge of biological toxicants onto the ground surface. Clean up hazardous spills.
- Conduct a worker education program to train project personnel on sensitive biological resources.
- Perform in kind compensation for impacted habitat.
- Minimize the introduction and spread of weeds.
- Minimize erosion and sedimentation. Protect water quality.
- Protect air quality.
- Avoid vernal pools, natural ponded waters, and washes during geophysical exploration.

4.10.2 Impacts Common to All Alternatives

Under the Reasonably Foreseeable Development (RFD) Scenario for oil and gas development on Federal mineral estate in the Planning Area, within the next 15 years there is expected to be: zero to 32 new development wells, most likely all within the existing Coalinga, San Ardo, Lynch Canyon, and Jacalitos fields, but potentially occurring anywhere that is open to oil and gas leasing; 3 to 5 exploratory wells outside existing fields, most if not all in areas of high oil and gas occurrence potential; and geophysical exploration. New surface disturbance of between 22 to over 206 acres is expected to be associated with this development. This acreage does not include disturbance within previously disturbed areas and the total disturbance area could potentially be greater than 206 acres. Areas of high oil and gas occurrence potential (Figure 4 of the RFD Scenario) generally correspond to identified oil and gas plays within the San Joaquin and Salinas Basins. See Appendix B for full details.

Oil and gas leasing would have short-term and long-term direct and indirect effects on vegetation and habitat if new or existing leases are developed. Geophysical exploration would result in many of the same impacts as other oil and gas activities but often results in short-term impacts on biological resources, particularly if the ground disturbance is confined to previously disturbed areas or to grasslands or similar vegetation types where natural recovery occurs within a short time span without additional restoration efforts.

Oil and gas development results in both short-term and long-term vegetation loss from installing roads, pipelines, power lines, drilling pads, sumps, and production facilities; from contouring surface profiles; and from making other surface modifications. Installation of roads and pipelines results in vegetation removal along linear routes, fragmenting the undisturbed vegetation. Construction can damage or destroy vegetation. Surface disturbance and travel on dirt roads create dust, which reduces photosynthesis and reproduction in plants. Oil spills or leaks can coat vegetation and soil. Soil disturbance can promote invasion or spread of non-native weeds. Weed species not currently present in the area can be inadvertently introduced and spread by oil field workers and equipment.

Depending on the affected vegetation, the loss of relatively small acreages for activities related to oil and gas development could cause substantial reduction of fish and wildlife habitat values. Similarly, depending on the affected vegetation community, the loss of relatively small acreages for oil and gas development could cause substantial reduction in the overall extent of the community. By contrast, activities (and associated disturbance) affecting sites with little native habitat value would not have substantial impacts to fish and wildlife habitat or sensitive vegetation communities. Examples of sites with little native habitat value include land already in industrial use such as operating well pads or other production-related disturbed lands.

Some future oil and gas leases may be located entirely or partially on open space lands supporting native vegetation types including, but not limited to, those described in Section 3.10. Impacts to native vegetation would be most likely for oil and gas development activities located outside of existing oil and gas fields or in fields where oil and gas production land uses are intermixed with native habitats.

Oil and gas development activities could affect wetlands as defined by Section 404 of the Clean Water Act. These impacts could include placing fill material into jurisdictional waters to provide level, dry work areas, drill pads, or roadways; constructing roadways, culverts, or other crossing structures across jurisdictional channels; installing channel armoring (such as riprap) in a channel near a work site to prevent flooding or erosion; constructing impoundments or detention basins on jurisdictional channels; grading or other site preparation that eliminates or redirects natural runoff; or impacts from spills of hazardous materials that may enter jurisdictional waters. Potential adverse effects are not limited to wetlands or mapped “blueline” streams; similar effects to intermittent channels or washes may also be substantial. Impacts to waters, including intermittent channels, could also affect downstream wetlands, riparian, or aquatic habitat and fish or wildlife found in those downstream habitats.

In addition, oil and gas development activities could affect lakes or streams (including seasonally or intermittently dry lakes or streams) that may not meet the Federal definition as wetlands, yet fall under State or Federal jurisdictional criteria as waters of the State or waters of the U.S. Even in the absence of State or Federal jurisdiction, the impacts of oil and gas development activities to perennial, seasonal, or intermittent wetlands, lakes, or streams may affect special-status wildlife, local biological diversity, or special-status natural communities.

Projects affecting waters of the State or waters of the U.S. will be subject to permitting under the California Fish and Game Code and Federal Clean Water Act. Each project applicant must prepare and submit appropriate applications, notifications, and fees to the USACE (according to Section 404 of the CWA), the CDFW (according to Sections 1600–1616 of the California Fish and Game Code) and the California Regional Water Quality Control Board (RWQCB; according to Section 401 of the CWA).

Federal CWA permitting is required for projects that would place dredged or fill material into jurisdictional waters of the U.S. State authorization is required if projects would 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 or dispose of debris, waste, or other material containing crumbled, flaked, or ground pavement where it may pass into any river, stream, or lake.

In addition to the direct impacts to habitat, oil and gas development activities could have several direct or indirect impacts to surrounding vegetation and habitat. The extent and significance of these indirect habitat effects would be dependent on the sensitivity of adjacent habitat and the fish and wildlife it supports. These impacts may include:

- Introduction or spread of invasive species;
- Dust caused by project activities or vegetation removal;
- Altered local surface hydrology, causing short-term or long-term habitat inundation behind berms, or interruption of downstream flow and sediment delivery; or
- Reduced surface or groundwater availability, caused by pumping from a surface source such as a lake, stream, spring, or a groundwater source, reducing surface or soil water availability for wildlife drinking water sources, or wetland, riparian, or aquatic habitat.
- Spills and releases of well stimulation fluids, hydrocarbons, or other project-related contaminants, and resulting cleanup efforts, may cause short-term and temporary and long-term and permanent loss and degradation of habitat.

Surface water contamination, if any, could affect vegetation and wetland resources at the contamination site or downstream. Potential effects to biological resources include damage to plant roots or physiology if the contaminant is taken up by plants. Spilled hydraulic fracturing fluid, or returned fluid mixed with oil, probably would not behave in the same way as oil (i.e., the hydraulic fracturing fluid would generally be water soluble, whereas oil would not).

Groundwater contamination, if any, could affect these resources at natural seeps or springs where the groundwater source discharges to the surface. Or, groundwater contamination could affect biological resources if a groundwater well is used as a water source for wetlands, fisheries, or other wildlife benefits (e.g., a water source for managed wetlands or for wildlife drinking). The actual distance to seeps, springs, or wells that could be affected will be site-specific, dependent on the groundwater resource extent and flow characteristics.

Potential surface water and groundwater quality impacts are described in Section 4.7 (Groundwater Resources) and Section 4.8 (Surface Water Resources). The operator must comply with all applicable regulations regarding storage and handling of project-related contaminants.

Potential air quality impacts are described in Section 4.5 (Air Quality). Air pollution generated by oil and gas development activities may also affect the health of vegetation. The operator must comply with all applicable regulations regarding air quality.

Climate change is described in Section 4.6 (Climate Change/Greenhouse Gas Emissions). Climate change is likely to cause drier summer vegetation conditions (i.e., decreased fuel moisture) and increasingly severe wildfires; reduced or altered food, cover, and water availability for fish and wildlife; habitat conversion as dominant plants are excluded from warmer and drier conditions at their lower elevational and latitudinal extents; generally earlier timing of seasonal activity periods for plants and animals (e.g., blooming, bird nesting, and insect flight seasons); reduced populations of anadromous fish (e.g., salmon and steelhead) and coastal birds, which are both dependent on productive nearshore feeding areas; and inundation of low-lying coastal habitats, including wetlands.

Vulnerability to the effects of climate change varies widely by species, according to ranges of tolerance to physical and biotic conditions for each species, and interaction among these inherent ranges and other changes throughout the environment. Retention of biological connectivity and facilitation of wildlife movement among habitat areas is the primary mitigation strategy to minimize expected effects of global climate change to biological resources. Many species or populations may need to move on a regional scale from areas of declining habitat suitability to areas of stable or increasing habitat suitability.

Oil and gas leasing on Federal mineral estate within the Planning Area would generate greenhouse gas emissions that contribute to global climate change. The effects of global climate change, in turn, would affect biological diversity. However, under all alternatives, this contribution would be minor. New oil and gas development on up to 206 acres within the Planning Area would also have a minor effect on regional biological connectivity.

General Mitigation

Under all alternatives, BLM management actions to conserve, restore, and enhance biological resources, including vegetation, would continue to be implemented. These proactive measures include direction to retain and acquire important native vegetation and habitat; secure areas important for listed species recovery (e.g., compensation lands); maintain, enhance, and restore native vegetation and habitat, including riparian habitat; maintain linkage between areas of natural habitat; improve the knowledge base of the species and lands under BLM management; and manage all public lands appropriately. In addition, the designation of special areas with high biological value as Areas of Conservation Concern (ACECs) and Special Management Areas (SMAs) would establish management objectives and use restrictions that would help protect important biological resources from human activities and result in the long-term maintenance of high-quality habitat across the landscapes where BLM surface lands occur.

Restrictions on certain activities to minimize impacts on biological resources, including vegetation, would continue to be imposed. These include such protective measures as lease stipulations, Best Management Practices (BMPs) and Standard Operating Procedures (SOPs) for oil and gas development (described above), and the closure of sensitive areas to oil and gas development. All of these actions would benefit vegetation and habitats at the local and landscape scales by eliminating or reducing negative impacts stemming from development.

In addition, site-specific evaluations of proposed ground disturbing activities will include delineations of State or federally hydrologic features, including wetlands, to determine whether State or Federal permitting may be required. Where proposed activities may fall under State or Federal jurisdiction, each lease holder or applicant will provide notification or application materials to CDFW, RWQCB, and USACE as required under Sections 1600-1616 of the California Fish and Game Code and Sections 401 and 404 of the Clean Water Act.

Implementation of lease stipulations, BMPs, SOPs, and compliance with CWA requirements would avoid and/or minimize potential impacts to biological resources. Species-specific surveys and species avoidance and habitat protection and compensation measures would minimize impacts of oil and gas development activities on special status species.

Under any of the Alternatives analyzed below, the actual impacts of future oil and gas development would depend on the specific extent and locations of surface disturbance. Each alternative identifies specific areas as either open or closed to development, or subject to NSO stipulations. Based on these designations, Alternative A (the No Action alternative) is the least restrictive regarding future disturbance to vegetation resources, and Alternative B is the most restrictive. That is, Alternative A could result in the greatest disturbance to native vegetation (up to 206 acres), and Alternative B could result in the least. Potential vegetation impacts of Alternatives C, D, and E would fall between the others, based on specific restrictions of each one. These comparisons are generalities, and the actual impacts under any alternative would be identified during site-specific evaluations of future development proposals.

Additional Mitigation

Compensation. Within the San Joaquin Valley, for every habitat acre permanently disturbed, 3 acres are set aside as compensation. For temporary disturbance, 1.1 acre is set aside. These ratios apply within the San Joaquin Valley, with the following exceptions:

- Within the Ciervo Panoche Natural Area the compensation ratio will be 4:1 for permanent impacts.
- The compensation ratio for vernal pool habitat will be 5:1 with a replacement element.
- If a new compensation ratio becomes established for a county or species, the BLM and USFWS may modify compensation ratios.

For protected lands (such as Federal lands, State wildlife areas, conservation banks) a replacement component will be added to the compensation ratio.

Compensation of habitat must be in kind. Land used for compensation must be of equal value or better than the land impacted. The same species must be present and habitat must be of an equal or greater value. Lands used for compensation for project impacts on San Joaquin woollythreads, California jewel-flower, blunt-nosed leopard lizard, and kangaroo rats must support these species or be approved by the USFWS for these species. Lands used to compensate for impacts on a kit fox natal den must support breeding populations of kit foxes.

See Section 1.4.4 of Appendix D (Compensation) for full details.

4.10.3 Impacts of Alternative A (No Action)

Alternative A is the No Action Alternative. The No Action Alternative would continue the current management goals, objectives, and direction for oil and gas as specified in the 2007 Hollister Field Office RMP. Areas currently open would remain open to oil and gas leasing, and areas closed under the 2007 RMP would remain closed (Wilderness, Wilderness Study Areas (WSAs), Clear Creek Serpentine ACEC, and Fort Ord National Monument). See Chapter 2 (Alternatives) for further information.

No surface occupancy (NSO) stipulations would be applied to new leases in ACECs and Recreation and Public Purpose (R&PP) leases. The NSO stipulation prohibits any surface disturbance on the lease land. Where applicable, the NSO stipulations prevent surface disturbance and potential for interactions between oil field activities and biological resources in these areas. The Endangered Species stipulation from the 2007 Hollister Field Office RMP would apply in all areas open to leasing (see Appendix D in BLM, 2007).

Under Alternative A, approximately 86 percent of BLM oil and gas Federal mineral estate would be open to oil and gas leasing with the CSU – Protected Species stipulation and subject to impacts as described in Section 4.10.2. Approximately 8 percent would be closed to oil and gas leasing and 6 percent would be subject to NSO lease stipulations. Under the RFD Scenario, the expected zero to 32 new development wells, most likely all within the existing Coalinga, San Ardo, Lynch Canyon, and Jacalitos fields, but potentially occurring anywhere that is open to oil and gas leasing, could still occur. The 3 to 5 exploratory wells outside existing fields could only occur within any of the Federal mineral estate lands open to oil and gas leasing.

The impacts of Alternative A on vegetation and habitat would be identical to existing conditions. In regard to BLM vegetation goals (see Section 4.10), with implementation of mitigation as described below, Alternative A has the potential to result in short-term and temporary and long-term and permanent adverse impacts to up to 206 acres that could range from negligible to major, depending on the extent and locations of surface disturbance for exploration and development. For example, impacts of new development on common vegetation communities that do not support special-status species would be minor,

whereas new surface disturbance in sensitive vegetation types such as riparian communities or vernal pools could have major effects to vegetation and habitat. Site-specific analysis would be required to determine actual extent of the impacts.

Mitigation

Under Alternative A, measures to minimize impacts on vegetation communities and habitat would continue to be applied to oil and gas leases. Examples of these measures are oil and gas stipulations included in Appendix D of the RMP FEIS (BLM, 2006), and the BMPs and SOPs that are included in Appendix D of this RMPA.

The Endangered Species stipulation from the 2007 Hollister Field Office RMP would apply in all areas open to leasing. Although primarily directed at special status species, this stipulation also has the following requirements:

- Minimize impacts to biological resources.
- Take reasonable measures required by the BLM to protect resources.
- Specialized habitats such as riparian areas, vernal pools, other wetlands, floodplains, native perennial grasses, saltbrush, and oak woodlands would be avoided by surface disturbing activities when practical and feasible alternatives exist.

General mitigation as described in Section 4.10.2 would apply. Implementation of lease stipulations, BMPs, and SOPs would require site-specific analysis of potential impacts to vegetation resources, avoidance of sensitive vegetation resources where feasible, and development of site-specific mitigation measures to avoid and minimize impacts to biological resources.

Leases Subject to Settlement Agreement – Subalternative 1

Under Alternative A, all areas of the 14 non-NSO leases, as identified in Case No. 11-06174 and Case No. 13-1749, would be available for oil and gas leasing and would be issued, as such they would be subject to resulting impacts as discussed above. The lease areas total approximately 17,600 acres. These leases do not include any lands designated as Wilderness, WSAs, Clear Creek Serpentine ACEC, or Fort Ord National Monument. The Endangered Species stipulation from the 2007 Hollister Field Office RMP would apply in all areas of the leases.

Impacts and mitigation within these leases would be the same as described for the Planning Area as a whole (Section 4.10.2).

Leases Subject to Settlement Agreement – Subalternative 2

The two non-NSO leases as identified in Case No. 11-06174 should not have been issued, and the 12 prospective non-NSO leases as identified in Case No. 13-1749 would not be issued. As such, no resource impact would occur.

4.10.4 Impacts of Alternative B

Under Alternative B, lands within oil and gas fields and a 0.5-mile buffer area, as currently defined by DOGGR, would be open and all other areas would be closed. All lands open to leasing would implement Controlled Surface Use (CSU) stipulations as appropriate. Please see Chapter 2 (Alternatives) for further information.

The CSU stipulations mean that use and occupancy is allowed (unless restricted by another stipulation), but identified resource values require special operation constraints that may modify the lease rights. The specific constraints would be applied based on the biological resources present and may include provi-

sions to address protected species; sensitive species; critical habitat; raptors; or priority species, plant communities, and habitat, and specific constraints based on surface restrictions associated with the Department of Defense as appropriate.

Under Alternative B, approximately 4 percent of BLM Federal mineral estate is identified as open to oil and gas leasing and subject to impacts as described in Section 4.10.2. Approximately 96 percent would be closed to leasing, which would eliminate surface disturbance and potential for interactions between oil field activities and biological resources in these areas.

Potential impacts within existing oil and gas fields and the surrounding 0.5-mile buffers would vary depending on site-specific factors, such as the type of native vegetation and habitat present in the field, and the extent and location of oil and gas development disturbance. All the development would be limited to the existing oil and gas fields and surrounding 0.5-mile buffers. CSU stipulations would be used to avoid and minimize impacts to certain sensitive biological resources.

The impacts of Alternative B on vegetation and habitat are likely to be substantially reduced from existing conditions (i.e., the No Action Alternative) due to limitations on the locations of future wells. Alternative B would have up to 32 wells drilled, rather than 37, because it is limited to the existing oil and gas fields and 0.5-mile buffer area and the 5 exploratory wells would not be drilled. As a result, ground disturbance associated with Alternative B would be up to 179 acres.

In regard to BLM vegetation goals (see Section 4.10), with implementation of mitigation as described below, Alternative B has the potential to result in short-term and temporary and long-term and permanent adverse impacts to up to 179 acres that could range from negligible to major depending on the extent and locations of surface disturbance for exploration and development. For example, impacts of new development on common vegetation communities that do not support special-status species would be minor, whereas new surface disturbance in sensitive vegetation types such as riparian communities or vernal pools could have major effects to vegetation and habitat. These resources could be located within existing oil and gas fields, or within the surrounding 0.5-mile buffer areas. Site-specific analysis would be required to determine actual impacts.

Mitigation

Under Alternative B, measures to minimize impacts on vegetation communities and habitat would continue to be applied to oil and gas leases. Examples of these measures are the oil and gas stipulations (Appendix C of this RMPA) and the BMPs and SOPs that are included in Appendix D of this RMPA.

General mitigation as described in Section 4.10.2 would apply. Implementation of lease stipulations, BMPs, and SOPs would require site-specific analysis of potential impacts to vegetation resources, avoidance of sensitive vegetation resources where feasible, and development of site-specific mitigation measures to avoid and minimize impacts to biological resources.

Leases Subject to Settlement Agreement

Under Alternative B, a portion of the area of 14 non-NSO leases, as identified in Case No. 11-06174 and Case No. 13-1749, would be available for oil and gas development (Section 2.7.2) and subject to resulting impacts as discussed above. The remaining areas of the leases would be closed to oil and gas development. Depending on location, some entire leases would be open for development, others would be all or nearly all closed. Many would have a mixture of open and closed areas. Of the total lease area of approximately 17,600 acres, 22 percent would be open and 78 percent would be closed. CSU stipulations would be used to avoid and minimize impacts to certain sensitive biological resources.

Impacts and mitigation within these leases would be the same as described for the Planning Area as a whole (Section 4.10.2).

4.10.5 Impacts of Alternative C

Under Alternative C, high oil and gas occurrence potential areas would be open. Moderate, low, and no oil and gas occurrence potential areas would be closed, as well as core population areas of the kangaroo rat in the vicinity of Panoche, Griswold, Tumey, and Ciervo Hills. Areas closed under the 2007 RMP would remain closed (Wilderness, WSAs, Clear Creek Serpentine ACEC, and Fort Ord National Monument). All lands open to leasing would have CSU stipulations, as described under Alternative B. NSO stipulations would apply to critical habitat, BLM-developed recreation and administration sites, and special status split estate lands (state parks, county parks, conservation easements, land trusts, and scenic designations). The NSO stipulation prohibits any surface disturbance on the lease land. Please see Chapter 2 (Alternatives) for further information.

Under Alternative C, approximately 47 percent of BLM oil and gas Federal mineral estate are identified as open to oil and gas leasing and subject to impacts as described in Section 4.10.2. Approximately 49 percent would be closed to leasing and 4 percent would be subject to NSO stipulations, which would eliminate surface disturbance and potential for interactions between oil field activities and biological resources in these areas.

Potential impacts to vegetation resources would vary depending on site-specific factors, such as the type of native vegetation and habitat present and the extent and location of oil and gas development disturbance. NSO stipulations would avoid impacts to biological resources on critical habitat and special status split estate lands.

Depending on where new oil and gas leases are located, the impacts of Alternative C on vegetation and habitat are likely to be reduced from existing conditions (i.e., the No Action Alternative) but greater than Alternative B. In regard to BLM vegetation goals (see Section 4.10), with implementation of mitigation as described below, Alternative C has the potential to result in short-term and temporary and long-term and permanent adverse impacts to up to 206 acres that could range from negligible to major depending on the extent and locations of surface disturbance for exploration and development. For example, impacts of new development on common vegetation communities that do not support special-status species would be minor, whereas new surface disturbance in sensitive vegetation types such as riparian communities or vernal pools could have major effects to vegetation and habitat. These resources could be located within existing oil and gas fields, or within the other areas identified as open and without the NSO stipulation under this alternative. Site-specific analysis would be required to determine actual impacts.

Mitigation

Under Alternative C, measures to minimize impacts on vegetation communities and habitat would continue to be applied to oil and gas leases. These measures are lease stipulations, BMPs and SOPs, and general mitigation as described in Section 4.10.2. As noted above under Alternative B, site-specific analysis of potential impacts to vegetation resources would be required to develop site-specific mitigation measures to avoid and minimize impacts to biological resources.

Leases Subject to Settlement Agreement

Under Alternative C, almost all of the 14 non-NSO leases, as identified in Case No. 11-06174 and Case No. 13-1749, would be available for oil and gas development (Section 2.8.2) and subject to resulting impacts as discussed above. Most leases would be all or nearly all open for development. These leases do not include any lands designated as Wilderness, WSAs, Clear Creek Serpentine ACEC, or Fort Ord National Monument. Of the total lease area of approximately 17,600 acres, approximately 99.5 percent would be open and less than 0.5 percent would be closed or open with NSO. CSU stipulations would be used to avoid and minimize impacts to certain sensitive biological resources.

Impacts and mitigation within these leases would be the same as described for the Planning Area as a whole (Section 4.10.2).

4.10.6 Impacts of Alternative D

Under Alternative D, Federal mineral estate underlying BLM surface estate would be open. Split estate lands would be closed. The Ciervo Panoche Natural Area would be closed. Areas closed under the 2007 RMP would remain closed (Wilderness, WSAs, Clear Creek Serpentine ACEC, and Fort Ord National Monument). All lands open to leasing would have CSU stipulations, described under Alternative B. NSO stipulations would apply to ACECs and R&PP leases. The NSO stipulation prohibits any surface disturbance on the lease land.

Under Alternative D, approximately 16 percent of BLM oil and gas Federal mineral estate is identified as open to oil and gas leasing and subject to impacts as described in Section 4.10.2. Approximately 83 percent would be closed to leasing and 1 percent would be subject to NSO stipulations, which would eliminate surface disturbance and potential for interactions between oil field activities and biological resources in these areas.

Potential impacts would vary depending on site-specific factors, such as the type of native vegetation and habitat present and the extent and location of oil and gas development disturbance. CSU stipulations would be used to avoid and minimize impacts to certain sensitive biological resources. NSO stipulations would avoid impacts to biological resources on critical habitat and special status split estate lands. No oil and gas development would occur and there would be no impacts to biological resources in the Ciervo Panoche Natural Area.

Depending on where new oil and gas leases are located, the impacts of Alternative D on vegetation and habitat are likely to be considerably reduced from existing conditions (i.e., the No Action Alternative), and somewhat reduced from Alternative C, but greater than Alternative D. In regard to BLM vegetation goals (see Section 4.10), with implementation of mitigation as described below, Alternative D has the potential to result in short-term and temporary and long-term and permanent adverse impacts to up to 206 acres that could range from negligible to major depending on the extent and locations of surface disturbance for exploration and development. For example, impacts of new development on common vegetation communities that do not support special-status species would be minor, whereas new surface disturbance in sensitive vegetation types such as riparian communities or vernal pools could have major effects to vegetation and habitat. These resources could be located within existing oil and gas fields or areas identified as open, and without the NSO stipulation under this alternative. Site-specific analysis would be required to determine actual impacts.

Mitigation

Under Alternative D, measures to minimize impacts on vegetation communities and habitat would continue to be applied to oil and gas leases. These measures are lease stipulations, BMPs and SOPs, and general mitigation as described in Section 4.10.2. As noted above under Alternative B, site-specific analysis of potential impacts to vegetation resources would be required to develop site-specific mitigation measures to avoid and minimize impacts to biological resources.

Leases Subject to Settlement Agreement

Under Alternative D, a portion of the area of the 14 non-NSO leases, as identified in Case No. 11-06174 and Case No. 13-1749, would be available for oil and gas development (Section 2.9.2) and subject to resulting impacts as discussed above. The remaining areas of the leases would be closed to oil and gas development. One lease would be entirely open; one would be entirely closed. Most leases would have a mixture of open and closed areas. All leases in the Ciervo Panoche Natural Area would be closed. The leases do not include any lands designated as Wilderness, WSAs, Clear Creek Serpentine ACEC, or Fort Ord National Monument. Of the total lease area of approximately 17,600 acres, 25 percent would be open areas and 75 percent would be closed.

Impacts and mitigation within these leases would be the same as described for the Planning Area as a whole (Section 4.10.2).

4.10.7 Impacts of Alternative E

Under Alternative E, Federal mineral estate outside California DWR Bulletin 118 groundwater basins and sub-basins would be open, while Federal mineral estate within these basins would be closed. Areas closed under the 2007 RMP would remain closed (Wilderness, WSAs, Clear Creek Serpentine ACEC, and Fort Ord National Monument). All lands open to leasing would have CSU stipulations, as described under Alternative B. NSO stipulations would apply to certain Hydrologic Units and areas within 0.25 miles of non-impaired, perennial surface waters and Wild and Scenic Rivers (See Chapter 2).

Under Alternative E, approximately 63 percent of BLM oil and gas Federal mineral estate is identified as open to oil and gas leasing and subject to impacts as described in Section 4.10.2. Approximately 12 percent would be closed to leasing and 26 percent would be subject to NSO stipulations, which would eliminate surface disturbance and potential for interactions between oil field activities and biological resources in these areas.

Potential impacts would vary depending on site-specific factors, such as the type of native vegetation and habitat present and the extent and location of oil and gas development disturbance. Impacts would occur only outside California DWR Bulletin 118 groundwater basins and sub-basins and the other lands that would remain closed (Wilderness, WSAs, Clear Creek Serpentine ACEC, and Fort Ord National Monument). CSU stipulations would be used to avoid and minimize impacts to certain sensitive biological resources. NSO stipulations would avoid impacts to biological resources within specified Hydrologic Units and within 0.25 miles of non-impaired, perennial surface waters and Wild and Scenic Rivers, and avoid and minimize impacts to these types of waters and associated wetlands.

Depending on where new oil and gas leases are located, the overall impacts of Alternative E on vegetation and habitat are likely to be reduced from existing conditions (i.e., the No Action Alternative), but may be similar to or greater to impacts of Alternatives B, C, and D. Impacts of Alternative E on waters and associated wetlands are likely to be reduced from existing conditions and the other alternatives. In regard to BLM vegetation goals (see Section 4.10), with implementation of mitigation as described below, Alternative E has the potential to result in short-term and temporary and long-term and permanent adverse impacts that could range from negligible to major depending on the extent and locations of surface disturbance for exploration and development. For example, impacts of new development on common vegetation communities that do not support special-status species would be minor, whereas new surface disturbance in sensitive vegetation types such as riparian communities or vernal pools could have major effects to vegetation and habitat. These resources could be located within existing oil and gas fields, or within open areas as identified in the alternative. Site-specific analysis would be required to determine actual impacts.

Mitigation

Under Alternative E, measures to minimize impacts on vegetation communities and habitat would continue to be applied to oil and gas leases. These measures are lease stipulations, BMPs and SOPs, and general mitigation as described in Section 4.10.2. Site-specific analysis of potential impacts to vegetation resources would be required to develop site-specific mitigation measures to avoid and minimize impacts to biological resources and certain types of waters and associated wetlands.

Leases Subject to Settlement Agreement

Under Alternative E, a portion of the area of the 14 non-NSO leases, as identified in Case No. 11-06174 and Case No. 13-1749, would be available for oil and gas development (Section 2.10.2) and subject to resulting impacts as discussed above. The remaining areas of the leases would be closed to oil and gas development or subject to NSO stipulations. Some entire leases would be open for development; one lease would be entirely within the NSO stipulation area. Most leases would have a mixture of open and

closed areas and some would have NSO stipulations on part of the areas. These leases do not include any lands designated as Wilderness, WSAs, Clear Creek Serpentine ACEC, or Fort Ord National Monument. Of the total lease area of approximately 17,600 acres, 57 percent would be open areas, 2 percent would be closed, and 41 percent would be open with NSO.

Impacts and mitigation within these leases would be the same as described for the Planning Area as a whole (Section 4.10.2).

4.11 Biological Resources – Wildlife Habitat

4.11.1 Introduction

This section discusses impacts on wildlife species and their habitats, along with applicable mitigation. Special status wildlife species are addressed in Section 4.12 of this document.

In analyzing management actions, the RMPA 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. See Section 3.11 for a discussion of game and indicator species. RTE wildlife species are addressed in Section 4.12 of this document.

BLM Wildlife Goals

The ROD (BLM, 2007) lists goals and objectives that define the desired future conditions for the resource. The goal for fish and wildlife is to ensure diverse, structured, resilient, and connected habitat on a landscape level to support viable and sustainable populations of wildlife, fish, and other aquatic organisms.

To achieve the goal for fish and wildlife, the following objectives are established:

- Maintain or enhance viable, healthy, and diverse populations of native and desired species, including special status species, where appropriate.
- Conserve habitat consistent with the *Installation-wide Multispecies Habitat Management Plan for Former Fort Ord, California*.
- Conserve habitat for migratory birds and species listed on the USFWS list of Birds of Conservation Concern.

Methods of Analysis

The analysis of direct and indirect effects is focused on species, populations, and habitats within the Planning Area. Direct impacts are the direct or immediate effects of an action on biological resources. Examples of direct impacts to wildlife and habitat include mortality, injury, or displacement of animals; removal or degradation of native habitat; interference with fish and wildlife movement or migration; disruption of essential wildlife behaviors such as feeding, breeding, and sheltering; and disturbance to animals and habitat from noise, light, or dust. Indirect impacts are those effects that are caused by or will result from the action, later in time or farther removed in distance, but are still reasonably certain to occur. Examples of indirect effects to native habitat and vegetation include erosion, sedimentation, and introduction of invasive species that may compete with native species and cause habitat degradation. An example of an indirect effect to fish and wildlife is increased predation due to certain habitat alterations (e.g., perch sites or "subsidies" for predators). See Section 4.10.1 for a complete description of analysis methodology.

Generalized impacts from oil and gas development, including hydraulic fracturing and other well stimulation techniques, are common to all alternatives. These generalized impacts are presented below. The impact discussion presented for each alternative focuses on the particular impacts of that alternative and builds on the discussion of generalized impacts that would occur under all alternatives.

Assumptions

The term habitat refers to the environment and ecological conditions where a species is found. One major component of most wildlife habitat is vegetation. Vegetation reflects many aspects of habitat, including regional climate, physical structure, and biological productivity and food resources for many wildlife species. Thus, vegetation is a useful overarching descriptor for habitat, and it is the primary factor in this

analysis of impacts to wildlife habitat. Impacts to vegetation communities and habitat are discussed in Section 4.10 and the particular impacts to wildlife and habitat of each alternative would be generally similar to those discussed in Section 4.10, as would applicable mitigation. The assumptions used in this impact analysis are listed in Section 4.10.

Management Actions

The ROD (BLM, 2007) listed a number of land use management actions to address identified issues, management concerns, and current and projected future uses of the lands administered by the CCFO in the Planning Area. The management actions that may be relevant to oil and gas development include, but are not limited to the following. The applicable areas for each management action are noted in parentheses at the end of each description.

- **HAB-C2.** Limit disturbance, within a distance of up to 0.5 miles of nesting special status raptors (e.g., California condor, bald eagle, golden eagle, Swainson's hawk, sharp-shinned hawk, northern harrier, peregrine falcon, and burrowing owl) during courtship, nest building, incubation, and fledging periods. Limit disturbance to other raptor species, including State species of concern (e.g., osprey, sharp-shinned hawk, northern harrier, ferruginous hawk, prairie falcon, short-eared owl, long-eared owl) and common species (e.g., red-tailed hawk and American kestrel) during critical periods of their reproductive cycle on a case-by-case basis (all management areas).
- **HAB-COM3.** Mitigate or relocate man-made barriers that substantially impede migration outside of wildlife travel corridors, as appropriate (Central Coast Management Area).

Lease Stipulations

Lease stipulations are used to protect resource values. See discussion in Section 2.5.1. Controlled Surface Use (CSU) stipulations mean that use and occupancy is allowed (unless restricted by another stipulation), but identified resource values require special operation constraints that may modify the lease rights. The specific constraints would be applied based on the biological resources present and may include provisions to address protected species; sensitive species; critical habitat; raptors; or priority species, plant communities, and habitat. The No Surface Occupancy (NSO) stipulation prohibits any surface disturbance on the lease land.

BMPs and SOPs

Leasing fluid mineral resources does not confer on the lessee the right to conduct any ground disturbing activities related to exploring for or developing the resources until a subsequent environmental analysis of the actual proposed operations for the site is conducted. There are various stages of fluid minerals resource development after leasing, such as exploration, development, production, and reclamation/closeout. These activities all require additional BLM authorization. All drilling or operations for fluid minerals production proposed to be conducted on an existing lease must be approved before surface disturbance is allowed. Surface disturbance is proposed in Applications for Permit to Drill (APDs), Rights-of-Way (ROWs), and Sundry Notices. During BLM NEPA review of these applications, site-specific appropriate mitigation/environmental protection measures are developed and approved prior to conducting ground disturbing activities. This sequential approval process (leasing, operations plan approval, etc.) allows BLM to consider application of restrictions at the appropriate action level. Restrictions are formulated at the proper stage when site-specific information is available.

BMPs and SOPs are 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. SOPs are the management controls and performance standards required for implementation of a specific type of action.

These practices are intended to protect and enhance natural resources that could be affected by management actions. Interdisciplinary site-specific analysis is necessary to determine which management practices would be necessary to meet specific goals.

BMPs are selected and implemented as necessary, based on site-specific conditions, to meet a variety of resource objectives for specific management actions. Additional BMPs or modifications may be identified to minimize the potential for negative impacts when evaluating site-specific management actions through an interdisciplinary process. In addition, implementation and effectiveness of BMPs need to be monitored to determine whether the practices are achieving resource objectives and accomplishing desired goals, and adjustments made as necessary.

The BMPs and SOPs for this RMPA (Appendix D: Sections 1.2 through 1.6, and 1.8) include a number of measures that would reduce impacts to wildlife. The topics addressed are briefly summarized in Section 4.10.2; additional topics specific to wildlife are included below. See Appendix D for complete text of measures.

- Use seasonal restrictions to protect nesting raptors.
- Construct facilities and structures in conformance with wildlife protection guidelines. Design new facilities with measures to reduce hazards to wildlife.
- Provide excavations, trenches, and troughs with wildlife escape ramps. Cover pipe ends. Check for and remove trapped animals.
- Store trash and food items in closed containers and remove from the site regularly. Maintain neat and orderly sites and remove junk and trash.
- Prohibit firearms and pets in work sites.
- Screen or eliminate exposed oil sumps. Design tanks, pits, and secondary containment to prevent wildlife entry.
- Allow access to work sites for CDFW and USFWS biologists and law enforcement personnel.
- Avoid burrows and dens during geophysical exploration.

4.11.2 Impacts Common to All Alternatives

Under the Reasonably Foreseeable Development (RFD) Scenario for oil and gas development on Federal mineral estate in the Planning Area, within the next 15 years there is expected to be zero to 32 new development wells, most likely within the existing Coalinga, San Ardo, Lynch Canyon, and Jacalitos fields but potentially occurring anywhere that is open to oil and gas leasing; 3 to 5 exploratory wells outside existing fields, most if not all in areas of high oil and gas occurrence potential; and geophysical exploration. Surface disturbance of up to 206 acres is expected to be associated with this development. A portion of this disturbance may be within previously disturbed areas. Areas of high oil and gas occurrence potential (Appendix B, RFD Scenario Figure 4) generally correspond to identified oil and gas plays within the San Joaquin and Salinas Basins.

Oil and gas leasing would have short-term and long-term direct and indirect effects on wildlife and habitat if new or existing leases are developed. Geophysical exploration would result in many of the same impacts as other oil and gas activities but often results in only short-term impacts on biological resources if the ground disturbance is confined to previously disturbed areas or to grasslands or similar habitats where natural recovery occurs within a short time span, without additional restoration efforts.

Site preparation and other work associated with oil and gas development could cause displacement or mortality of fish and wildlife on the site. Animals would generally leave, or attempt to leave, during grading or clearing. Many small mammals and reptiles, as well as nestling birds or eggs, could be crushed by equipment. Other animals, including adult fish or birds, generally would flee the site where they may be

subject to further adverse effects, potentially including mortality. They would be at increased risk of predation as they flush from cover during site clearing. After leaving their home territories, displaced animals may be unable to find suitable food or cover in new, unfamiliar areas. They may find themselves within the occupied territory of another individual of the same or similar species, leading to competition for resources and reduced survivorship or breeding success. In addition, oil and gas development may cause wildlife mortality, injury, or illness due to vehicle strikes; entrapment in trenches, pipes, or other supplies and equipment; drowning in stored water; or poisoning by ingestion or exposure to stored or spilled chemicals, including exposure to produced water or flowback water.

Noise and disturbance associated with oil and gas development activities may result in wildlife avoiding otherwise suitable habitat on or near work sites, leading to indirect habitat loss (Beckmann et al., 2012; Sawyer et al., 2006; Doherty et al., 2008; Bayne et al., 2008). Wildlife that remain in habitat exposed to noise and disturbance may experience physiological stress, which can affect disease resistance, survival, and reproductive success (Kight and Swaddle, 2011). Noise can also disrupt behavior, such as predator avoidance and communication, which can affect survival and reproduction (Habib et al., 2007; Francis and Barber, 2013). Noise and disturbance may also affect ecosystem structure and diversity by impacting wildlife that pollinate flowers and disperse seeds (Francis et al., 2012).

Artificial lighting may be required for oil and gas development and can disorient wildlife, leading migrating or dispersing animals off-course. Lit structures can be a collision hazard for birds. Lighting can also disrupt circadian (24-hour) rhythms, potentially affecting mating behavior, nocturnal visual communication, competition, and predation (Longcore and Rich, 2004).

Oil and gas development activities could interrupt fish or wildlife movement routes, cause habitat fragmentation, or contribute to existing habitat fragmentation at multiple geographic scales. New barriers to wildlife movement, such as roads or fences, could interrupt local biological connectivity. Culverts or other structures at stream crossings could impair fish movement upstream and downstream.

Habitat fragmentation occurs when development or other disturbance divides habitat that was once continuous into separate and smaller sections. This affects wildlife movement and the viability of the habitat to support various species. Fragmentation also increases the proportion of disturbed edge habitat to undisturbed interior habitat (edge effect) (Wilcove et al., 1986). Habitat fragmentation resulting from development of well pads, roads, and other infrastructure may cause a shift in wildlife species composition. Fragmentation favors common habitat generalists, such as raccoon (*Procyon lotor*) and American crow (*Corvus brachyrhynchos*), over more specialized, and typically rarer, species (Brittingham, no date). Development may result in a shift in biological diversity and local declines in some fish and wildlife populations (Gilbert and Chalfoun, 2011; Ingelfinger and Anderson, 2004).

Many oil and gas development activities located on operating well pads or other production-related disturbed lands and heavily disturbed sites would generally have less effect on fish or wildlife movement and habitat fragmentation than activities within or adjacent to natural habitat. Short-term and temporary effects, such as temporary construction fencing, generally would not have important or lasting effects on wildlife movement and habitat fragmentation. Oil and gas development activities would not substantially affect fish or wildlife movement or habitat fragmentation if they meet the following criteria:

- Activities are located outside any designated linkage area (as recognized by BLM, CDFW, or other resource agency, local agency, or regional conservation plan);
- The work site is surrounded by sufficient natural open space accessible to terrestrial wildlife including large mammals, small mammals, reptiles, and amphibians, such that project-related habitat conversion or fencing would not substantially interfere with local wildlife movement; and
- Activities do not include stream crossing alterations or other potential impairments to fish movement.

Alternatively, oil and gas development activities may be located entirely or partially on open space lands or in areas identified as important biological linkages or "corridors," potentially including sensitive wetland, riparian, or aquatic habitats. Substantial wildlife movement and habitat fragmentation impacts would be most likely for oil and gas development activities located outside of existing oil and gas fields, or located in operating fields where production-related land uses are intermixed with native habitats. For oil and gas development activities within recognized biological linkages, or located in habitat "corridors," habitat conversion, fencing, or other project effects may affect local wildlife movement, or require culvert or other stream crossings. These effects may be substantial without mitigation. See Section 4.10.2 for a discussion regarding the effects of climate change on vegetation and habitat, including to biological connectivity.

Oil and gas development activities could contaminate surface water or groundwater if a project causes well stimulation fluids, hydrocarbons, or other project-related contaminants including enhanced oil recovery to enter surface water or groundwater. Project-related materials that could contaminate surface water include, but are not limited to drilling fluid ("drill mud"), hydraulic fracturing fluids, produced water, crude oil, methane or other dissolved gases, crude oil mixed with hydraulic fracturing fluid or produced water, chemicals used in well-related and other activities, and fuels, lubricants, or other fluids that could leak from equipment. Potential contamination may result from spills on the site or away from the site (e.g., during transportation of project materials or wastewater, or from pipeline failure).

Project-related contaminants may be toxic to plants, fish, or wildlife. For example, drilling fluids may contain biocides, anti-corrosives, clarifiers, heavy metals, petroleum hydrocarbons, and brine. Additionally, produced water has high salinity and electrical conductivity, which can be harmful to wildlife and aquatic species that inhabit freshwater streams. In addition to elevated levels of mineral salts, produced water generally contains traces (1 to 3 percent) of petroleum oil, organic acids and elevated concentrations of heavy metals (including barium, cadmium, chromium, lead, copper and nickel). Since there are trace amounts of oil in the produced water, polycyclic aromatic hydrocarbons (PAH) and benzene, toluene, ethylbenzene and xylene (BTEX), some of which are carcinogens, are usually detected in produced water. If produced water is absorbed into stream sediments, it may cause longer-term impacts to biota. Produced water cannot be contained by traditional oil spill response methods, (e.g., containment boom and sediment berms); therefore, if spilled, it may flow further downstream and soak deeper into sediments than crude oil. If these fluids or dissolved gases enter surface water or groundwater, they may affect plants, fish, wildlife, and habitat that come into contact with them. Effects of contact with toxic chemicals can include damage to or mortality of plants, and distress, impaired health, abnormality, reproductive harm, or mortality of animals (Adams, 2011; Papoulias and Velasco, 2013; Gentes et al., 2007).

In addition to potential hazards of industrial fluids, crude oil is deleterious to wildlife. For example, birds are harmed by dermal exposure (oiling of feathers), ingestion, and effects on embryos when oil contacts egg shells. Oil on feathers causes the loss of water repellency and insulation, which may result in hypothermia or hyperthermia. In addition, oiled feathers may reduce buoyancy, and in severe cases, a bird may lose the ability to fly, dive, swim, feed, or escape predators. Ingestion of even a small amount (0.002 kg) of crude oil can have negative effects including a decrease in fertilization, egg laying, and hatching rates. A laboratory study showed that one drop of oil applied to the outside shell on an incubating egg causes high levels of mortality in a variety of birds (developing embryos obtain oxygen and disperse carbon dioxide through the porous shells). A slightly oiled bird can deliver this small quantity of oil to its clutch. The primary causes of wildlife mortality and morbidity by crude oil exposure are the physical effects of oil exposure to skin, fur, and feathers (loss of water repellency and insulation) and the resulting hypothermia or hyperthermia, as well as irritation of skin, oral, ocular, respiratory, and gastrointestinal mucous membranes. In addition, exposure to oil may damage the reproductive system, liver, and kidneys. Suppression of the immune response and disruption or inhibition of red blood cell formation has also been noted.

Surface water contamination, if any, could affect fish, wildlife, or other aquatic and wetland resources at the contamination site or downstream. Potential effects to biological resources include attraction and ingestion by wildlife, direct toxicity to fish, or damage to plant roots or physiology if the contaminant is taken up by plants. Spilled fluids, or returned fluid mixed with oil, probably would not behave in the same way as oil (i.e., the fluids would generally be water soluble, whereas oil would not).

Groundwater contamination, if any, could affect these resources at natural seeps or springs where the groundwater source discharges to the surface. Or, groundwater contamination could affect biological resources if a groundwater well is used as a water source for wetlands, fisheries, or other wildlife benefits (e.g., a water source for managed wetlands or for wildlife drinking). The actual distance to seeps, springs, or wells that could be affected will be site-specific, dependent on the groundwater resource extent and flow characteristics.

Potential surface water and groundwater quality impacts are described in Section 4.7 (Groundwater Resources) and Section 4.8 (Surface Water Resources). The operator must comply with all applicable regulations regarding storage and handling of project-related contaminants.

Potential air quality impacts are described in Section 4.5 (Air Quality). Air pollution generated by oil and gas development activities may also affect the health of plants and wildlife. The operator must comply with all applicable regulations regarding air quality.

General Mitigation

Under all alternatives, BLM management actions to conserve, restore, and enhance biological resources, including wildlife and habitat, would continue to be implemented. These proactive measures include direction to retain and acquire important native habitat; to implement recovery plans and secure areas important for recovery (e.g., compensation lands); maintain, enhance, and restore native habitat and native populations, including riparian and sensitive species; maintain linkage between areas of natural habitat; improve the knowledge base of the species and lands under BLM management; and manage all public lands appropriately. In addition, the designation of special areas with high biological value as Areas of Conservation Concern (ACECs) and Special Management Areas (SMAs) would establish management objectives and use restrictions that would help protect important biological resources from human activities and would result in the long-term maintenance of high-quality habitat across the landscapes where BLM surface lands occur.

Restrictions on certain activities to minimize impacts on biological resources, including wildlife habitat, would continue to be imposed. These include such protective measures as BMPs and Standard Operating Procedures SOPs for oil and gas development and the closure of sensitive areas to oil and gas development. All of these actions would benefit native populations and habitats at the local and landscape scales by eliminating or reducing negative impacts stemming from development.

Implementation of lease stipulations, BMPs, and SOPs, would avoid and minimize impacts to biological resources. Species-specific surveys and species avoidance and habitat protection and compensation measures would minimize impacts of oil and gas development activities on special status species.

Additional Mitigation

Compensation

Within the San Joaquin Valley, for every habitat acre permanently disturbed, 3 acres are set aside as compensation. For temporary disturbance, 1.1 acre is set aside. These ratios apply within the San Joaquin Valley, with the following exceptions:

- Within the Ciervo Panoche Natural Area the compensation ratio will be 4:1 for permanent impacts.
- The compensation ratio for vernal pool habitat will be 5:1 with a replacement element.
- If a new compensation ratio becomes established for a county or species, the BLM and USFWS may modify compensation ratios.

For protected lands (such as Federal lands, State wildlife areas, conservation banks) a replacement component will be added to the compensation ratio.

Compensation of habitat must be in kind. Land used for compensation must be of equal value or better than the land impacted. The same species must be present and habitat must be of an equal or greater value. Lands used for compensation for project impacts on San Joaquin woollythreads, California jewelflower, blunt-nosed leopard lizards, and the kangaroo rats must support these species or be approved by the USFWS for these species. Lands used to compensate for impacts on a kit fox natal den must support breeding populations of kit foxes.

See Section 1.4.4 of Appendix D (Compensation) for full details.

4.11.3 Impacts of Alternative A (No Action)

See Section 4.10.3 for a discussion of the vegetation and habitat impacts of this alternative.

The impacts of Alternative A on wildlife and habitat would be identical to existing conditions. In regard to BLM wildlife goals (see Section 4.11.1), with implementation of mitigation as described below, Alternative A has the potential to result in short-term and temporary and long-term and permanent adverse impacts to up to 206 acres that could range from negligible to major, depending on the extent and locations of surface disturbance for exploration and development. Site-specific analysis would be required to determine actual impacts.

Mitigation

Under Alternative A, measures to minimize impacts on wildlife and habitat would continue to be applied to oil and gas leases. Examples of these measures are oil and gas stipulations included in Appendix D of the RMP FEIS (BLM, 2006), and the BMPs and SOPs that are included in Appendix D of this RMPA.

The Endangered Species stipulation from the 2007 Hollister Field Office RMP would apply in all areas open to leasing. Although primarily directed at special status species, this stipulation also has the following requirements:

- Minimize impacts to biological resources.
- Take reasonable measures required by the BLM to protect resources.
- Specialized habitats such as riparian areas, vernal pools, other wetlands, floodplains, native perennial grasses, saltbrush, and oak woodlands would be avoided by surface disturbing activities when practical and feasible alternatives exist.

General mitigation as described in Section 4.11.2 would apply. Implementation of lease stipulations, BMPs, and SOPs would require site-specific analysis of potential impacts to wildlife and habitat resources, avoidance of sensitive areas where feasible, and development of site-specific mitigation measures to avoid and minimize impacts to biological resources.

Leases Subject to Settlement Agreement – Subalternative 1

Under Alternative A, all areas of the 14 non-NSO leases, as identified in Case No. 11-06174 and Case No. 13-1749, would be available for oil and gas leasing and would be issued (Section 2.6.2), as such the leases would subject to resulting impacts as discussed above. The lease areas total approximately 17,600 acres. The Endangered Species stipulation from the 2007 Hollister Field Office RMP would apply in all areas of the leases.

Impacts and mitigation would be the same as those for the Planning Area as a whole (Section 4.11.2).

Leases Subject to Settlement Agreement – Subalternative 2

The two non-NSO leases as identified in Case No. 11-06174 should not have been issued, and the 12 prospective non-NSO leases as identified in Case No. 13-1749 would not be issued. As such, no resource impact would occur.

4.11.4 Impacts of Alternative B

See Section 4.10.4 for a discussion of the vegetation and habitat impacts of this alternative.

Potential impacts within existing oil and gas fields and the surrounding 0.5-mile buffers would vary depending on site-specific factors, such as the wildlife and habitat present in the field, and the extent and location of oil and gas development disturbance. All the development would be limited to the existing oil and gas fields and surrounding 0.5-mile buffers. CSU stipulations would be used to avoid and minimize impacts to certain sensitive biological resources.

The impacts of Alternative B on wildlife and habitat are likely to be substantially reduced from existing conditions (i.e., the No Action Alternative) due to limitations on the locations of future wells. Alternative B would have up to 32 wells drilled, rather than 37, because it is limited to the existing oil and gas fields and 0.5-mile buffer area and the 5 exploratory wells would not be drilled. As a result, ground disturbance associated with Alternative B would be up to 179 acres

In regard to BLM wildlife goals (see Section 4.11.1), with implementation of mitigation as described below, Alternative B has the potential to result in short-term and temporary and long-term and permanent adverse impacts to approximately 22.45 to 179 acres that could range from negligible to major depending on the extent and locations of surface disturbance for exploration and development. Affected wildlife and habitat resources could be located within existing oil and gas fields, or within the surrounding 0.5-mile buffer areas. Site-specific analysis would be required to determine actual impacts.

Mitigation

Under Alternative B, measures to minimize impacts on wildlife and habitat would continue to be applied to oil and gas leases. Examples of these measures are oil and gas stipulations (Appendix C) and the BMPs and SOPs that are included in Appendix D of this RMPA. General mitigation as described in Section 4.11.2 would apply. Implementation of lease stipulations, BMPs, and SOPs would require site-specific analysis of potential impacts to wildlife and habitat resources, avoidance of sensitive areas where feasible, and development of site-specific mitigation measures to avoid and minimize impacts to biological resources.

Leases Subject to Settlement Agreement

Under Alternative B, a portion of the area of 14 non-NSO leases, as identified in Case No. 11-06174 and Case No. 13-1749, would be available for oil and gas development (Section 2.7.2) and subject to resulting impacts as discussed above. The remaining areas of the leases would be closed to oil and gas development. Depending on location, some entire leases would be open for development, others would be all or nearly all closed. Many would have a mixture of open and closed areas. Of the total lease area of approximately 17,600 acres, 22 percent would be open and 78 percent would be closed. CSU stipulations would be used to avoid and minimize impacts to certain sensitive biological resources.

Impacts and mitigation within these leases would be to the same as those for the Planning Area as a whole (Section 4.11.2).

4.11.5 Impacts of Alternative C

See Section 4.10.5 for a discussion of the vegetation and habitat impacts of this alternative.

Potential impacts to wildlife and habitat would vary depending on site-specific factors, such as the type of native vegetation and habitat present and the extent and location of oil and gas development disturbance. CSU stipulations would be used to avoid and minimize impacts to certain sensitive biological resources. NSO stipulations would avoid impacts to biological resources on critical habitat and special status split estate lands. Alternative C would close lands to leasing in core population areas of the kangaroo rat in the vicinity of Panoche, Griswold, Tumey, and Ciervo Hills (see Figure 2-3), and thus provides greater protections to this core population than Alternatives A or E.

Depending on where new oil and gas leases are located, the impacts of Alternative C on wildlife and habitat are likely to be reduced from existing conditions (i.e., the No Action Alternative) but greater than Alternative B. In regard to BLM wildlife goals (see Section 4.11.1), with implementation of mitigation as described below, Alternative C has the potential to result in short-term and temporary and long-term and permanent adverse impacts to up to 206 acres that could range from negligible to major depending on the extent and locations of surface disturbance for exploration and development. Wildlife and habitat resources could be located within existing oil and gas fields, or within the other areas identified as open and without the NSO stipulation under this alternative. Site-specific analysis would be required to determine actual impacts.

Mitigation

Under Alternative C, measures to minimize impacts on wildlife and habitat would continue to be applied to oil and gas leases. General mitigation as described in Section 4.11.2 would apply. Implementation of lease stipulations, BMPs, and SOPs would require site-specific analysis of potential impacts to wildlife and habitat resources, avoidance of sensitive areas where feasible, and development of site-specific mitigation measures to avoid and minimize impacts to biological resources.

Leases Subject to Settlement Agreement

Under Alternative C, most of the 14 non-NSO leases, as identified in Case No. 11-06174 and Case No. 13-1749, would be available for oil and gas development (Section 2.8.2) and subject to resulting impacts as discussed above. Of the total lease area of approximately 17,600 acres, approximately 99.5 percent would be open with less than 0.5 percent closed or open with NSO. CSU stipulations would be used to avoid and minimize impacts to certain sensitive biological resources.

Impacts and mitigation would be to the same as those for the Planning Area as a whole (Section 4.11.2).

4.11.6 Impacts of Alternative D

See Section 4.10.6 for a discussion of the vegetation and habitat impacts of this alternative.

Potential impacts would vary depending on site-specific factors, such as the type of wildlife and habitat present and the extent and location of oil and gas development disturbance. CSU stipulations would be used to avoid and minimize impacts to certain sensitive biological resources. NSO stipulations would avoid impacts to biological resources on critical habitat and special status split estate lands. No oil and gas development would occur and there would be no impacts to biological resources in the Ciervo Panoche Natural Area.

Depending on where new oil and gas leases are located, the impacts of Alternative D on wildlife and habitat are likely to be considerably reduced from existing conditions (i.e., the No Action Alternative), and somewhat reduced from Alternative C, but greater than Alternative D. In regard to BLM wildlife goals (see Section 4.11.1), with implementation of mitigation as described below, Alternative D has the potential to result in short-term and temporary and long-term and permanent adverse impacts to up to 206 acres that could range from negligible to major depending on the extent and locations of surface disturbance for exploration and development. Wildlife and habitat resources could be located within existing oil and gas fields or areas identified as open, and without the NSO stipulation under this alternative. Site-specific analysis would be required to determine actual impacts.

Mitigation

Under Alternative D, measures to minimize impacts on wildlife and habitat would continue to be applied to oil and gas leases. General mitigation as described in Section 4.11.2 would apply. Implementation of lease stipulations, BMPs, and SOPs would require site-specific analysis of potential impacts to wildlife and habitat resources, avoidance of sensitive areas where feasible, and development of site-specific mitigation measures to avoid and minimize impacts to biological resources.

Leases Subject to Settlement Agreement

Under Alternative D, a portion of the area of the 14 non-NSO leases, as identified in Case No. 11-06174 and Case No. 13-1749, would be available for oil and gas development (Section 2.9.2) and subject to resulting impacts as discussed above. The remaining areas of the leases would be closed to oil and gas development. One lease would be entirely open; one would be entirely closed. Most leases would have a mixture of open and closed areas. All leases within the Ciervo Panoche Natural Area would be closed. Of the total lease area of approximately 17,600 acres, approximately 25 percent would be open and 75 percent would be closed.

Impacts and mitigation would be the same as those for the Planning Area as a whole (Section 4.11.2).

4.11.7 Impacts of Alternative E

See Section 4.10.7 for a discussion of the vegetation and habitat impacts of this alternative.

Potential impacts would vary depending on site-specific factors, such as the type of native vegetation and habitat present and the extent and location of oil and gas development disturbance. Impacts would occur only outside California DWR Bulletin 118 groundwater basins and sub-basins, and the other lands that would remain closed (Wilderness, WSAs, Clear Creek Serpentine ACEC, and Fort Ord National Monument). CSU stipulations would be used to avoid and minimize impacts to certain sensitive biological resources. NSO stipulations would avoid impacts to biological resources within specified Hydrologic Units (see Chapter 2) and within 0.25 miles of non-impaired, perennial surface waters and Wild and Scenic Rivers, and avoid and minimize impacts to these types of waters and associated wetlands.

Depending on where new oil and gas leases are located, the overall impacts of Alternative E on wildlife and habitat are likely to be reduced from existing conditions (i.e., the No Action Alternative), but may be similar to or greater to impacts of Alternatives B, C, and D. Impacts of Alternative E on waters and associated wetlands are likely to be reduced from existing conditions and the other alternatives. In regard to BLM wildlife goals (see Section 4.11.1), with implementation of mitigation as described below, Alternative E has the potential to result in short-term and temporary and long-term and permanent adverse impacts that could range from negligible to major depending on the extent and locations of surface disturbance for exploration and development. Wildlife and habitat resources could be located within existing oil and gas fields, or within open areas as identified in the alternative. Site-specific analysis would be required to determine actual impacts.

Mitigation

Under Alternative E, measures to minimize impacts on wildlife and habitat would continue to be applied to oil and gas leases. General mitigation as described in Section 4.11.2 would apply. Implementation of lease stipulations, BMPs, and SOPs would require site-specific analysis of potential impacts to wildlife and habitat resources, avoidance of sensitive areas where feasible, and development of site-specific mitigation measures to avoid and minimize impacts to biological resources.

Leases Subject to Settlement Agreement

Under Alternative E, a portion of the area of the 14 non-NSO leases, as identified in Case No. 11-06174 and Case No. 13-1749, would be available for oil and gas development (Section 2.10.2) and subject to resulting impacts as discussed above. The remaining areas of the leases would be closed to oil and gas development or subject to NSO stipulations. Some entire leases would be open for development; one lease would be entirely within the NSO stipulation area. Most leases would have a mixture of open and closed areas and some would have NSO stipulations on part of the areas. Of the total lease area of approximately 17,600 acres, approximately 57 percent would be open, 2 percent would be closed, and 41 percent would be open with NSO.

Impacts and mitigation would be similar to those for the Planning Area as a whole (Section 4.11.2).

4.12 Biological Resources – Special Status Species

4.12.1 Introduction

This section discusses impacts on special status plant and animal species, along with applicable mitigation. In analyzing management actions, the RMPA/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. See Section 3.11 for a discussion of game and indicator species. Impacts and mitigation for non-special status wildlife species and their habitat are addressed in Section 4.11 of this document.

BLM Special Status Species Goals

The ROD (BLM, 2007) lists goals and objectives that define the desired future conditions for the special status species resource. The goal for management of special status species is to (1) protect and/or improve habitat necessary to recover populations of special status species, and (2) manage BLM surface land to maintain, restore, or enhance populations and habitat of special status fish, wildlife, and plant species.

To achieve the goal for management of special status species, the following objectives are established:

- Manage listed, proposed, or candidate threatened or endangered species to comply with the provisions of the Endangered Species Act (ESA).
- Manage special status plants consistent with BLM policy on Special Status Species Management (BLM Manual 6840).
- Prevent the need for listing proposed, candidate, and sensitive species under the ESA
- Improve the condition of special status species and their habitats to a point where their special status recognition is no longer warranted.

Methods of Analysis

The analysis of direct and indirect effects is focused on species, populations, and habitats within the Planning Area. Direct impacts are the direct or immediate effects of an action on biological resources. Examples of direct impacts to wildlife and habitat include mortality, injury, or displacement of animals; removal or degradation of native habitat; interference with fish and wildlife movement or migration; disruption of essential wildlife behaviors such as feeding, breeding, and sheltering; and disturbance to animals and habitat from noise, light, or dust. Indirect impacts are those effects that are caused by or will result from the action, later in time or farther removed in distance, but are still reasonably certain to occur. Examples of indirect effects to native habitat and vegetation include erosion, sedimentation, and introduction of invasive species that may compete with native species and cause habitat degradation. An example of an indirect effect to fish and wildlife is increased predation due to certain habitat alterations (e.g., perch sites or “subsidies” for predators). See Section 4.10.1 for a complete description of analysis methodology.

Generalized impacts from oil and gas development, including hydraulic fracturing and other well stimulation techniques, are common to all alternatives. These generalized impacts are presented below. The impact discussion presented for each alternative focuses on the particular impacts of that alternative and builds on the discussion of generalized impacts that would occur under all alternatives.

Assumptions

Impacts to wildlife and habitat are discussed in Section 4.11. The effects of each alternative to special status species habitat would be generally similar to those discussed in Section 4.11, as would applicable mitiga-

tion. The assumptions used for biological effects analysis in general are listed in Section 4.10, Vegetation. Additional assumptions used in this impact analysis include the following:

- Species-specific surveys and species avoidance and habitat protection measures would result in land use authorizations that minimize impacts on these special status species. Examples of these measures are provided below and in Appendix D – Best Management Practices and Standard Operating Procedures.
- Listed plant populations usually would be avoided by development.
- Although there may be localized effects on special status species, adjacent BLM surface lands would continue to support populations of these species, which would contribute to their conservation and recovery.
- All new oil, gas, and geothermal leases would be issued with stipulations to protect special status species and critical habitat. These stipulations would allow the BLM to move, delay, and even prohibit surface-disturbing activities on all or a portion of the lease, if necessary, to reduce impacts on biological resources to an acceptable level.
- Other actions to conserve, restore, and enhance special status species habitat would also continue to be implemented. These proactive measures include direction to retain and acquire important native habitat, especially for listed species; to implement recovery plans and secure areas important for recovery (e.g., compensation lands); to maintain, enhance, and restore native habitat and native populations, including riparian and sensitive species; to maintain linkage between areas of natural habitat; to improve the knowledge base of the species and lands under BLM management; and to manage all public lands appropriately.
- The management of special areas with high biological value as ACECs would help protect important biological resources from human activities and would result in the long-term maintenance of high-quality habitat across the landscapes where BLM surface lands occur.
- Within the Planning Area, most of the oil and gas activity is projected to occur near existing oil fields in the Monterey, Fresno, and San Benito Counties. Between 0 and 37 wells are forecast to be drilled per year. The RFD Scenario estimates that between 179 and 206 acres of surface disturbance would occur as a result of new Federal oil and gas leases. Only a portion of the disturbance would be within habitat.
- For every acre of (federally listed) special status species habitat permanently disturbed, 3 acres are set aside as compensation. For temporary disturbance, 1.1 acre is set aside. In addition, if an acre of public land that has been identified as part of the reserve and corridor system were disturbed, temporarily or permanently, an additional replacement acre would be set aside to compensate for the additional disturbance. These measures are implemented to maintain listed species habitats at the landscape scale.

Management Actions

The ROD (BLM, 2007) also lists a number of land use management actions to address identified issues, management concerns, and current and projected future uses of the lands administered by the CCFO in the Planning Area. The management actions that may be relevant to oil and gas development include, but are not limited to the following. The applicable areas for each management action are noted in parentheses at the end of each description.

- **SSS-COM2.** Monitor and maintain upland habitat for the California tiger salamander (all management areas).
- **SSS-C1.** Maintain, restore, or enhance special status species habitat (all management areas).
- **SSS-C2.** Limit proposed new surface-disturbing activities within occupied or potential habitat for special status species and significant plant communities. Limit long-term disturbances in potential habitat (all management areas).

- **SSS-C3.** Mitigate or relocate activities that disturb, alter, or interrupt hydrologic or ecological processes that support special status species (all management areas).
- **SSS-COM3.** Protect ponds, wetlands, or riparian areas known to support or that could potentially support California tiger salamander, red-legged frog, or California linderiella to maintain natural corridors between pools/wetlands and upland habitat so that continuous native plant coverage allows adequate movement of these species (Central Coast Management Area).

Lease Stipulations

Lease stipulations are used to protect resource values. See discussion in Section 2.5.1. Controlled Surface Use (CSU) stipulations mean that use and occupancy is allowed (unless restricted by another stipulation), but identified resource values require special operation constraints that may modify the lease rights. The specific constraints would be applied based on the biological resources present and may include provisions to address protected species; sensitive species; critical habitat; raptors; or priority species, plant communities, and habitat. No Surface Occupancy (NSO) stipulations prohibit any surface disturbance on the lease land.

BMPs and SOPs

BMPs and SOPs are land and resource management techniques designed to maximize beneficial results and minimize negative impacts of management actions. See discussion in Section 4.10.2. The BMPs and SOPs for this RMPA (Appendix D: Sections 1.2 through 1.6, and 1.8) include a number of measures that would reduce impacts to wildlife. The topics addressed are briefly summarized in Sections 4.10.2 and 4.11.2; additional topics applicable to special status species are listed below; see Appendix D for complete text of measures.

- Minimize habitat disturbance and reduce the potential for take of listed species.
- Minimize activities during evening hours.
- Immediately cease project activities that are likely to cause the allowed extent of take to be exceeded.
- Extend protective measures for listed species to candidate and proposed species.
- Conduct surveys for listed species and important habitat features for listed species.

There are also species-specific BMPs and SOPs measures for certain special status species, as briefly summarized below; see Appendix D for additional details and complete text of measures. Project areas include surrounding buffers of varying sizes.

Federally Listed Species

All listed species:

- Conduct biological monitoring by BLM-approved, USFWS-qualified biologists.
- Submit monitoring and compliance reports to BLM.
- Provide in-kind compensation for impacts to listed species habitat at established ratios.
- Minimize the introduction and spread of weeds. Prohibit release of non-native animals.
- Conduct pre-activity biological surveys and implement specified impact avoidance measures during geophysical surveys. Establish no-disturbance buffers for dens, burrows, and populations of listed plants during seismic surveys.

Steelhead:

- Designate a BLM-approved third party salmonid biological monitor to oversee compliance.
- Conduct monitoring during surface-disturbing activities.
- Submit a spill prevention plan to BLM. Notify BLM of spills within 500 feet of critical habitat and implement spill response.
- Conduct worker training.

- Restrict activities to certain time periods to reduce impacts.
- Store liquids in closed containers with secondary containment. Clean up spills of hazardous liquids, and do not leave unattended until clean-up is complete. Construct containment berms. Remove materials with potential to discharge pollutants (if inundated) during high flows, spawning runs, and juvenile out-migration.
- Suspend new pipelines above the 100-year flood line at stream crossings within critical habitat.
- Submit information on stream crossing use to BLM prior to project approval. Survey for presence of salmonids prior to use of wet stream crossings.
- Use temporary structures to span streams.
- Avoid new construction in areas below the 100-year flood line in steelhead critical habitat.
- Maintain work areas free of trash and debris. Remove all chemicals, spoils, equipment, and wastes prior to November 30.
- Avoid storing spoils and materials in locations where it could be washed into a stream.
- Restrict vehicle speed to 20 mph or less on access routes and 5 mph or less in earthen stream crossings.
- Restrict equipment, materials, and personnel to disturbed areas. Avoid drainages and stream channels.
- No vehicle use outside of work areas and access routes.
- Implement appropriate fire prevention methods and fire watch.
- Prohibit firearms and pets in work areas. Prohibit feeding of wildlife.

Blunt-nosed leopard lizard:

- Survey for burrows in the project area.
- Avoid and protect burrows.
- Contact BLM if a blunt-nosed leopard lizard is observed in the project area or along access route and comply with any additional measures required by BLM.
- Conduct daily monitoring of the work area and access routes. Submit monitoring reports to BLM. Submit an Operations and Maintenance Plan describing impact avoidance measures to BLM.
- Install signage or temporary barriers to protect occupied areas near access routes. Install exclusion barriers around work sites.
- Conduct project activities at night when possible.
- Control vehicle speed. Check under vehicles and equipment prior to operation. Conduct vehicle escorts in occupied areas.
- Regularly inspect trenches and excavations for entrapped animals and provide escape ramps.

San Joaquin antelope squirrel:

- Apply measures described for blunt-nosed leopard lizard also to San Joaquin antelope squirrel.
- Implement CDFW-approved measures to avoid take.

Giant kangaroo rat:

- Survey for burrow precincts (i.e., burrow complexes) in the project area. Implement a no-disturbance buffer around burrow precincts.
- Implement a capture and release program, as required by USFWS and BLM.

California condor:

- Restrict activities to certain time periods to reduce impacts.
- Designate a representative to oversee compliance.
- Conduct worker training.
- Keep work areas free of trash, microtrash, debris, and other hazards, or secure in closed containers. Cover or bury hoses and cords.
- Avoid direct contact with condors.
- Store all liquids in closed containers. Clean up spills of hazardous liquids and do not leave unattended until clean-up is complete.

- Avoid use of ethylene glycol based antifreeze. Check any vehicles with ethylene glycol–based antifreeze for leaks daily.
- Restrict vehicle speed to 20 mph or less.
- No vehicle use outside of work areas and access routes.
- Restrict equipment, materials, and personnel to disturbed areas that are not habitat for listed species.
- Prohibit firearms and pets in work areas. Prohibit feeding of wildlife.
- Implement appropriate fire prevention methods and fire watch.
- Obtain approval from USFWS prior to use of aircraft or flaring of flammable gases or substances at the project site.
- Report use of the project site and associated facilities by condors to BLM. Report any take of condors (e.g., harm, harassment, injury, death) to USFWS and BLM. Immediately cease activity that caused take.
- Install barriers around well cellars and secondary containment to prevent condor access.
- Use stainless steel rather than poly chemical lines.
- Attach landing deterrents to walking beams on pumping units.
- Install perimeter fencing to deter condor access.
- Install information signs regarding microtrash.
- Install bird deflectors on power lines. Design power lines with sufficient separation to prevent electrocution of condors. Avoid citing power lines on ridgelines or spanning canyons.

San Joaquin kit fox:

- Survey for dens in the project area.
- Protect dens and establish no-disturbance buffers. Employ passive relocation of non-natal dens.
- Conduct blasting, seismic surveys, and other non-fatal disturbance outside of breeding season.
- Search pipes and culverts before sealing to ensure no kit fox are entrapped.

San Joaquin woollythreads and California jewelflower:

- Survey in the project area during appropriate season and environmental conditions.
- Avoid extant populations. Fence or flag populations to prevent accidental encroachment.
- Avoid herbicide use within 300 feet of populations.

Federal Proposed, Federal Candidate, and State Listed Species

- Survey for important habitat features in the project area (animals).
- Survey in the project area during appropriate season (plants).
- Conduct pre-activity biological surveys prior to geophysical surveys. Implement specified impact avoidance measures for geophysical surveys.

Other Special Status Species

- Conduct pre-activity biological surveys prior to geophysical surveys. Implement specified impact avoidance measures for geophysical surveys. Establish no-disturbance buffers for badger dens and burrowing owl burrows during seismic surveys.

Additional Mitigation

Compensation

Within the San Joaquin Valley, for every habitat acre permanently disturbed, 3 acres are set aside as compensation. For temporary disturbance, 1.1 acre is set aside. These ratios apply within the San Joaquin Valley, with the following exceptions:

- Within the Ciervo Panoche Natural Area the compensation ratio will be 4:1 for permanent impacts.
- The compensation ratio for vernal pool habitat will be 5:1 with a replacement element.

If a new compensation ratio becomes established for a county or species, the BLM and USFWS may modify compensation ratios.

For protected lands (such as Federal lands, State wildlife areas, conservation banks) a replacement component will be added to the compensation ratio.

Compensation of habitat must be in kind. Land used for compensation must be of equal value or better than the land impacted. The same species must be present and habitat must be of an equal or greater value. Lands used for compensation for project impacts on San Joaquin woollythreads, California jewelflower, blunt-nosed leopard lizards, and the kangaroo rats must support these species or be approved by the USFWS for these species. Lands used to compensate for impacts on a kit fox natal den must support breeding populations of kit foxes.

See Section 1.4.4 of Appendix D (Compensation) for full details.

Nesting Birds. In addition to the lease stipulations, BMPs, and SOPs summarized above, clearing of vegetation, site preparation in open areas, or other oil and gas development activities that may adversely affect breeding birds will be scheduled outside the peak nesting season (generally February 1 through August 31, but variable according to region) wherever feasible. If activities would take place during bird breeding seasons, a qualified BLM-approved biological monitor will conduct field surveys and establish appropriate no-disturbance buffers to avoid take of nesting birds.

Burrowing Owl. In addition to the lease stipulations, BMPs, and SOPs summarized above, on any proposed oil and gas development site where burrowing owl may occur, a qualified BLM-approved biological monitor will evaluate occupancy and habitat suitability for burrowing owls. If burrowing owls are present on or near the site, the applicant will implement measures to exclude burrowing owls from the site, or protect them in place throughout project implementation by designating a buffer area where project activities will be avoided.

San Benito evening-primrose. In addition to the lease stipulations, BMPs, and SOPs summarized above, on any proposed oil and gas development site where San Benito evening-primrose may occur, the following measures will apply:

Surveys for San Benito evening primrose will be conducted during the peak flowering period (April — June) during an adequate rainfall year (the grassland landscape should appear uniformly green) in the area to be disturbed by the project plus a 50-foot buffer. Conduct reconnaissance-level surveys to determine habitat suitability using meandering walk-over surveys. Conduct site-specific surveys in appropriate habitat by walking transects with 50-foot spacing. At the discretion of an approved BLM botanist, existing information may be used to conclude that the site is not occupied and surveys are not required or that project impacts are acceptable without detailed surveys.

Extant populations will be avoided, to the greatest extent practicable. The locations of listed plants will be avoided and temporarily fenced or prominently flagged to prevent inadvertent encroachment by vehicles and equipment during the activity.

Herbicide use will not be permitted within 300 feet of populations identified during pre-project surveys.

Geophysical exploration activities will avoid populations of San Benito evening-primrose to the maximum extent practicable in the growing season (from first significant rains and germination to flowering; approximately early November through June). Populations of special-status plants will be avoided by relocating and/or reconfiguring source points, receiver points and travel routes. If it becomes necessary to locate a project in an area where San Benito evening-primrose is known or thought to be present, every reasonable effort shall be made to wait until after seed set before beginning ground disturbances.

4.12.2 Impacts Common to All Alternatives

Under the Reasonably Foreseeable Development (RFD) Scenario for oil and gas development on Federal mineral estate in the Planning Area, within the next 15 years there is expected to be zero to 32 new development wells, most likely within the existing Coalinga, San Ardo, Lynch Canyon, and Jacalitos fields, but potentially occurring anywhere that is open to oil and gas leasing; 3 to 5 exploratory wells outside existing fields, most if not all in areas of high oil and gas occurrence potential; and geophysical exploration. Surface disturbance of 22 to 206 acres is expected to be associated with this development. A portion of this disturbance may be within previously disturbed areas. Areas of high oil and gas occurrence potential (Figure 4 of the RFD Scenario, Appendix B) generally correspond to identified oil and gas plays within the San Joaquin and Salinas Basins. See Appendix B for details.

Oil and gas leasing would have short-term and long-term direct and indirect effects on special status species if new or existing leases are developed. Geophysical exploration would result in many of the same impacts as other oil and gas activities, but generally results in short-term impacts on biological resources.

Oil and gas development activities could affect special status fish, wildlife, or plants, including federally listed endangered or threatened species and BLM sensitive species, depending on the specific location of the activities and their on-site and off-site habitat effects. See Table 3.12-1 for the definition of special status species, as used in this document.

Examples of adverse effects to endangered, rare, or threatened plants include grading or mowing plants during site preparation or other ground-disturbing activities; soil compaction or other habitat effects that may prevent seeds from germinating or becoming established; alterations to upstream or downstream site hydrology, leading to alteration of special-status plant habitat (e.g., removing surface or soil water source, or causing inundation of an upland species occurrence); introduction or spread of invasive species that may compete with rare plants or alter natural processes; or introduction of substantial dust from project activities, interfering with plant physiology.

Direct or indirect impacts to special status wildlife include take, mortality, injury, loss or degradation of occupied habitat, or disturbance that may affect normal behavior patterns such as breeding, feeding, sheltering, migration, or dispersal. Wildlife, including special status wildlife, could be exposed to hazards such as vehicle strikes, nest disturbance, entrapment, collision, electrocution, and hazardous materials.

Other potential impacts to special status species would be similar to those discussed in Sections 4.10 and 4.11. Additional impact information for certain special status species is provided below.

California condor

The Planning Area is within the range of the California condor. Condors can be harmed by ingesting oilfield materials, including oil, vehicle coolant, chemicals, and trash. Condors can collide with structures and power lines. Habituation to humans can increase the likelihood of human-condor interactions. Noise from activities can disrupt roosting and nesting behavior, and place condor chicks at risk. Condors can become coated with oil from well cellars, leaks, and spills or become entangled in equipment or fences. While these impacts may occur at a local scale, they may impact condor populations across the larger landscape where these birds occur. The impacts may be short-term or long-term depending on the extent of impacts and condor population levels and population trends.

San Joaquin Valley species

The Planning Area includes portions of the San Joaquin Valley. Some of the federally listed or BLM sensitive species in this area are San Joaquin woollythreads, California jewelflower, San Joaquin kit fox, blunt-nosed leopard lizard, giant kangaroo rat, Tipton kangaroo rat, and San Joaquin antelope squirrel.

Oil and gas development affects special status species by habitat loss due to vegetation removal and grading for well pads, roads, and other facilities. Noise and vibration, venting of toxic and noxious gases, and release of petroleum products and wastewaters result in habitat degradation. Injury and mortality may result from vehicle strikes, entrapment, and drowning in oil sumps or wastewater ponds.

Ecological communities in San Joaquin Valley saltbush scrub may remain relatively intact with low to medium levels of oil field development. At higher levels of development, greater structural diversity due to facilities and plantings, greater amount of edge habitat, and the availability of water create habitat that is occupied by common, opportunistic species rather than special status endemic species (Fiehler and Cypher, 2011). Low and moderate levels of development could sustain suitable habitat for San Joaquin kit fox, and other special status species, as long as suitable mitigation policies are observed, while high-density development areas become unsuitable or are largely avoided (Fiehler and Cypher, 2011; USFWS, 1998).

General Mitigation

Under all alternatives, BLM management actions to conserve, restore, and enhance biological resources, including special status species, would continue to be implemented. These proactive measures include direction to retain and acquire important native habitat, especially for listed species; to implement recovery plans and secure areas important for recovery (e.g., compensation lands); to maintain, enhance, and restore native habitat and native populations, including riparian and sensitive species; to maintain linkage between areas of natural habitat; to improve the knowledge base of the species and lands under BLM management; and to manage all public lands appropriately. In addition, the designation of special areas with high biological value as Areas of Conservation Concern (ACECs) and Special Management Areas (SMAs) would establish management objectives and use restrictions that would help protect important biological resources from human activities and would result in the long-term maintenance of high-quality habitat across the landscapes where BLM surface lands occur.

Restrictions on certain activities to minimize impacts on biological resources, including special status species, would continue to be imposed. These include such protective measures as Best Management Practices (BMPs) and Standard Operating Procedures (SOPs) for oil and gas development and the closure of sensitive areas to oil and gas development. All of these actions would benefit native populations and habitats at the local and landscape scales by eliminating or reducing negative impacts stemming from development.

Implementation of lease stipulations, BMPs, and SOPs, and additional mitigation would avoid and minimize impacts to biological resources. Species-specific surveys and species avoidance and habitat protection and compensation measures would minimize impacts of oil and gas development activities on special status species.

4.12.3 Impacts of Alternative A (No Action)

See Sections 4.10.3 and 4.11.3 for discussion of the vegetation and wildlife habitat impacts of this alternative.

The impacts of Alternative A on special status species would be identical to existing conditions. In regard to BLM special status species goals (see Section 4.12.1), with implementation of mitigation as described below, Alternative A has the potential to result in short-term and temporary and long-term and permanent adverse impacts to up to 206 acres that could range from negligible to major, depending on the extent and locations of surface disturbance for exploration and development. For example, new development on disturbed sites within developed oil and gas fields that are not within habitat occupied by special status species would be minor, whereas new surface disturbance in occupied habitat could have major effects to special status species. Site-specific analysis would be required to determine actual impacts. However, lease stipulations (and mitigation measures at the project level) are designed to avoid or minimize potential effects on these resources.

Mitigation

Under Alternative A, measures to minimize impacts on wildlife and habitat would continue to be applied to oil and gas leases. Examples of these measures are oil and gas stipulations included in Appendix D of the RMP FEIS (BLM, 2006) and the BMPs and SOPs in Appendix D of this RMPA.

The Endangered Species stipulation from the 2007 Hollister Field Office RMP would apply in all areas open to leasing. Although primarily directed at special status species, this stipulation also has the following requirements:

- Minimize impacts to biological resources.
- Take reasonable measures required by the BLM to protect resources.
- Specialized habitats such as riparian areas, vernal pools, other wetlands, floodplains, native perennial grasses, saltbrush, and oak woodlands would be avoided by surface disturbing activities when practical and feasible alternatives exist.

General mitigation as described in Section 4.12.2 would apply. Implementation of lease stipulations, BMPs, and SOPs would require site-specific analysis of potential impacts to special status species, avoidance of occupied habitat where feasible, and development of site-specific mitigation measures to avoid and minimize impacts to special status species.

Leases Subject to Settlement Agreement – Subalternative 1

Under Alternative A, all areas of the 14 non-NSO leases, as identified in Case No. 11-06174 and Case No. 13-1749, would be available for oil and gas leasing and development and would be issued (Section 2.6.2), as such the leases would be subject to resulting impacts discussed above. The lease areas total approximately 17,600 acres. The Endangered Species stipulation from the 2007 Hollister Field Office RMP would apply in all areas of the leases.

Impacts and mitigation would be the same as those for the Planning Area as a whole (Section 4.12.2).

Leases Subject to Settlement Agreement – Subalternative 2

The two non-NSO leases as identified in Case No. 11-06174 should not have been issued, and the 12 prospective non-NSO leases as identified in Case No. 13-1749 would not be issued. As such, no resource impact would occur.

4.12.4 Impacts of Alternative B

See Sections 4.10.4 and 4.11.4 for discussion of the vegetation and wildlife habitat impacts of this alternative.

Potential impacts within existing oil and gas fields and the surrounding 0.5-mile buffers would vary depending on site-specific factors, such as the special status species present in the field, and the extent and location of oil and gas development disturbance. All the development would be limited to the existing oil and gas fields and surrounding 0.5-mile buffers. CSU stipulations would be used to avoid and minimize impacts to certain sensitive biological resources.

The impacts of Alternative B on special status species are likely to be substantially reduced from existing conditions (i.e., the No Action Alternative) due to limitations on the locations of future wells. Alternative B would have up to 32 wells drilled, rather than 37, because it is limited to the existing oil and gas fields and 0.5-mile buffer area and the 5 exploratory wells would not be drilled. As a result, ground disturbance associated with Alternative B would be up to 179 acres.

In regard to BLM special status species goals (see Section 4.12.1), with implementation of mitigation as described below, Alternative B has the potential to result in short-term and temporary and long-term and permanent adverse impacts to 22 to 179 acres that could range from negligible to major depending on the extent and locations of surface disturbance for exploration and development. For example, new development on disturbed sites within developed oil and gas fields that are not within habitat occupied by special status species would be minor, whereas new surface disturbance in occupied habitat could have major effects to special status species. However, lease stipulations (and mitigation measures at the project-level) are designed to avoid or minimize potential effects on these resources. Affected special status species and associated habitat could be located within existing oil and gas fields, or within the surrounding 0.5-mile buffer areas. Site-specific analysis would be required to determine actual impacts.

Mitigation

Under Alternative B, measures to minimize impacts on special status species would continue to be applied to oil and gas leases. Examples of these measures are oil and gas stipulations (Appendix C of this RMPA) and the BMPs and SOPs that are included in Appendix D of this RMPA.

General mitigation as described in Section 4.12.2 would apply. Implementation of lease stipulations, BMPs, and SOPs would require site-specific analysis of potential impacts to special status species, avoidance of occupied habitat where feasible, and development of site-specific mitigation measures to avoid and minimize impacts to special status species.

Leases Subject to Settlement Agreement

Under Alternative B, a portion of the area of the 14 non-NSO leases, as identified in Case No. 11-06174 and Case No. 13-1749, would be available for oil and gas leasing and development (Section 2.7.2) and subject to resulting impacts as discussed above. The remaining areas of the leases would be closed to oil and gas development. Depending on location, some entire leases would be open for development, others would be all or nearly all closed. Many would have a mixture of open and closed areas. Of the total lease area of approximately 17,600 acres, approximately 22 percent would be open and 78 percent would be closed. CSU stipulations would be used to avoid and minimize impacts to certain sensitive biological resources.

Impacts and mitigation within these leases would be the same as those for the Planning Area as a whole (Section 4.12.2).

4.12.5 Impacts of Alternative C

See Sections 4.10.5 and 4.11.5 for discussion of the vegetation and wildlife habitat impacts of this alternative.

Potential impacts to special status species would vary depending on site-specific factors, such as the special status species present and the extent and location of oil and gas development disturbance. CSU stipulations would be used to avoid and minimize impacts to certain sensitive biological resources. NSO stipulations would avoid impacts to biological resources on critical habitat and special status split estate lands.

Depending on where new oil and gas leases are located, the impacts of Alternative C on wildlife and habitat are likely to be reduced from existing conditions (i.e., the No Action Alternative) but greater than Alternative B. However, approximately 35,400 acres would be closed within or in the vicinity of Panoche, Griswold, Tumey, and Ciervo Hills. The areas that are proposed for closure to leasing within Panoche, Griswold, Tumey, and Ciervo Hills areas have been selected for the protection and recovery of a core population of the federally endangered giant kangaroo rat as well as for protection and recovery of the federally endangered San Joaquin kit fox. These areas are known to contain these listed species, and the proposed closure areas in the vicinity of Panoche, Griswold, Tumey, and Ciervo Hills are intended to maintain

connectivity and movement corridors within suitable habitat for the San Joaquin kit fox. Additionally, portions of these areas are known to contain the federally endangered blunt-nosed leopard lizard.

In regard to BLM special status species goals (see Section 4.12.1), with implementation of mitigation as described below, Alternative C has the potential to result in short-term and temporary and long-term and permanent adverse impacts to up to 206 acres that could range from negligible to major depending on the extent and locations of surface disturbance for exploration and development. For example, new development on disturbed sites within developed oil and gas fields that are not within habitat occupied by special status species would be minor, whereas new surface disturbance in occupied habitat could have major effects to special status species. However, lease stipulations (and mitigation measures at the project level) are designed to avoid or minimize potential effects on these resources. Special status species and associated habitat could be located within existing oil and gas fields, or within the other areas identified as open and without the NSO stipulation under this alternative. Site-specific analysis would be required to determine actual impacts.

Mitigation

Under Alternative C, measures to minimize impacts on special status species would continue to be applied to oil and gas leases.

General mitigation as described in Section 4.12.2 would apply. Implementation of lease stipulations, BMPs, and SOPs would require site-specific analysis of potential impacts to special status species, avoidance of occupied habitat where feasible, and development of site-specific mitigation measures to avoid and minimize impacts to special status species.

Leases Subject to Settlement Agreement

Under Alternative C, most of the 14 non-NSO leases, as identified in Case No. 11-06174 and Case No. 13-1749, would be available for oil and gas leasing and development (Section 2.8.2) and subject to resulting impacts as discussed above. Of the total lease area of approximately 17,600 acres, approximately 99.5 percent would be open with less than 0.5 percent closed or open with NSO. CSU stipulations would be used to avoid and minimize impacts to certain sensitive biological resources. Impacts and mitigation would be to the same as those for the Planning Area as a whole (Section 4.12.2).

4.12.6 Impacts of Alternative D

See Sections 4.10.6 and 4.11.6 for discussion of the vegetation and wildlife habitat impacts of this alternative.

Potential impacts would vary depending on site-specific factors, such as the special status species present and the extent and location of oil and gas development disturbance. CSU stipulations would be used to avoid and minimize impacts to certain sensitive biological resources. NSO stipulations would avoid impacts to biological resources in ACECs and R&PP leases. Under Alternative D, closure of the Ciervo Panoche Natural Area to oil and gas development would avoid impacts to the special status species found in that area, including San Joaquin woolly threads (*Monolopia congdonii*), San Joaquin kit fox (*Vulpes macrotis mutica*), giant kangaroo rat (*Dipodomys ingens*), and blunt-nosed leopard lizard (*Gambelia sila*).

Depending on where new oil and gas leases are located, the impacts of Alternative D on special status species are likely to be considerably reduced from existing conditions (i.e., the No Action Alternative), and somewhat reduced from Alternative C, but greater than Alternative D. In regard to BLM special status species goals (see Section 4.12.1), with implementation of mitigation as described below, Alternative D has the potential to result in short-term and temporary and long-term and permanent adverse impacts to up to 206 acres that could range from negligible to major depending on the extent and locations of surface disturbance for exploration and development. For example, new development on disturbed sites within developed oil and gas fields that are not within habitat occupied by special status spe-

cies would be minor, whereas new surface disturbance in occupied habitat could have major effects to special status species. However, lease stipulations (and mitigation measures at the project-level) are designed to avoid or minimize potential effects on these resources. These resources could be located within existing oil and gas fields, or within the other areas identified as open and without the NSO stipulation under this alternative. Site-specific analysis would be required to determine actual impacts.

Mitigation

Under Alternative D, measures to minimize impacts on special status species would continue to be applied to oil and gas leases.

General mitigation as described in Section 4.12.2 would apply. Implementation of lease stipulations, BMPs, and SOPs would require site-specific analysis of potential impacts to special status species, avoidance of occupied habitat where feasible, and development of site-specific mitigation measures to avoid and minimize impacts to special status species.

Leases Subject to Settlement Agreement

Under Alternative D, a portion of the area of the 14 non-NSO leases, as identified in Case No. 11-06174 and Case No. 13-1749, would be available for oil and gas leasing and development (Section 2.9.2) and subject to resulting impacts as discussed above. The remaining areas of the leases would be closed to oil and gas development. Most leases would have a mixture of open and closed areas. Of the total lease area of approximately 17,600 acres, open areas would be approximately 25 percent and closed areas 75 percent.

Impacts and mitigation would be the same as those for the Planning Area as a whole (Section 4.12.2).

4.12.7 Impacts of Alternative E

See Sections 4.10.7 and 4.11.7 for discussion of the vegetation and wildlife habitat impacts of this alternative.

Potential impacts would vary depending on site-specific factors, such as the special status species present and the extent and location of oil and gas development disturbance. Impacts would occur only outside California DWR Bulletin 118 groundwater basins and sub-basins and the other lands that would remain closed (Wilderness, WSAs, Clear Creek Serpentine ACEC, and Fort Ord National Monument). CSU stipulations would be used to avoid and minimize impacts to certain sensitive biological resources. NSO stipulations would avoid impacts to biological resources within 0.25 miles of non-impaired, perennial surface waters and Wild and Scenic Rivers and specified Hydrologic Units (see Chapter 2), and avoid and minimize impacts to these types of waters and associated wetlands.

Depending on where new oil and gas leases are located, the overall impacts of Alternative E on special status species are likely to be reduced from existing conditions (i.e., the No Action Alternative), but may be similar to or greater to impacts of Alternatives B, C, and D. Impacts of Alternative E on special status species associated with waters and wetlands are likely to be reduced from existing conditions and the other alternatives. In regard to BLM special status species goals (see Section 4.12.1), with implementation of mitigation as described below, Alternative E has the potential to result in short-term and temporary and long-term and permanent adverse impacts that could range from negligible to major depending on the extent and locations of surface disturbance for exploration and development. For example, new development on disturbed sites within developed oil and gas fields that are not within habitat occupied by special status species would be minor, whereas new surface disturbance in occupied habitat could have major effects to special status species. However, lease stipulations (and mitigation measures at the project level) are designed to avoid or minimize potential effects on these resources. Special status species and associated habitat could be located within existing oil and gas fields, or within open areas as identified in the alternative. Site-specific analysis would be required to determine actual impacts.

Mitigation

Under Alternative E, measures to minimize impacts to special status species would continue to be applied to oil and gas leases.

General mitigation as described in Section 4.12.2 would apply. Implementation of lease stipulations, BMPs, and SOPs would require site-specific analysis of potential impacts to special status species, avoidance of occupied habitat where feasible, and development of site-specific mitigation measures to avoid and minimize impacts to special status species.

Leases Subject to Settlement Agreement

Under Alternative E, a portion of the area of the 14 non-NSO leases, as identified in Case No. 11-06174 and Case No. 13-1749, would be available for oil and gas leasing and development (Section 2.10.2) and subject to resulting impacts as discussed above. The remaining areas of the leases would be closed to oil and gas development or subject to NSO stipulations. Some entire leases would be open for development; one lease would be entirely within the NSO stipulation area. Most leases would have a mixture of open and closed areas and some would have NSO stipulations on part of the areas. Of the total lease area, open areas would be approximately 66 percent, closed areas 2 percent, and NSO areas 32 percent.

Impacts and mitigation would be similar to those for the Planning Area as a whole (Section 4.12.2).

4.13 Visual Resource Management

This Visual Resource Management section addresses the BLM's Oil and Gas Visual Resource Management (VRM) Best Management Practices (BMPs), which include utilizing the BLM's VRM system. This section describes the types of potential impacts Alternatives A through E could have on visual resources in the BLM Central Coast Field Office Planning Area (Planning Area), and it addresses the types of mitigation that could be implemented to lessen the degree of the impacts, where applicable.

4.13.1 Introduction

Approach to Impact Assessment

A visual resource impact analysis involves determining whether the potential visual impacts from proposed surface-disturbing activities or developments will meet the class management objectives established for the area or whether design adjustments will be required. This is done using BLM's VRM system and is summarized as follows. A contrast rating process is used wherein a project's features are compared with the major features in the existing landscape using the basic design elements of form, line, color, and texture. The results can be used as a guide for resolving any visual impacts. Once every attempt has been made to reduce visual impacts and inconsistencies with VRM class management objectives, BLM managers can decide whether to accept or deny project proposals. BLM Managers also have the option of attaching additional stipulations to attempt to bring the proposal into compliance with the VRM class objectives. In some cases, a VRM inconsistency may trigger the Resource Management Plan amendment process and subsequent changes in the applicable VRM management classes.

The impact analysis is based on the following assumptions:

- The public would continue to value landscape appearance as a resource to be managed in the Planning Area.
- The machinery and infrastructure associated with oil and gas activities would remain relatively unchanged over the life of the RMPA.
- Recreational use would continue to increase over the life of the RMPA, increasing the value of unmodified landscapes.
- All surface disturbance associated with oil and gas development analyzed in this Draft RMPA/EIS would occur in one area, thereby maximizing the potential visual impacts and presenting a worst-case scenario.
- Areas open to oil and gas leasing (with no stipulations and based on the current natural conditions of the areas managed as VRM Class I, II, III, and IV; see Section 3.13.4):
  - *would be inconsistent* with the VRM Class I objective;
  - *would likely be inconsistent* with VRM Class II objective;
  - *may be inconsistent* with VRM Class III objective; and
  - *would be consistent* with the VRM Class IV objective.
- Areas open to oil and gas leasing with Controlled Surface Use (CSU) stipulations (and based on the current natural conditions of the areas managed as VRM Class I, II, and III; see Section 3.13.4):
  - *would likely be inconsistent* with the VRM Class I objective;
  - *may not be consistent* with VRM Class II and III objectives; and
  - *would be consistent* with the VRM Class IV objective.

  This is the case because oil and gas activities would still occur on all or portions of a lease. CSU stipulations are intended to be used when fluid mineral occupancy and use are generally allowed on all or portions of the lease year-round, but because of special values, or resource concerns, lease activities must be strictly controlled.

- Areas open to oil and gas leasing with No Surface Occupancy (NSO) stipulations *would be consistent* with all VRM class objectives since there would be no visually apparent surface disturbance. NSO stipulations are intended for use only when other stipulations are determined insufficient to adequately protect the public interest.
- Areas closed to oil and gas leasing *would be consistent* with all VRM class objectives because there would be no visual change to the landscape.

Impacts to visual resources are considered major if they substantially change or degrade the character of the landscape as seen from sensitive viewsheds, or if the allowable modifications exceed VRM objectives. While topography can allow for some landscape modifications, many types of disturbance, such as roads and built structures, can dominate the landscape depending on their size, distance, topographic position, presence or absence of screening, and contrast with surrounding conditions. Viewsheds deemed to be of high value are those that have high scenic quality, such as the Ventana Wilderness near U.S. Highway 101 or the Joaquin Ridge/Rocks area west of I-5, or high visual sensitivity due to a large amount of public interest and viewing.

The visual resources analysis in this Draft RMPA/EIS evaluates five oil and gas alternatives and their potential impacts on visual resources in the Planning Area. The overarching objective of BLM's Visual Resource Management is to manage public lands in a manner, which will protect the quality of their scenic (visual) values. This visual resources analysis evaluates each alternative relative to the VRM class objectives outlined in the Proposed RMPA/Final EIS (BLM, 2005) and Record of Decision for the Resource Management Plan for the Southern Diablo Mountain Range and Central Coast of California (RMP; BLM, 2007; see Table 3.13-1). Those objectives are listed in this report in Table 3.13-1 in Section 3.13.1.

Types of Impacts

Constructing oil and gas facilities would promote the types of visible landscape contrasts associated with that industry. The industrial machinery and equipment necessary for clearing vegetation, grading landforms, and drilling wells during the construction and maintenance phases of leasable oil and gas operations would result in direct, short-term contrasts of an episodic and transient nature. Movement and activity of construction and drilling machinery would draw the observer's attention to form and color contrasts. Construction equipment and activities would promote the occurrence of traffic and dust resulting in short-term landscape contrasts. The actions of well pad and road construction would result in long-term contrasts in form, line, color, and texture. Form and color contrasts would diminish somewhat as areas transition from construction to the operational phase, largely due to the absence of large equipment movement and activity.

Landscape contrast could be long-term during operational/production phases because leased areas would harbor structures and equipment that would introduce or exacerbate industrial character and create contrasts in form, texture, and possibly color. Equipment likely to appear in these areas over the long term could include tanks, compressor stations, valves, pipes, vents, and enclosed control rooms. Well pads and other areas cleared of vegetation could result in localized and moderate contrasts in line, color, and texture over the long term. Roads, pipeline corridors, and other linear areas cleared of vegetation would result in contrasts in line, color, and texture that could result in long-term land scarring.

Evaporation ponds near oil and gas well pads may draw the eye of the casual observer and could increase landscape contrasts in different ways depending on the relationship of water and vegetation surrounding the ponds. Surface disturbance would be visible when the water levels drop below a pond's capacity and vegetation does not mask contrasts in color and texture. Color contrasts could also be visible at evaporation ponds where salts and minerals accumulate on the substrate and the ponds are empty.

Production facilities could be illuminated at night resulting in nighttime color contrasts over the long term and a reduction in night-sky visibility and naturalness. The magnitude of these contrasts would depend on several factors including time of day, season, density, and extent of the oil and gas production facilities.

4.13.2 Impacts Common to All Alternatives

The Reasonably Foreseeable Development (RFD) Scenario (i.e., between zero and 37 development and exploratory wells with approximately 206 acres of surface disturbance over the next 15 to 20 years on Federal mineral estate in the Planning Area) would occur under all of the alternatives. The worst-case scenario (i.e., 37 wells and 206 acres of surface disturbance) is assumed for each alternative herein, and it is assumed that all of this disturbance would occur in one area, thereby maximizing the potential visual impacts.

For all alternatives, all oil and gas leasing in areas designated VRM Class IV would be consistent with the VRM Class IV objective (including the leases subject to the settlement agreement located in the Williams Hill area of the Salinas MA). Therefore, these leases are not addressed in the following sections.

For all alternatives, Panoche Hills WSA and San Benito WSA (both VRM Class I) would be closed to oil and gas leasing, which would be consistent with the VRM Class I objective. Furthermore, Pinnacles National Park is a non-discretionary closure that is not open to oil and gas leasing under any alternative.

For all alternatives, leases subject to the settlement agreement occur in the Williams Hill area of the Salinas MA (VRM Class IV) and the Griswold-Tumey Hills area (VRM Class III) of the San Joaquin MA.

For all alternatives, there are no leases subject to the settlement agreement located in the Central Coast and San Benito MAs.

For all alternatives, the BLM does not have any Federal mineral estate at the Coast Dairies so this area is not part of the RMPA.

4.13.3 Impacts of Alternative A (No Action)

Alternative A would utilize the 2015 RFD Scenario but would continue current visual resource management goals, objectives, and management (see Table 3.13-1) under the existing 2007 RMP (BLM, 2007). Alternative A impacts to visual resources managed by the BLM as VRM Class I, II, and III in the Planning Area are analyzed below. Alternative A would include: (1) areas open to oil and gas leasing, (2) areas open to leasing with NSO stipulations, and (3) areas closed to leasing (Figure 2-1) as addressed below by MA.

Central Coast Management Area

Ford Ord National Monument, which is designated VRM Class II, would be closed to oil and gas leasing under Alternative A (Figure 2-1); this would be *consistent* with the VRM Class II objective.

San Joaquin Management Area

The Panoche, Griswold, Tumey, and Ciervo Hills and Coalinga Mineral Springs areas of the San Joaquin MA are designated VRM Class III. Under Alternative A, these areas would contain: (1) areas open to oil and gas leasing with no stipulations and (2) areas open to leasing with NSO stipulations (Figure 2-1). Oil and gas leasing with no stipulations has the potential to cause a high level of visual change and result in adverse visual impacts that *may be inconsistent* with the VRM Class III objective (moderate level of change allowed). Leases with NSO stipulations would result in no visually apparent surface disturbance, which would be *consistent* with the VRM Class III objective.

The Joaquin Rocks area is designated VRM Class II. Under Alternative A, this area would contain: (1) areas open to oil and gas leasing with no stipulations and (2) areas open to leasing with NSO stipulations (Figure 2-1). Oil and gas leasing with no stipulations has potential to create moderate to high levels of

visual change and result in adverse visual impacts that would *likely be inconsistent* with the VRM Class II objective (only a low level of change allowed). Leases with NSO stipulations would result in no visually apparent surface disturbance, which would be *consistent* with the VRM Class II objective.

Salinas Management Area

The Sierra de Salinas area of the Salinas MA is designated VRM Class III. Under Alternative A, this area would contain areas open to oil and gas leasing with no stipulations (Figure 2-1). These leases have potential to create a high level of visual change and result in adverse visual impacts. Therefore, they *may be inconsistent* with the VRM Class III objective (moderate level of change allowed).

Also under Alternative A, the Ventana (and Silver Peak) Wilderness Area and the Bear Mountain WSA would be closed to oil and gas leasing under Alternative A (Figure 2-1); this would be *consistent* with the VRM Class I objective.

San Benito Management Area

The Hernandez Valley, Call Mountain, and Laguna Mountain areas of the San Benito MA are designated VRM Class III. Under Alternative A, these areas would contain areas open to oil and gas leasing with no stipulations (Figure 2-1), which has the potential create a high level of visual change and, therefore, result in adverse visual impacts that *may be inconsistent* with the VRM Class III objective (moderate level of change allowed).

Mitigation

Mitigation Measures VR-1 through VR-10 include the types of measures that could be implemented to lessen the degree of potential adverse visual impacts from oil and gas leases associated with Alternative A. These measures incorporate the fundamental principles in the VRM system upon which the VRM BMPs are based and include proper site selection, minimizing visual contrast, reducing unnecessary surface disturbance, exercising proper color selection, and restoration of impacted landscapes.

VR-1 **Construction Activities.** Locate construction sites and all staging and material and equipment storage areas, including storage sites for excavated materials, away from areas of high public visibility. If visible from nearby roads, residences, public gathering areas, or recreational areas, facilities, or trails, construction sites, and staging and storage areas should be visually screened with fencing of an appropriate design and color for each specific location.

VR-2 **Vegetation Removal.** Remove only the minimum amount of vegetation necessary for construction. Conserve topsoil located in areas containing sensitive habitat, to the extent such areas are not already avoided, and reuse it as cover on disturbed areas to facilitate re-growth of vegetation.

Limit Disturbance Areas. Delineate the boundaries of all areas to be disturbed with stakes and flagging (no marking of natural features) before construction and in consultation with a visual resources specialist. Locate parking areas and staging and disposal sites in areas approved by the visual resources specialist. Confine all disturbances by vehicles and equipment to the delineated areas.

Minimize Road Impacts. New and existing roads that are planned for construction, widening, or other improvements should not extend beyond the delineated limits as described above. All vehicles passing or turning around should do so within the delineated limits or in previously disturbed areas. Where new access is required outside of existing roads or the construction zone, the route should be clearly marked (e.g., staked and flagged) before the start of construction and in consultation with a visual resources specialist.

VR-3 **Revegetate Temporarily Disturbed Areas.** Revegetate all areas subject to temporary disturbance to pre-disturbance grade and conditions. The goal of revegetation is to minimize visual impacts by re-establishing the pre-existing colors, textures, and forms of the landscape. Visually integrate adjacent edges by removing lines of demarcation.

VR-4 **Color Contrast of Land Scars.** Where construction would unavoidably create land scars visible from sensitive public viewing locations, treat disturbed soils with an appropriate material (Natina Concentrate, Eonite, Permeon, or similar) to reduce the visual contrast created by lighter-colored disturbed soils and rock with darker soil and vegetated surroundings.

VR-5 **In-line Views of Land Scars.** Land scars could result from construction of access roads, for example, and those roads should be constructed at appropriate angles from the originating, primary travel facilities to minimize extended, in-line views of newly graded terrain. All new access roads should be evaluated for their visibility from sensitive viewing locations prior to final design. "Drive and crush" access is a feasible measure to avoid access road scars where grading or vegetation removal are not required.

VR-6 **Construction Marking of Natural Features.** Do not apply paint or permanent discoloring agents to rocks or vegetation to indicate survey or construction activity limits or for any other purpose.

VR-7 **Waste Control.** Place all trash and food-related waste in self-closing containers to be removed weekly or as needed.

VR-8 **Night Lighting.** Avoid night lighting where possible and minimize it under all circumstances. Consistent with safety and security considerations, install lighting such that: (a) lamps and reflectors are not visible from beyond the construction site or facility; (b) lighting does not cause excessive reflected glare; (c) direct lighting does not illuminate the nighttime sky; and (d) permanent light sources that are used are below 3,500 Kelvin color temperature (warm white) and are full cutoff fixtures.

Limit always-on security lighting to one low-wattage, fully shielded, full cutoff light fixture at main entrances to facilities. Include security lighting that is motion-activated (and only through the use of passive infrared sensors) and controlled as specific zones such that only targeted areas are illuminated. Do not utilize other lighting on a nightly basis when a facility is not occupied.

VR-9 **Project Design.** Use proper design fundamentals to reduce the visual contrast to the characteristic landscape through: proper siting and location; reduction of visibility; repetition of form, line, color, and texture of the landscape; and reduction of unnecessary disturbance. Design strategies that can address these fundamentals may be based on the following factors.

- **Earthwork.** Select locations and alignments that fit into the landforms to minimize the sizes of cuts and fills.
- **Vegetation Manipulation.** Use existing vegetation to screen graded areas and facilities from public viewing to the extent feasible. Feather and thin the edges of cleared areas and retain a representative mix of plant species and sizes.
- **Facilities.** Minimize the number of facilities. Use natural, self-weathering materials and/or chemical treatments on surfaces to reduce color contrast (see Mitigation Measure VR-10). Use road aggregate and concrete colors that match the color of the characteristic landscape surface or apply appropriate colorants such as Natina Concentrate.
- **Reclamation and Restoration.** Blend disturbed areas into the characteristic landscape. Replace soil, brush, rocks, and natural debris over these disturbed areas. Newly introduced plant species should be of a form, color, and texture that blend with the landscape.

VR-10 **Surface Treatment.** Treat the surfaces of all facilities visible to the public such that their colors minimize visual contrast by blending with the characteristic landscape, and their colors and finishes do not create excessive glare.

AQ-1 **Control or Suppress Fugitive Dust.**

Leases Subject to Settlement Agreement – Subalternative 1

Some of the leases subject to the settlement agreement are located in areas open to oil and gas leasing with no stipulations in the Griswold-Tumey Hills area of the San Joaquin MA that is designated VRM Class III (Figure 2-1). Under Alternative A, this oil and gas leasing has the potential to create a high level of change and result in adverse visual impacts. Therefore, it *may be inconsistent* with the VRM Class III objective.

Leases Subject to Settlement Agreement – Subalternative 2

The two non-NSO leases as identified in Case No. 11-06174 should not have been issued, and the 12 prospective non-NSO leases as identified in Case No. 13-1749 would not be issued. As such, no resource impact would occur.

4.13.4 Impacts of Alternative B

Alternative B impacts to visual resources managed by the BLM as VRM Class I, II, and III in the Planning Area are analyzed below. Alternative B only includes: (1) areas that would be open to oil and gas leasing with CSU stipulations and (2) areas that would be closed to leasing (Figure 2-2).

Central Coast Management Area

The Fort Ord National Monument is closed to oil and gas leasing under Alternative B (Figure 2-2); this would be *consistent* with the VRM Class I objective.

San Joaquin Management Area

The Panoche Hills, Ciervo Hills, and Coalinga Mineral Springs areas of the San Joaquin MA would be closed to oil and gas leasing (Figure 2-2), which would be *consistent* with the VRM Class III objective (moderate level of change allowed) for these areas. The Griswold-Tumey Hills area (also VRM Class III) would contain areas both closed to oil and gas leasing and open to leasing with CSU stipulations (Figure 2-2). Areas closed to leasing would be *consistent* with the VRM Class III objective. Even with CSU stipulations, oil and gas leasing has the potential to cause a high level of visual change and result in adverse visual impacts. Therefore, it *may be inconsistent* with the VRM Class III objective.

The Joaquin Rocks area is designated VRM Class II. Under Alternative B, a portion of this area would be open to oil and gas leasing with CSU stipulations (Figure 2-2). Even with CSU stipulations, however, the leases have potential to create a moderate to high level of change and result in adverse visual impacts that may be inconsistent with the VRM Class II objective (low level of change allowed).

Salinas Management Area

The Sierra de Salinas area of the Salinas MA is designated VRM Class III. Under Alternative B, this area would be closed to oil and gas leasing (Figure 2-2), which would be *consistent* with the VRM Class III objective (moderate level of change allowed). Additionally, the Ventana (and Silver Peak) Wilderness Area and Bear Mountain and Bear Canyon WSAs (VRM Class I) would be closed to leasing, which would be *consistent* with VRM Class I objective (only a very low level of change allowed).

San Benito Management Area

The Hernandez Valley, Call Mountain, and Laguna Mountain areas of the San Benito MA are designated VRM Class III (moderate level of change allowed). Under Alternative B, these areas would be closed to oil and gas leasing (Figure 2-2), which would be *consistent* with the Class III objective.

Mitigation

Mitigation Measures VR-1 through VR-10 and AQ-1 at the end of Section 4.13.3 include the types of measures that could be implemented to lessen the degree of potential adverse visual impacts from oil and gas leases associated with Alternative B.

Leases Subject to Settlement Agreement

Some of the leases subject to settlement agreement are located in areas that would be open to oil and gas leasing with CSU stipulations in the Griswold-Tumey Hills area of the San Joaquin MA that is designated VRM Class III (Figure 2-2). Even with CSU stipulations, oil and gas leasing has potential to create a high level of visual change and, therefore, result in adverse visual impacts that *may be inconsistent* with the VRM Class III objective. Other areas located in the Griswold-Tumey Hills would be closed to oil and gas leasing (Figure 2-2), which would be *consistent* with the VRM Class III objective.

4.13.5 Impacts of Alternative C

Alternative C impacts to visual resources managed by the BLM as VRM Class I, II, and III in the Planning Area are analyzed below. Alternative C would include: (1) areas that would be open to oil and gas leasing with CSU stipulations, (2) areas that would be open to leasing with NSO stipulations, and (3) areas that would be closed to leasing (Figure 2-3).

Central Coast Management Area

The Fort Ord National Monument is closed to oil and gas leasing under Alternative C (Figure 2-3); this would be *consistent* with the VRM Class I objective.

San Joaquin Management Area

Under Alternative C, the Panoche Hills, Griswold, Tumey, and Ciervo Hills and Coalinga Mineral Springs areas (VRM Class III) of the San Joaquin MA would contain areas open to oil and gas leasing with CSU stipulations (Figure 2-3). Even with CSU stipulations, the leases have potential to create a high level of change and result in adverse visual impacts that *may be inconsistent* with the VRM Class III objective (moderate level of change allowed). The Panoche Hills area would also contain areas open to oil and gas leasing with NSO stipulations; Figure 2-3). The leases with NSO stipulations would result in no visually apparent surface disturbance and would, therefore, be consistent with the VRM Class III objective.

The Joaquin Rocks area is designated VRM Class II. Under Alternative C, this area would also be open to oil and gas leasing with CSU stipulations (Figure 2-3). Even with CSU stipulations, however, the leases have potential to create a moderate to high level of change and result in adverse visual impacts that *may be inconsistent* with the VRM Class II objective (low level of change allowed).

Salinas Management Area

The Sierra de Salinas area of the Salinas MA is designated VRM Class III. The Ventana (and Silver Peak) Wilderness Area would typically be afforded visual resource protections comparable to the BLM's VRM Class I objective (only a very low level of change allowed). Bear Mountain and Bear Canyon WSAs are designated VRM Class I. Under Alternative C all of these areas would be closed to oil and gas leasing (Figure 2-3), which would be *consistent* with: (1) the VRM Class III objective (moderate level of change allowed), (2) protections comparable to the VRM Class I objective, and (3) the VRM Class I objective.

San Benito Management Area

Under Alternative C, the Hernandez Valley and Call Mountain areas (VRM Class III) of the San Benito MA would contain: (1) areas open to oil and gas leasing with CSU stipulations and (2) areas open to leasing with NSO stipulations (Figure 2-3). Even with CSU stipulations, the leases have potential to create a high level of visual change and result in adverse visual impacts that *may be inconsistent* with the VRM Class III objective (moderate level of change allowed). The leases with NSO stipulations would result in no visually apparent surface disturbance and would, therefore, be consistent with the VRM Class III objective.

The Laguna Mountain area (Class III) would contain: (1) areas closed to leasing and (2) areas open to leasing with NSO stipulations (Figure 2-3). The closure of areas to leasing would be *consistent* with the VRM Class III objective. The leases with NSO stipulations would result in no visually apparent surface disturbance and would also be consistent with the VRM Class III objective.

Mitigation

Mitigation Measures VR-1 through VR-10 and AQ-1 at the end of Section 4.13.3 include the types of measures that could be implemented to lessen the degree of potential adverse visual impacts from oil and gas leases associated with Alternative C.

Leases Subject to Settlement Agreement

Some of the leases subject to settlement agreement are located in areas that would be open to oil and gas leasing with CSU stipulations in the Griswold-Tumey Hills area of the San Joaquin MA (Figure 2-3) designated VRM Class III. Even with CSU stipulations, the leases have potential to create a high level of visual change and result in adverse visual impacts that *may be inconsistent* with the VRM Class III objective.

4.13.6 Impacts of Alternative D

Alternative D impacts to visual resources managed by the BLM as VRM Class I, II, and III in the Planning Area are analyzed below. Alternative D includes: (1) areas that would be open to oil and gas leasing with CSU stipulations, (2) areas that would be open to leasing with NSO stipulations, and (3) areas that would be closed to leasing (Figure 2-4).

Central Coast Management Area

The Fort Ord National Monument is closed to oil and gas leasing under Alternative D (Figure 2-4); this would be *consistent* with the VRM Class I objective.

San Joaquin Management Area

Under Alternative D, the Panoche Hills, Griswold, Tumey, and Ciervo Hills, and Coalinga Mineral Springs areas (VRM Class III) of the San Joaquin MA would contain areas open to oil and gas leasing with CSU stipulations (Figure 2-4). Even with CSU stipulations, the leases have potential to create a high level of change and result in adverse visual impacts that *may be inconsistent* with the VRM Class III objective (moderate level of change allowed).

These same areas would also contain areas open to oil and gas leasing with NSO stipulations (i.e., Panoche, Griswold, Tumey, and Ciervo Hills) and areas closed to leasing (i.e., Griswold-Tumey Hills and Coalinga Mineral Springs; Figure 2-4). The leases with NSO stipulations and areas closed to leasing would result in no visually apparent surface disturbance and no surface disturbance, respectively, and would, therefore, be *consistent* with the VRM Class III objective.

The Joaquin Rocks area is designated VRM Class II. Under Alternative D, this area would be open to oil and gas leasing with CSU stipulations (Figure 2-4). Even with CSU stipulations, the leases have potential to create a moderate or high level of visual change and result in adverse visual impacts that *may be inconsistent* with the VRM Class II objective (low level of change allowed). Other areas in the Joaquin Rocks area would be open to oil and gas leasing with NSO stipulations (Figure 2-4), so there would be no visually apparent surface disturbance. The leases with NSO stipulations would be *consistent* with the VRM Class II objective.

Salinas Management Area

The Sierra de Salinas area of the Salinas MA is designated VRM Class III. Under Alternative D, this area would contain: (1) areas open to oil and gas leasing with CSU stipulations and (2) areas closed to leasing (Figure 2-4). Even with CSU stipulations, the leases have potential to create a high level of change and result in adverse visual impacts that *may be inconsistent* with the VRM Class III objective (moderate level of change allowed). The areas closed to leasing, however, would be *consistent* with that objective.

The Ventana (and Silver Peak) Wilderness Area would be closed to oil and gas leasing under Alternative D (Figure 2-4), which would be *consistent* with visual resource protections comparable to the VRM Class I objective (only a very low level of change allowed) that would be afforded by the managing agencies. The Bear Mountain and Bear Canyon WSAs would also be closed to oil and gas leasing (Figure 2-4), which would be *consistent* with the VRM Class I objective.

San Benito Management Area

Under Alternative D, the Hernandez Valley, Call Mountain, and Laguna Mountain areas (VRM Class III) of the San Benito MA would contain areas open to oil and gas leasing with CSU stipulations (Figure 2-4). Even with CSU stipulations, the leases have potential to create a high level of change and result in adverse visual impacts that *may be inconsistent* with the VRM Class III objective (moderate level of change allowed). Under Alternative D, these areas would also contain areas closed to leasing (Figure 2-4), which would be *consistent* with the VRM Class III objective.

Mitigation

Mitigation Measures VR-1 through VR-10 and AQ-1 at the end of Section 4.13.3 include the types of measures that could be implemented to lessen the degree of potential adverse visual impacts from oil and gas leases associated with Alternative D.

Leases Subject to Settlement Agreement

Some of the leases subject to settlement agreement are located in areas that would be open to oil and gas leasing with CSU stipulations in the Griswold-Tumey Hills area of the San Joaquin MA (Figure 2-4) that is designated VRM Class III. Even with CSU stipulations, the leases have potential to create a high level of visual change and result in adverse visual impacts that *may be inconsistent* with the VRM Class III objective.

4.13.7 Impacts of Alternative E

Alternative E impacts to visual resources managed by the BLM as VRM Class I, II, and III in the Planning Area are analyzed below. Alternative E includes: (1) areas that would be open to oil and gas leasing with CSU stipulations, (2) areas that would be open to leasing with NSO stipulations, and (3) areas that would be closed to leasing (Figure 2-5).

Central Coast Management Area

The Fort Ord National Monument is closed to oil and gas leasing under Alternative E (Figure 2-5); this would be *consistent* with the VRM Class I objective.

San Joaquin Management Area

Under Alternative E, the Panoche, Griswold, Tumey, and Ciervo Hills and Coalinga Mineral Springs areas (VRM Class III) of the San Joaquin MA would contain areas open to oil and gas leasing with CSU stipulations (Figure 2-5). Even with CSU stipulations, the leases have potential to create a high level of change and result in adverse visual impacts that *may be inconsistent* with the VRM Class III objective (moderate level of change allowed).

Panoche Hills and Griswold-Tumey Hills (VRM Class III) would also contain areas open to oil and gas leasing with NSO stipulations and both would contain areas closed to leasing (Figure 2-5). The leases with NSO stipulations and areas closed to leasing would result in no visually apparent surface disturbance and no surface disturbance, respectively, and would, therefore, be *consistent* with the VRM Class III objective.

The Joaquin Rocks area is designated VRM Class II. Under Alternative E, this area would be open to oil and gas leasing with CSU stipulations (Figure 2-5). Even with CSU stipulations, the leases have potential to create a moderate to high level of visual change and result in adverse visual impacts that *may be inconsistent* with the VRM Class II objective (low level of change allowed). Other areas in the Joaquin Rocks area would be open to oil and gas leasing with NSO stipulations (Figure 2-5), so there would be no visually apparent surface disturbance. The leases with NSO stipulations would be *consistent* with the VRM Class II objective.

Salinas Management Area

The Sierra de Salinas area of the Salinas MA is designated VRM Class III. Under Alternative E, this area would contain areas open to oil and gas leasing with CSU stipulations (Figure 2-5). Even with CSU stipulations, the leases have potential to create a high level of change and result in adverse visual impacts that *may be inconsistent* with the VRM Class III objective (moderate level of change allowed). The Sierra de Salinas area would also contain areas open to leasing with NSO stipulations (Figure 2-5). The leases with NSO stipulations would be *consistent* with the VRM Class III objective since there would be no visually apparent surface disturbance.

The Ventana (and Silver Peak) Wilderness Area and Bear Mountain and Bear Canyon WSAs (VRM Class I) would be closed to oil and gas leasing (Figure 2-5); this would be consistent with VRM Class I objective.

San Benito Management Area

Under Alternative E, the Hernandez Valley, Call Mountain, and Laguna Mountain areas (VRM Class III) of the San Benito MA would contain areas open to oil and gas leasing with CSU stipulations (Figure 2-5). Even with CSU stipulations, the leases have potential to create a high level of change and result in adverse visual impacts that *may be inconsistent* with the VRM Class III objective (moderate level of change allowed). The Laguna Mountain area would also contain areas open to leasing with NSO stipulations (Figure 2-5). Since there would be no visually apparent surface disturbance, those leases would be *consistent* with the VRM Class III objective.

Mitigation

Mitigation Measures VR-1 through VR-10 and AQ-1 at the end of Section 4.13.3 include the types of measures that could be implemented to lessen the degree of potential adverse visual impacts from oil and gas leases associated with Alternative E.

Leases Subject to Settlement Agreement

Some of the leases subject to settlement agreement are located in areas that would be open to oil and gas leasing with CSU stipulations in the Griswold-Tumey Hills area of the San Joaquin MA (Figure 2-5) that is designated VRM Class III. Even with CSU stipulations, the leases have potential to create a high level of change and result in adverse visual impacts that *may be inconsistent* with the VRM Class III objective. Some of the leases are also located in areas that would be open to oil and gas leasing with NSO stipulations (Figure 2-5), which would be *consistent* with the VRM Class III objective since there would be no visually apparent surface disturbance.

4.14 Special Management Areas

This section provides the impact analysis for the potential effects to national monuments, national recreation and historic trails, Areas of Critical Environmental Concern (ACECs), Research Natural Areas (RNAs), Wilderness Areas, and Wilderness Study Areas (WSAs), by alternative. These SMAs are described in Section 3.14 and are shown in Figure 3.14-1. Effects on Wild and Scenic Rivers are discussed in Section 3.21.

4.14.1 Introduction

Approach to Impact Assessment

This analysis identifies effects of management decisions on the BLM's ability to prevent irreparable damage to the relevant and important values associated with each SMA. In concert with the BLM guidelines, the impact analysis considers management actions that "defend or guard against damage or loss" to the relevant and important values. This includes effects to values that could be restored and those that would be irreparable during the 20-year planning period. The management actions associated with the alternatives could either degrade or retain the relevant and important values.

Assumptions

The analysis is based on the following assumptions:

- The BLM would continue to manage each ACEC according to the prescriptions included in the 2007 HFO RMP.
- Under all alternatives, WSAs will continue to be managed according to BLM Manual 6330 (Management of BLM Wilderness Study Areas) until such time that Congress designates them as Wilderness Areas or releases them from consideration.
- Under the 2007 HFO RMP, prior existing rights within Wilderness Areas and WSAs are permitted to continue. As the proposed RMPA alternatives would not alter the management of Wilderness Areas and WSAs, the effects of valid existing rights are not included in the analysis.
- Future environmental analyses would be conducted, as appropriate, for project- and site-specific actions proposed in the CCFO Planning Area. Applications for Permit to Drill would address potential conflicts between oil and gas development and other resources within the site specific area.
- As described in Section 2.5.2, the same level of oil and gas development under the 2015 RFD Scenario would apply to each alternative (i.e., 37 exploratory and development wells on 206 acres of disturbance).
- All surface-disturbing activities related to the 2015 RFD Scenario would most likely occur on Federal mineral estate in Fresno, Monterey, and San Benito Counties within the area of high oil and gas occurrence potential (shown in Figure 5-1) for the CCFO Planning Area but may potentially occur anywhere that is open to oil and gas leasing. New oil and gas well locations would most likely be within or near established producing oil and gas fields.

4.14.2 Impacts Common to All Alternatives

As discussed in Section 3.14, SMAs are managed by the BLM in order to protect their ecological, historic, cultural, scenic, scientific, and recreation resources and values. While specific SMAs such as the Panoche/Coalinga ACEC have been open to oil and gas leasing under the 2007 HFO RMP, SMA designations generally limit available areas for energy development and require stipulations for oil and gas leases.

The following SMAs were closed to oil and gas leasing under the 2007 HFO RMP, and would continue to be closed under all alternatives:

- Wilderness Areas
- Wilderness Study Areas
- Fort Ord National Monument
- Clear Creek Serpentine ACEC

The severity of impacts from oil and gas development on SMAs is dependent upon the degree to which oil and gas activities would affect the specific resources for which an SMA is designated. Impacts may vary in intensity and duration depending on the location and duration of oil and gas development within an SMA and the type of resource values that are protected. As described in the 2015 RFD Scenario, it is unlikely that more than 37 exploratory and development wells would be drilled on Federal oil and gas leases, and total estimated ground disturbance would not be expected to exceed 206 acres.

Although specific SMAs would be closed to oil and gas leasing under each alternative, oil and gas development outside of SMAs could indirectly affect these special designations. For example, noise associated with oil and gas development (e.g., truck traffic, drilling, well pumps, compressors, etc.) as well as a severe degradation of air quality[1] could alter the habitat conditions for biological resources that are protected within an SMA, which would create a moderate impact on these resources. A major impact to an SMA could result from surface disturbance and the presence of industrial infrastructure that would permanently alter the visual character of land surrounding the SMA. However, the degree of impact would depend on the final location of the estimated 206 acres of disturbance. Over the long-term, oil and gas development may create permanent impacts to an SMA's resource values such that the eligibility of the SMA (i.e., purpose for its special designation) would change. An SMA that was to lose its eligibility for a special designation would have suffered major impacts to its resource values.

During the BLM's Social and Economic Workshop held on February 4, 2015, a primary concern expressed by participants was the adequacy of protection measures to minimize the impacts to local resources from oil and gas development (see Appendix F). Sections 4.14.3 through 4.14.7 discuss the effectiveness of proposed stipulations as well as the need for additional mitigation to protect SMAs.

Leases Subject to Settlement Agreement

None of the 14 non-NSO leases would be located within 2 miles of an SMA. Given the distance of these leases from SMAs, which is the same for each of the RMPA alternatives, future oil and gas development within the 14 lease areas would create a negligible impact on special designations. Therefore, the leases subject to settlement agreement are not discussed further.

4.14.3 Impacts of Alternative A (No Action)

Section 4.14.2 lists the SMAs that would be closed to oil and gas development under all alternatives. The following SMAs would be open to oil and gas leasing under Alternative A:

- Juan Bautista de Anza National Historic Trail
- Coalinga Mineral Springs National Recreation Trail
- Panoche/Coalinga ACEC (subject to NSO stipulations)
- Joaquin Rocks ACEC (subject to NSO stipulations)

As identified above, NSO stipulations would apply to the ACECs and the RNA open to leasing under Alternative A. The text of this NSO stipulation is included below and described in detail in Appendix C (Statewide Stipulations):

[1] Air emission sources during oil and gas development include construction equipment, combustion emissions, fugitive natural gas, and fugitive dust. See Section 4.5 (Air Quality and Atmospheric Conditions) and Section 4.6 (Greenhouse Gas Emissions/Climate Change) for a full discussion of air emission impacts.

The NSO-General stipulation would be applied when adequate protection of surface resources cannot be provided through mitigation, and fluid mineral development of the lease from an off-site location is recommended. If there is no surface location available for directional drilling, the land would not be leased.

With application of this NSO stipulation, oil and gas leases would not be granted in the event that a surface location is not available for directional drilling, which would effectively protect important SMA resource values. Impacts to the ACECs and RNA that would be open to leasing under Alternative A would occur over the long-term (i.e., during oil and gas drilling and production), but would be minor given that SMAs would be managed with NSO stipulations. As discussed in Sections 4.14.4 through 4.14.7, the degree of impact from Alternative A would be less than Alternatives C and E due to the larger acreage where Alternative A would apply NSO stipulations to SMAs. However, overall impacts to SMAs from Alternative A would be greater than Alternatives B and D given that a larger acreage of Federal mineral estate within SMAs would be open to leasing under Alternative A than Alternatives B and D.

Special designations not subject to NSO stipulations under Alternative A include the national historic and national recreation trails listed above. Without stipulations or other conditions of approval, if oil and gas development occurred along these trails it could degrade cultural or historic resources (i.e., Juan Bautista de Anza National Historic Trail), or conflict with designated recreation uses (i.e., hunting at Coalinga Mineral Springs National Recreation Trail) leading to effects that range from minor impacts over the short-term (e.g., temporary trail closure or reroute, construction noise and fugitive dust) to major impacts over the long-term (e.g., area no longer suitable for recreational use).

4.14.4 Impacts of Alternative B

Section 4.14.2 lists the SMAs that would be closed to oil and gas development under all alternatives. The following SMAs would be open to oil and gas leasing under Alternative B:

- Panoche/Coalinga ACEC (the majority of the ACEC would be closed to leasing)
- Joaquin Rocks ACEC (the majority of the ACEC would be closed to leasing)

The NSO stipulation discussed in Section 4.14.3 would not apply to the SMAs open for oil and gas leasing under Alternative B. Without stipulations or other conditions of approval, if oil and gas development occurred within SMAs it could degrade biological resources (i.e., Panoche/Coalinga ACEC), visual resources (i.e., Joaquin Rocks ACEC), or conflict with designated recreation uses. This could lead to effects ranging from minor impacts over the short-term (e.g., temporary closure to public access, construction noise and fugitive dust) to major impacts over the long-term (e.g., area no longer eligible for special designation). Unlike Alternative A, Alternative B would apply CSU stipulations to all Federal mineral estate open to leasing, which are used to alter the site-specific location of well pads, pipelines, and roads to avoid important resources. CSU stipulations would effectively minimize indirect impacts to SMAs. Given that Alternative B would have the fewest acres of open areas on SMAs and CSU stipulations would apply to all open lease areas, Alternative B would create the least adverse effects on SMAs compared with all other alternatives. Mitigation measures to minimize impacts to SMAs are identified below.

Mitigation

SMA-1 **Apply Lease Stipulations within ACECs and RNAs.** Prior to granting an oil and gas lease within the boundary of an Area of Critical Environmental Concern or a Research Natural Area, the BLM shall determine whether lease stipulations are needed to reduce or avoid impacts to the special designation's resource values. If lease stipulations are recommended, one of the following measures shall be applied to the lease: No Surface Occupancy, Controlled Surface Use, or Timing Limitation. Lease stipulations shall comply with the guidelines that are fully described in Appendix C (Central Coast Oil and Gas Stipulations).

4.14.5 Impacts of Alternative C

Section 4.14.2 lists the SMAs that would be closed to oil and gas development under all alternatives. The following SMAs would be open to oil and gas leasing under Alternative C:

- Coalinga Mineral Springs National Recreation Trail
- Panoche/Coalinga ACEC (some areas within the ACEC would be closed to leasing)
- Joaquin Rocks ACEC

The NSO stipulation discussed in Section 4.14.3 would not apply to the SMAs open for oil and gas leasing under Alternative C. Without stipulations or other conditions of approval, if oil and gas development occurred within SMAs it could degrade biological resources (i.e., Panoche/Coalinga ACEC), visual resources (i.e., Joaquin Rocks ACEC), or conflict with designated recreation uses (i.e., hunting at Coalinga Mineral Springs National Recreation Trail). This could lead to effects ranging from minor impacts over the short-term (e.g., temporary closure to public access, construction noise and fugitive dust) to major impacts over the long-term (e.g., area no longer eligible for special designation). The degree of impact from Alternative C could be the greatest among all of the alternatives given that Alternative C would have the greatest acreage of SMAs open to oil and gas leasing, and none of this acreage would be subject to NSO stipulations. Mitigation measures to minimize impacts to SMAs are identified below.

Mitigation

The following mitigation measures would apply to the avoidance or reduction of impacts to SMAs. The effectiveness of these measures and the potential for residual impact following their implementation would depend on the exact location of future oil and gas lease sites relative to each SMA, as well as project-specific conditions:

SMA-1 **Apply Lease Stipulations within ACECs and RNAs.** See full text of this measure under Section 4.14.5, Impacts of Alternative B.

SMA-2 **Apply CSU-Existing Surface Use/Management Stipulation along National Trails.** Prior to granting an oil and gas lease within 1,000 feet of a national historic trail or national recreation trail, the BLM shall determine whether a Controlled Surface Use (CSU)-Existing Surface Use/Management stipulation shall be applied to that lease. If the BLM determines that a CSU stipulation shall be applied to all, or part, of a lease, it shall comply with the guidelines that are fully described in Appendix C (Central Coast Oil and Gas Stipulations).

4.14.6 Impacts of Alternative D

Section 4.14.2 lists the SMAs that would be closed to oil and gas development under all alternatives. The following SMAs would be open to oil and gas leasing under Alternative D:

- Coalinga Mineral Springs National Recreation Trail (some areas around the trail would be closed to leasing)
- Panoche/Coalinga ACEC (mostly open and subject to NSO stipulations including for the Monvero Dunes RNA; some areas within the ACEC would be closed to leasing)
- Joaquin Rocks ACEC (subject to NSO stipulations)

As identified above, NSO stipulations would apply to the ACECs and the RNA open to leasing under Alternative D. The text of this NSO stipulation is presented under Alternative A. With application of this NSO stipulation, oil and gas leases would not be granted in the event that a surface location is not available for directional drilling, which would effectively protect important SMA resource values. Impacts to the ACECs and RNA that would be open to leasing under Alternative D could occur over the long-term (i.e., during oil and gas drilling and production), but would be minor given that SMAs would be managed with NSO stipulations. The degree of impact from Alternative D could be less than Alternatives A, C, and E given that Alternative D would have less acreage available for oil and gas leasing within and around

SMAs. However, the complete closure of SMAs to oil and gas leasing under Alternative B would create less of an impact (i.e., negligible impact) on SMAs than under Alternative D (i.e., minor impact).

A special designation that would not be subject to NSO stipulations under Alternative D is the Coalinga Mineral Springs National Recreation Trail. Without stipulations or other conditions of approval, if oil and gas development occurred along this trail it could conflict with designated recreation uses (i.e., hunting). This would lead to effects that range from minor impacts over the short-term (e.g., temporary trail closure or reroute, construction noise and fugitive dust) to major impacts over the long-term (e.g., area no longer suitable for recreational use). Mitigation measures to minimize impacts to this national recreation trail are identified below.

Mitigation

The following mitigation measure would apply to the avoidance or reduction of impacts to the Coalinga Mineral Springs National Recreation Trail, depending on future oil and gas lease sites and project-specific conditions:

SMA-2 **Apply CSU-Existing Surface Use/Management Stipulation along National Trails.** See full text of this measure under Section 4.14.5, Impacts of Alternative C.

4.14.7 Impacts of Alternative E

Section 4.14.2 lists the SMAs that would be closed to oil and gas development under all alternatives. The following SMAs would be open to oil and gas leasing under Alternative E:

- Juan Bautista de Anza National Historic Trail (subject to NSO stipulations along some areas of the trail)
- Coalinga Mineral Springs National Recreation Trail
- Panoche/Coalinga ACEC (mostly open; subject to NSO stipulations within a small area of the ACEC)
- Joaquin Rocks ACEC

The NSO stipulation discussed in Section 4.14.3 would not apply to many of the SMAs open for oil and gas leasing under Alternative E. Without stipulations or other conditions of approval, if oil and gas development occurred within SMAs it could degrade biological resources (i.e., Panoche/Coalinga ACEC), visual resources (i.e., Joaquin Rocks ACEC), degrade cultural or historic resources (i.e., Juan Bautista de Anza National Historic Trail), or conflict with designated recreation uses (i.e., hunting at Coalinga Mineral Springs National Recreation Trail). This would lead to effects that range from minor impacts over the short-term (e.g., temporary closure to public access, construction noise and fugitive dust) to major impacts over the long-term (e.g., area no longer eligible for special designation). The degree of impact from Alternative E would be less than Alternative C given that Alternative E would have less acreage of SMAs open to oil and gas leasing and would require NSO stipulations in some lease areas. Overall impacts to SMAs from Alternative E would be greater than Alternatives A, B, and D as Alternative E would have more acreage of SMAs open to oil and gas leasing with less acreage subject to NSO stipulations compared with the other three alternatives. Mitigation measures to minimize impacts to SMAs are identified below.

Mitigation

The following mitigation measures would apply to the avoidance or reduction of impacts to SMAs. The effectiveness of these measures and the potential for residual impact following their implementation would depend on the exact location of future oil and gas lease sites relative to each SMA, as well as project-specific conditions.

SMA-1 **Apply Lease Stipulations within ACECs and RNAs.** See full text of this measure under Section 4.14.5, Impacts of Alternative B.

SMA-2 **Apply CSU-Existing Surface Use/Management Stipulation along National Trails.** See full text of this measure under Section 4.14.5, Impacts of Alternative C.

4.15 Cultural and Heritage Resources

The goals for cultural resource management in the CCFO Planning Area as identified in the 2007 Proposed Resource Management Plan (RMP) are to (1) identify, preserve, and protect significant cultural resources and ensure that they are available for appropriate uses by present and future generations; (2) provide access to areas managed by the CCFO for federally and non-federally recognized Native Americans and California Indians for the purpose of maintaining traditional values intrinsic to their cultural identities; (3) fulfill the essential roles that public communication and heritage education play in historic preservation; and (4) improve access where appropriate to cultural resources on public lands for the benefit of public use. With these goals in mind, potential consequences of the oil and gas development actions identified in the Reasonably Foreseeable Development (RFD) Scenario are assessed.

4.15.1 Introduction

Cultural resources include prehistoric and historic archaeological sites, artifacts and rock art, sacred sites and other traditional cultural properties, buildings and structures, landscaping, historic districts, and rural landscapes. Consideration and treatment of cultural resources by Federal agencies is mandated by a number of Federal statutes (see Section 3.15.2). Section 106 of the National Historic Preservation Act (NHPA) requires Federal agencies to "take into account the effects of Federal actions on historic properties" and outlines Federal agency responsibilities for identification, management, protection, preservation, and use of historic properties. The principal Federal regulations that guide implementation of the NHPA are found at 36 CFR 800 (Protection of Historic Properties) and 36 CFR 60 (National Register of Historic Places [NRHP]). The Bureau of Land Management (BLM) National Programmatic Agreement (PA) between BLM, the Advisory Council on Historic Preservation (ACHP), and the National Conference of State Historic Preservation Officers (NCSHPO) provides alternative procedures for implementing 36 CFR 800, along with BLM Manual Series 8100 and the California Protocol implementing the 2012 National PA.

Assumptions

Cultural sites can potentially occur anywhere in the Decision Area, which has not been completely inventoried for the presence of cultural sites. Some yet to be identified cultural resources may be determined significant and qualify for consideration under the NHPA. Such resources as identified pursuant to the NHPA are designated as "historic properties" and are defined in 36 CFR 800.16(1) as "any prehistoric or historic district, site, building, structure or object included in, or eligible for inclusion in, the National Register of Historic Places (NRHP)." Archaeological components of historic properties on Federal lands are identified through survey, research, and often test excavations to determine their NRHP eligibility. Culturally sensitive locations may be identified through government-to-government consultation with federally recognized tribes and outreach to other Native American individuals and groups. Not all sites or places of cultural value may qualify as historic properties under the NHPA, but may be considered part of the environment for purposes of NEPA review and addressed under such authorities as AIRFA and Executive Order 13007, Sacred Sites.

Given the above considerations, the analysis of historic properties is based on the following assumptions:

- Archaeological sites are highly sensitive to impacts, which are irreversible, and result in irretrievable loss.
- Archaeological resources derive their data value from the context of the artifacts and physical features contained within the site. Therefore, disturbance of the arrangement of the site contents effectively destroys the information it contains.

- Unless determined otherwise, all cultural resources including archeological sites are treated as eligible historic properties and afforded the associated emphasis on preservation through avoidance of any potential adverse effect.
- Sensitive cultural resource records, site location information, and traditional cultural properties and values must be held confidential from the public as deemed appropriate to protect historic properties (NHPA, Section 304 [a], Archaeological Resource Protection Act [ARPA], Section 9[a]).
- Historic properties could continue to be found throughout the CCFO Planning Area, given the long history of occupation and the non-random distribution of critical resources (food, water, shelter, and raw materials for tools).
- Commonly in the region, historic properties are more likely to be found on shallow slopes and close to reliable water sources.
- Historic properties in the CCFO Planning Area have been buried, destroyed, or altered by natural agents (erosion and deposition) and human activity. Such disturbance from natural and human agents is likely to continue.
- Oil and gas exploration or development activities have the potential to cause irreversible disturbance and damage to non-renewable historic properties. The BLM could mitigate impacts to these resources from authorized uses through project avoidance, redesign, and, if necessary, data recovery investigations, in accordance with the BLM Manual 8100 and with the protocols set forth in the BLM's National Cultural Programmatic Agreement (2012) and the corresponding 2014 statewide agreement with the California State Historic Preservation Office.
- Operators must submit proposals for any site-specific project that would require the BLM approval. Additional site-specific NEPA analyses and a Section 106 review will be conducted on these individual projects. The BLM will complete comprehensive identification (e.g., field inventory), evaluation, protection, and mitigation following the pertinent laws, regulations, and policies.
- The BLM does not approve any ground-disturbing activities that may adversely affect any historic properties, sacred landscapes, and/or resources protected under the NHPA, American Indian Religious Freedom Act, Native American Graves Protection and Repatriation Act, Executive Order 13007, or other statutes and executive orders until it completes its obligations under applicable requirements of the NHPA and other authorities. The BLM may require modification to exploration or development proposals to protect such properties, or disapprove any activity that is likely to result in adverse effects that cannot be successfully avoided, minimized, or mitigated.
- Upon request by Native Americans access to places of importance to Native American people would be accommodated when practicable.
- The BLM will continue to implement government-to-government consultation with federally and non-federally recognized tribes on a case-by-case basis for site-specific proposals which would help determine other issues of concern, including but not limited to access rights, disruptions of cultural practices, impacts on visual resources important to the tribes, and impacts on subsistence resources. It should be noted that even when consultation and an extensive inventory or data collection occur, not all impacts on tribally sensitive resources can be fully mitigated.

4.15.2 Impacts Common to All Alternatives

The RFD Scenario identifies a number of potential actions that could pose effects to cultural and historical resources in the CCFO Planning Area. The RFD Scenario states that between zero and 32 development wells and three to five exploratory wells could be expected over 15 years on Federal mineral estate. Associated with these wells are certain levels of surface-disturbing work including well pads (1 to 3 acres per well), roads (40 feet wide and 4.8 miles long per well location), pipeline (20 feet wide corridor and 0

to 10 miles in length), and related facilities for those wells that lead to development (zero to eight facilities at 1 acre per facility). The roads would be a 20-foot-wide gravel surface bordered by ditches, cuts, and fill. Total surface disturbance for each well is estimated to be 5.4 acres. The RFD Scenario also identified potentially up to 34 miles of seismic exploration work. The drill hole method of geophysical exploration could involve use of truck-mounted or portable air drills drilling four to 12 holes per mile of line and an explosive charge placed in each hole. Vehicles may include heavy truck-mounted drill rigs, track-mounted drill rigs, water trucks, computer recording trucks, and light pickups. Travel would use existing roads or disturbed areas, to the extent feasible. Overall, the RFD Scenario projects between 22.45 and 205.7 acres of disturbance. Development of new producing fields is not likely to occur on Federal mineral estate in the CCFO Planning Area as a result of the exploratory wells. Well stimulation treatment operations are expected to occur entirely within the well pad disturbance area but would increase vehicle presence involving control vans, pump trucks, a flatbed truck, a tanker, crane water trucks, sand trucks, and a manifold/treating iron trailer. Number of vehicles would vary depending on if an enhanced oil recovery (EOR) technique was employed. An assumption of this analysis is that the same level of activity is associated with each of the five Alternatives identified in Chapter 2.

Many of the ground disturbing actions could affect pre-historic and historic resources. An effect is considered adverse when the effect on a National Register-eligible property may diminish the integrity of the property's location, design, setting, materials, workmanship, feeling or association. These effects are commonly caused by direct impacts of soil-disturbing activities or indirect impacts through visual or auditory intrusions. Adverse effects include the physical destruction of all or part of the property. Adverse effects on historic properties resulting from oil and gas development and exploration can include, but are not limited to:

- Physical destruction or alteration of all or part of the property;
- Isolation of the property from or alteration of the property's setting when that character contributes to the property's qualifications for listing in the National Register;
- Introduction of visual, audible, or atmospheric elements that are out of character with the property or alter its setting; or
- Unauthorized collection of artifacts by fieldworkers associated with the project

Many of the surface disturbing actions identified in the RFD Scenario could result in adverse effect determinations for purposes of compliance with Section 106 of the NHPA. According to 36 CFR 800.9(a), "an undertaking has an effect on a historic property when the undertaking may alter characteristics of the property that may qualify the property for inclusion in the National Register."

If ground disturbance from oil and gas development occurred at locations of known cultural resources such as those identified in Section 3.15.4 (Current Conditions or Trends) or at locations of unknown cultural resources, these adverse effects would be permanent and direct impacts on the resource because the sites are non-renewable resources that can be irretrievably lost if subject to certain management actions. As described in Section 3.15, the most likely sites to be encountered during oil and gas activities are prehistoric archaeological sites. For this area, the most common site types include residential occupation sites, often found in proximity of water sources such as rivers and springs, and small special use sites found in upland settings. The larger residential sites may also include human burials. Native American traditional use locations and built-environment sites are much less likely to be encountered. Establishment of a limited surface use stipulation for fluid mineral development based on the presence of recorded, eligible cultural resources within newly leased parcels can achieve avoidance for those resources that have surface cultural indicators, or that are important due to their cultural use. When avoidance is not feasible, the effects can be mitigated by a variety of methods based on the type of site and proposed action. The selected method(s) is determined by consultations between the Federal agency, SHPO, and the ACHP with applicable Native American tribes and the public as necessary. Mitigation for impacts to archaeolog-

ical sites is often the recovery of a site's scientific data potential through excavation and archaeological study. Mitigation for built-environment properties is most often historical and architectural documentation prepared in accordance with Historic American Building Survey, Historic American Engineering Survey, or similar programs, in combination with interpretation of the property for purposes of public education and awareness.

When avoidance of adverse effects on historic properties is not feasible or when they inadvertently occur in spite of site protection and preservation management practices, procedures identified in Section 9.0 of the Revised 2014 California *State Protocol Agreement* shall be employed to develop appropriate mitigation measures as necessary to resolve adverse effects under Section 106 (NHPA).

4.15.3 Impacts of Alternative A (No Action)

Alternative A includes 683,800 acres of Federal mineral estate in the CCFO Planning Area open for development and 41,700 acres designated for no surface occupancy (NSO). Despite NSO stipulations applied in some areas, the potential for impact to historic properties still remains due to their potential to be buried with few surface indicators. Impacts posed by Alternative A are the same as Impacts Common to All Alternatives. However, the varying acreages associated with each alternative indicates the potential concentration of oil and gas exploration and development since a similar amount of activity is assumed for each alternative. Compliance with Section 106 of the NHPA is intended to promote the protection and preservation of historic properties so that authorized use of public lands would not result in adverse impacts to NRHP-eligible archaeological sites, traditional cultural properties, or built-environment resources. However, when avoidance of adverse impacts is not feasible due to overriding project or land use considerations, mitigation measures may be implemented as outlined below. Such an analysis recognizes the importance of government-to-government consultation with Native American tribes and other concerned parties on specific undertakings involving various authorized land uses. Authorized uses with high potential to directly affect historic properties include new oil and gas leasing, mineral extraction and exploratory actions, road and pipeline construction, and facilities construction.

Mitigation

Best Management Practices / Standard Operating Procedures are provided in Appendix D including those for Cultural Resources. The practices and procedures most relevant to the treatment of cultural resources including mitigation measures include:

- No construction or surface-disturbing activities shall occur without prior written authorization of the authorized BLM officer based, in part, on completion of compliance with Section 106 of the NHPA and other related authorities.
- Identification, safe avoidance, or mitigation of potential adverse effect on cultural properties shall be required as a condition of a lease or permit associated with oil and gas development.
- Where avoidance or adequate protection is not feasible and the property is significant for the scientific data it may contain, initiate a data retrieval (excavation) of sites.
- Surface disturbance will be minimized as project applicants will be encouraged to utilize previously disturbed sites when feasible.
- Work area boundaries will be delineated with flagging, temporary fencing, or other marking.
- Resource protection may include installation of fencing, protective barriers, or site capping to minimize surface disturbance or impacts on culturally sensitive resources; the potential of certain protective measures (e.g., fencing) that may draw unwanted attention to sites or inadvertently restrict access to traditional use areas shall be considered.

- BLM will continue open dialogue and share information through government-to-government consultation with federally recognized tribes and with other Native Americans and ethnic groups that have cultural ties to lands proposed for development.
- The presence or absence of cultural properties will be determined prior to the approval of any surface-disturbing activity through such means as cultural resource field inventories, archival research, oral history, or other data gathering means deemed appropriated and evaluations of identified resources shall be evaluated and appropriate treatment measures identified for all project areas subject to surface disturbance or visual intrusions.
- When cultural properties are present, the project would be redesigned or modified to the extent feasible to safely avoid impacting cultural sites or steps taken to adequately mitigate impacts through project redesign or data recovery.
- During periods of high rainfall and runoff or when soils are wet and muddy, soil-disturbing activities shall be avoided in order to minimize impacts to nearby culturally sensitive resources vulnerable to soil erosion.
- Discovery during construction activities of a cultural resource or of Native American human remains and/or related cultural items pursuant to NAGPRA shall be reported to the authorized officer and all activity in the immediate discovery area associated with the project be suspended until an evaluation of the discovery is made by the archaeologist to determine appropriate actions to prevent further disturbance of remains and related cultural items or the loss of significant cultural or scientific values. A written authorization to resume the project, or to take appropriate mitigation action, will be issued by the authorized officer.
- Additional archaeological or cultural surveys and further consultation with tribes will be required in the event a proposed project or its location is changed or modified after the consultation, initial survey is completed; the inventory, associated documentation, and necessary compliance would be completed prior to project approval.

Leases Subject to Settlement Agreement – Subalternative 1

The record search did not identify resources located in these parcels. The same procedures for identification, evaluation, and protection described in Section 4.15.1 would apply to these parcels.

Leases Subject to Settlement Agreement – Subalternative 2

The two non-NSO leases as identified in Case No. 11-06174 should not have been issued, and the 12 prospective non-NSO leases as identified in Case No. 13-1749 would not be issued. As such, no resource impacts would occur, and therefore, the procedures for identification, evaluation, and protection described in Section 4.15.1 would not be applicable.

4.15.4 Impacts of Alternative B

Alternative B consists of over 39,000 acres open for development with CSU stipulations, the least amount of acreage open for oil and gas development and only 5 percent of the amount in Alternative A. As a result, potential oil and gas development activities will be more concentrated, and potentially would use more land that was previously disturbed because it would be located within existing oil and gas fields and a buffer around these fields. The types of impacts to cultural resources would be the same as described for Alternative A.

Mitigation

The mitigation measures identified for Alternative A would remain the same for Alternative B.

Leases Subject to Settlement Agreement

The same procedures for identification, evaluation, and protection described in Section 4.15.1 would apply to these parcels.

4.15.5 Impacts of Alternative C

Alternative C consists of approximately 368,800 acres open for development with CSU stipulations and 29,800 acres open with NSO. This area is 55 percent the amount in Alternative A. As a result, potential oil and gas development activities would be more concentrated than in Alternatives A and E, but much less concentrated than Alternatives B and D.

Mitigation

The mitigation measures identified for Alternative A would remain the same for Alternative C.

Leases Subject to Settlement Agreement

The same procedures for identification, evaluation, and protection described in Section 4.15.1 would apply to these parcels.

4.15.6 Impacts of Alternative D

Alternative D consists of 121,200 acres open for development with CSU stipulations and 16,400 acres open with NSO. This area is about 14 percent the amount in Alternative A. As a result, potential oil and gas development activities would be considerably more concentrated than in Alternatives A, C, and E.

Mitigation

The mitigation measures identified for Alternative A would remain the same for Alternative D.

Leases Subject to Settlement Agreement

The same procedures for identification, evaluation, and protection described in Section 4.15.1 would apply to these parcels.

4.15.7 Impacts of Alternative E

Alternative E consists of 487,200 acres open for development with CSU stipulations and 206,400 acres open with NSO. This area is 96 percent the amount in Alternative A. As a result, potential oil and gas development activities would be concentrated about the same.

Mitigation

The mitigation measures identified for Alternative A would remain the same for Alternative E.

Leases Subject to Settlement Agreement

The same procedures for identification, evaluation, and protection described in Section 4.15.1 would apply to these parcels.

4.16 Paleontological Resources

This section analyzes the potential impacts of five alternatives for the Central Coast Oil and Gas Leasing and Development RMPA/EIS for the CCFO Planning Area, including the Leases Subject to Settlement Agreement. Section 4.16.1 provides the impact methodology used for this analysis. Section 4.16.2 outlines the direct and indirect impacts common to all RMPA alternatives, and Sections 4.16.3 through 4.16.7 provides impacts for RMPA Alternatives A through E as well as appropriate measures to avoid or reduce adverse effects on paleontological resources. Refer to Section 5.3.15 for the evaluation of cumulative impacts associated with paleontological resources. Finally, Chapter 7 provides references cited for the RMPA/EIS analysis.

The management goals for paleontological resources under the 2007 Proposed RMP also apply to this RMPA/EIS. The goals aim to:

(1) preserve, protect and manage fossilized vertebrates, noteworthy invertebrates, and plants in accordance with existing laws and regulations for current and future generations;

(2) facilitate the appropriate scientific, educational, and recreational uses of paleontological resources such as research and interpretation;

(3) accommodate permit requests for scientific research by qualified individuals or institutions; and

(4) ensure proposed land uses do not destroy or damage paleontological resources (BLM, 2007b).

4.16.1 Introduction

The loss of any identifiable fossil that could yield information important to prehistory, or that embodies the distinctive characteristics of a type of organism, environment, period of time, or geographic region, would be an adverse environmental impact. Direct impacts on paleontological resources primarily concern the potential destruction of non-renewable paleontological resources and the loss of information associated with these resources. This includes the unauthorized collection of fossil remains. If potentially fossiliferous bedrock or surficial sediments are disturbed, the disturbance could result in the destruction of paleontological resources and subsequent loss of information (adverse impact). Impacts under NEPA (42 USC 4321 and 4331-4335) are defined by the Council on Environmental Quality regulations and require consideration of the temporal scale, spatial extent, and intensity of the change that would be introduced by the RMPA alternatives. At the project-specific level, adverse impacts can be minimized through the implementation of paleontological mitigation, including systematic identification, documentation, curation, avoidance, or protection from damage or destruction. Mitigation of adverse impacts to paleontological resources is consistent with the purpose of the PRPA (16 USC 470aaa et seq.), Antiquities Act of 1906 (16 USC 431-433), and other pertinent regulations, as discussed in Section 3.16.2.

Approach to Impact Assessment

In general, for Federal mineral estate within the bounds of oil and gas fields which are underlain by paleontologically sensitive geologic units (i.e., PFYC 3-5), the greater the amount of ground disturbance, the higher the potential for adverse impacts to paleontological resources. For those areas directly underlain by geologic units with very low to low paleontological sensitivity (i.e., PFYC 1-2), there is low to negligible potential for impacts on paleontological resources unless sensitive geologic units which underlie the marginally sensitive unit(s) are also impacted.

Direct impacts result from ground-disturbing activities related to oil and gas development. These impacts occur at the same time and place as the surface disturbing action. The potential for direct impacts on scientifically significant surface and subsurface fossils in fossiliferous sedimentary deposits is controlled by two factors:

(1) the depth and lateral extent of disturbance of fossiliferous bedrock and/or surficial sediments; and

(2) the depth and lateral extent of occurrence of fossiliferous bedrock and/or surficial sediments beneath the surface.

Ground disturbance has the potential to adversely affect an unknown quantity of fossils that may occur on or underneath the surface in areas containing paleontologically sensitive geologic units. Without mitigation, these fossils, as well as the paleontological data they could provide if properly salvaged and documented, could be adversely affected (destroyed), rendering them permanently unavailable for future scientific research.

Indirect impacts occur later in time or further away in distance than direct impacts, but are still reasonably foreseeable. They typically include those impacts which result from the normal ongoing operations of facilities constructed within a given project area. An example of an indirect adverse impact on paleontological resources would be the construction of a new road that increases public access to a previously inaccessible area, which results in unauthorized fossil collecting (i.e., poaching) and vandalism. Mitigation strategies could include periodic surveys by qualified paleontologists to collect significant surface fossils, transfer them to a public museum, and identify locations of fossil localities in the vicinity that have the potential to yield additional fossils as erosion occurs, and the construction of protective fencing or other barriers around known paleontological localities.

Assumptions

As described in Section 3.16.1, geologic units are considered "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 is not limited to areas where surface fossils may be exposed. Using the BLM's (2007a) PFYC sensitivity classification system, the major significant fossil-bearing units underlying the CCFO Planning Area were assigned a preliminary PFYC classification (i.e., sensitivity) based on the programmatic assessment in Chapter 3 (Affected Environment). These PFYC assignments are subject to revision and refinement as additional information becomes available.

The 2007 Proposed RMP set forth management actions for the protection of paleontological resources within the CCFO Planning Area (BLM, 2007b). Many of those actions are assumed to be appropriate for the mitigation of adverse impacts to paleontological resources that occur as the result of oil and gas development activities. These Management Actions are described below.

Paleontology Management Actions – Inventory, Monitoring, Avoidance

The BLM instituted guidelines for the management of paleontological resources in the General Procedural Guidance for Paleontological Resource Management Handbook (H-8270, H-8270-1) (1998a, 1998b) and Instruction Memorandums (IM) 2008-009 and 2009-011 (2007a, 2008), which establish criteria for the sensitivity and significance assessment (i.e., PFYC classification system) and mitigation of sensitive fossil resources. In accordance with these guidelines, in order to determine the paleontological sensitivity and impact potential for a given oil and gas development project, the appropriate CCFO representative must establish, in consultation with the BLM California State Office paleontologist, whether an inventory shall be conducted. The inventory, which would be performed by a qualified paleontologist and approved by BLM, would set forth PFYC and mitigation recommendations for the project. The final PFYC determination would be made by an authorized BLM officer. If a PFYC 3-5 area is identified during the inventory, impacts from oil and gas development activities could be mitigated to an acceptable level with appropriate measures provided in H-8270, H-8270-1, IM2008-009, and IM2009-011 (BLM, 1998a, 1998b, 2007a, 2008). Measures may include the creation of a buffer, avoidance, construction monitoring procedures, and curation, as specified in the required permitting documents associated with energy and minerals or other land use authorizations (BLM, 2007b).

Paleontology Management Actions – Preservation

The establishment of an Area of Critical Environmental Concern (ACEC) is a management strategy that promotes the preservation of paleontological resources. The Panoche/Coalinga ACEC is an example of a region in the CCFO Planning Area that has been set aside to protect paleontological resources that have particularly important scientific significance. Preservation, as defined in this RMPA/EIS, also includes accommodating permits for scientific research and protecting paleontological resources from inadvertent damage. The Paleontology Management Actions are outlined in Table 4.14-1.

Table 4.14-1. Summary of Paleontological Resources Management Actions for the RMPA Alternatives

Type of Preservation	Management Actions
Buffer around paleontological sites	Construct a 300-foot buffer to protect paleontological resources from inadvertent impacts or disturbance. (PALEO-C1)
Avoidance of disturbance	Protect all resources from inadvertent impacts from proposed land uses, including oil and gas development. (PALEO-COM2). This may include the temporary installation of temporary fences along margins of pad sites on oil and gas developments to eliminate off-site project-related vehicle impacts on undisturbed areas. (PALEO-C2).
Site-specific mitigation: reconnaissance survey, construction monitoring, recovery, and curation	Reduce adverse impacts to paleontological resources through site-specific mitigation procedures such as surveying, construction monitoring, resource recovery and curation. (PALEO-C2)
Preservation	Accommodate permit requests for scientific studies issued by the State office and preserve all significant fossil resources by avoidance, fossil recovery, or stabilize soils from erosion; establishment of ACEC. (PALEO-COM1 and PALEO-C3)

Source: BLM, 2007b

Best Management Practices / Standard Operating Procedures

Best Management Practices (BMPs) / Standard Operating Procedures for the CCFO Planning Area are provided in Appendix D. The practices and procedures most relevant to the treatment of paleontological resources are provided below.

The following BMPs will be applied to all BLM undertakings and authorizations:

- No construction or surface-disturbing activities shall occur without prior written authorization of the authorized BLM officer.
- Surface disturbance will be minimized. Project applicants will be encouraged to utilize previously disturbed sites when feasible.
- Authorizations for new surface-disturbing activities will place priority on avoiding impacts to paleontological resources. Avoidance will employ measures such as relocation of project sites, modifying construction techniques, and altering project timing.
- Delineate work area boundaries with flagging, temporary fencing, or other marking to minimize surface disturbance or impacts on sensitive paleontological resources.
- When necessary to protect sensitive paleontological resources, monitoring by BLM-approved paleontologists shall be required during construction activities.
- Avoid soil-disturbing activities during periods of high rainfall and runoff or when soils are wet and muddy in order to minimize impacts to paleontological resources.
- Any discovery of a paleontological resource during a project would be reported to the authorized officer. All activity in the immediate discovery area associated with the project would be suspended until an evaluation of the discovery is made by the BLM-approved paleontologist to determine appropriate

actions to prevent the loss of significant paleontological or scientific values. A written authorization to resume the project, or to take appropriate mitigation action, would be issued by the authorized BLM officer.

- It is the policy of the BLM (1) to avoid impacts on significant paleontological resources and traditional properties and values whenever possible and (2) to avoid inadvertent loss or destruction of paleontological resources by BLM actions or authorizations.

Other Management Actions

Paleontological resources would benefit from soil resource management actions that control erosion and avoid surface disturbance on steep slopes or during wet periods. Due to high erosion rates on steep slopes in the CCFO Planning Area, soil resource management actions would reduce potential impacts to significant paleontological resources from moderate and minor to negligible and would cause a beneficial impact by mitigating the constant exposure of subsurface materials, including new fossils. If exposed for long periods of time, these fossils would erode from the confining sediments and gradually deteriorate. Management actions, such as installing temporary fences, maintaining buffer zones, relocating resources, and stabilizing and rehabilitating soils, would help mitigate erosion and prevent inadvertent damage or exposure of paleontological resources.

4.16.2 Impacts Common to All Alternatives

The Reasonably Foreseeable Development (RFD) Scenario for oil and gas in the CCFO Planning Area identifies a number of potential actions that could result in adverse impacts to paleontological resources due to oil and gas development. The RFD Scenario states that between zero and 32 development wells and three to five exploratory wells could be expected over 15 years on Federal mineral estate. Associated with these wells are certain levels of surface disturbing work, including well pads (1 to 3 acres per well), roads (40 feet wide and 4.8 miles long per well location), pipeline installation (20 feet wide corridor and 0 to 10 miles in length), and related facilities (zero to eight facilities at 1 acre per facility). The RFD Scenario also identifies up to 34 miles of seismic exploration work. Overall, the RFD Scenario projects include between 22.45 and 205.7 acres of disturbance. Well stimulation treatment operations are expected to occur entirely within the well pad disturbance area but would increase vehicle presence involving control vans, pump trucks, a flatbed truck, a tanker, crane water trucks, sand trucks, and a manifold/treating iron trailer. An assumption of this analysis is that the same level of activity is associated with each of the five alternatives identified in Chapter 2.

The potential to discover paleontological resources during activities related to oil and gas development under the five RMPA alternatives in the CCFO Planning Area ranges from low to high based on the location of ground-disturbing activities. The amount of ground disturbance would likely be greatest for new well pads, especially within areas outside of existing fields, as well as site preparation and grading, excavations of pit and sumps, grading of access roads, well drilling, pipeline construction, geophysical exploration, and ancillary facility construction. Well stimulation technologies, such as hydraulic fracturing and acid matrix stimulation, have a low to negligible potential to adversely impact paleontological resources because:

(1) only limited new surface-disturbing activities (e.g., staging areas or temporary access roads and facilities for wastewater) are expected to result from these activities;

(2) subsurface hydraulic fracturing is considered to have a negligible effect to paleontologically sensitive geologic units because the widths of fractures are a fraction of an inch wide; and

(3) acid matrix stimulation could theoretically destroy buried fossil resources; however, many of the reservoir rocks are deeply buried and are unlikely to be recovered within their original context.

These adverse impacts would be reduced to an acceptable level with implementation of the Mitigation and Management Actions presented above under "Assumptions."

The impacts to paleontological resources for each Alternative are described in the following sections. Alternatives A through E are each largely underlain by geologic units identified as having moderate to high paleontological sensitivity (PFYC 3a – PFYC 5). Therefore, regardless of the total acreage per alternative, the impacts for each alternative are similar.

4.16.3 Impacts of Alternative A (No Action)

Alternative A includes approximately 683,800 acres of Federal mineral estate in the CCFO Planning Area open for oil and gas leasing with CSU stipulations and 41,700 acres open and subject to NSO lease stipulations. According to geologic mapping by Jennings and Strand (1958) and Wagner et al. (1991), Alternative A is underlain by 24 of the 31 major significant fossil-bearing geologic units described in Chapter 3 (Affected Environment). These units include the Franciscan Assemblage, Panoche Formation, Moreno Formation, Laguna Seca Formation, Martinez Formation, Lodo Formation, Domengine Formation, Avenal Sandstone, Kreyenhagen Formation, Markley Formation, Temblor Formation, Vaqueros Formation, Monterey Group, San Pablo Group, Oro Loma Formation, Santa Margarita Formation, Santa Cruz Mudstone, Jacalitos Formation, Purisima Formation, Etchegoin Formation, San Benito Gravels, Paso Robles Formation, Tulare Formation, and Quaternary Older Alluvium, which have sensitivity classifications ranging from PFYC 3a to 5.

The potential to encounter paleontological resources during oil and gas development within Federal mineral estate under Alternative A ranges from low to high based on the location of ground-disturbing activities. Oil and gas leases within Federal mineral estate under Alternative A would be subject to construction-related ground disturbances such as site and well pad preparation, excavations of pit and sumps, grading of access roads, well drilling, and ancillary facility construction associated with oil and gas development.

Mitigation

The adverse impacts to paleontological resources under Alternative A would be reduced with implementation of the Paleontology Management Actions as described in Section 4.16.2.

Leases Subject to Settlement Agreement – Subalternative 1

Under Alternative A, BLM-managed areas that contain the 14 non-NSO leases, as identified in Case No. 11-06174 and Case No. 13-1749, are underlain by 12 of the 31 major fossil-bearing geologic units described in Chapter 3 (Affected Environment). These units include the Panoche Formation, Moreno Formation, Laguna Seca Formation, Martinez Formation, Lodo Formation, Domengine Formation, Kreyenhagen Formation, Temblor Formation, Monterey Group, Oro Loma Formation, Paso Robles Formation, and Quaternary Older Alluvium, which have a sensitivity classification ranging from PFYC 3a to 5. Adverse impacts to paleontological resources within the non-NSO leases would be reduced with implementation of the Paleontology Management Actions as described in Section 4.16.2.

Leases Subject to Settlement Agreement – Subalternative 2

The two non-NSO leases as identified in Case No. 11-06174 should not have been issued, and the 12 prospective non-NSO leases as identified in Case No. 13-1749 would not be issued. As such, no paleontological resource impacts would occur.

4.16.4 Impacts of Alternative B

Alternative B includes approximately 39,000 acres of Federal mineral estate in the CCFO Planning Area open for oil and gas leasing with CSU stipulations. According to geologic mapping by Jennings and Strand (1958) and Wagner et al. (1991), Alternative B is underlain by 23 of the 31 major significant fossil-bearing geologic units described in Chapter 3 (Affected Environment). These units include the

Franciscan Assemblage, Panoche Formation, Moreno Formation, Laguna Seca Formation, Martinez Formation, Lodo Formation, Domengine Formation, Kreyenhagen Formation, Markley Formation, Temblor Formation, Vaqueros Formation, Monterey Group, San Pablo Group, Oro Loma Formation, Santa Margarita Formation, Santa Cruz Mudstone, Jacalitos Formation, Purisima Formation, Etchegoin Formation, San Benito Gravels, Paso Robles Formation, Tulare Formation, and Quaternary Older Alluvium, which have sensitivity classifications ranging from PFYC 3a to 5.

The potential to discover paleontological resources during oil and gas development within Federal mineral estate under Alternative B ranges from low to high based on the location of ground-disturbing activities. Oil and gas leases within Federal mineral estate under Alternative B would be subject to construction-related ground disturbances such as site and well pad preparation, excavations of pit and sumps, grading of access roads, well drilling, and ancillary facility construction associated with oil and gas development.

Mitigation

The adverse impacts to paleontological resources under Alternative B would be reduced to an acceptable level with implementation of the Paleontology Management Actions as described in Section 4.16.2.

Leases Subject to Settlement Agreement

Under Alternative B, BLM-managed areas that contain the 14 non-NSO leases, as identified in Case No. 11-06174 and Case No. 13-1749, are underlain by 12 of the 31 significant fossil-bearing geologic units described in Chapter 3 (Affected Environment). The units include the Panoche Formation, Moreno Formation, Laguna Seca Formation, Martinez Formation, Lodo Formation, Domengine Formation, Kreyenhagen Formation, Temblor Formation, Monterey Group, Oro Loma Formation, Paso Robles Formation, and Quaternary Older Alluvium, which have sensitivity classifications ranging from PFYC 3a to 5. Adverse impacts to paleontological resources within the non-NSO leases would be reduced to an acceptable level with implementation of the Paleontology Management Actions as described in Section 4.16.2.

4.16.5 Impacts of Alternative C

Alternative C includes approximately 368,800 acres of Federal mineral estate in the CCFO Planning Area open for oil and gas leasing with CSU stipulations and 29,800 acres open and subject to NSO lease stipulations. According to geologic mapping by Jennings and Strand (1958) and Wagner et al. (1991), Alternative C is underlain by 22 of the 31 major fossil-bearing geologic units described in Chapter 3 (Affected Environment). These units include the Franciscan Assemblage, Panoche Formation, Moreno Formation, Laguna Seca Formation, Martinez Formation, Lodo Formation, Domengine Formation, Kreyenhagen Formation, Markley Formation, Temblor Formation, Vaqueros Formation, Monterey Group, San Pablo Group, Oro Loma Formation, Santa Margarita Formation, Jacalitos Formation, Purisima Formation, Etchegoin Formation, San Benito Gravels, Paso Robles Formation, Tulare Formation, and Quaternary Older Alluvium, which have sensitivity classifications ranging from PFYC 3a to 5.

The potential to encounter paleontological resources during oil and gas development within Federal mineral estate under Alternative C ranges from low to high based on the location of ground-disturbing activities. Oil and gas leases within Federal mineral estate under Alternative C would be subject to construction-related ground disturbances such as site and well pad preparation, excavations of pit and sumps, grading of access roads, well drilling, and ancillary facility construction associated with oil and gas development.

Mitigation

The adverse impacts to paleontological resources under Alternative C would be reduced to an acceptable level with implementation of the Paleontology Management Actions as described in Section 4.16.2.

Leases Subject to Settlement Agreement

Under Alternative C, BLM-managed areas that contain the 14 non-NSO leases, as identified in Case No. 11-06174 and Case No. 13-1749, are underlain by 12 of the 31 major fossil-bearing geologic units described in Chapter 3 (Affected Environment). The units include the Panoche Formation, Moreno Formation, Laguna Seca Formation, Martinez Formation, Lodo Formation, Domengine Formation, Kreyenhagen Formation, Temblor Formation, Monterey Group, Oro Loma Formation, Paso Robles Formation, and Quaternary Older Alluvium, which have sensitivity classifications ranging from PFYC 3a to 5. Adverse impacts to paleontological resources within the non-NSO leases would be reduced with implementation of the Paleontology Management Actions as described in Section 4.16.2.

4.16.6 Impacts of Alternative D

Alternative D includes approximately 121,200 acres of Federal mineral estate in the CCFO Planning Area open for oil and gas leasing with CSU stipulations and 16,400 acres open and subject to NSO lease stipulations. According to geologic mapping by Jennings and Strand (1958) and Wagner et al. (1991), Alternative D is underlain by 21 of the 31 major significant fossil-bearing geologic units described in Chapter 3 (Affected Environment). These units include the Franciscan Assemblage, Panoche Formation, Moreno Formation, Laguna Seca Formation, Martinez Formation, Lodo Formation, Domengine Formation, Kreyenhagen Formation, Temblor Formation, Vaqueros Formation, Monterey Group, San Pablo Group, Oro Loma Formation, Santa Margarita Formation, Jacalitos Formation, Purisima Formation, Etchegoin Formation, San Benito Gravels, Paso Robles Formation, Tulare Formation, and Quaternary Older Alluvium, which have sensitivity classifications ranging from PFYC 3a to 5.

The potential to encounter paleontological resources during oil and gas development within Federal mineral estate under Alternative D ranges from low to high based on the location of ground-disturbing activities. Oil and gas leases within Federal mineral estate under Alternative D would be subject to construction-related ground disturbances such as site and well pad preparation, excavations of pit and sumps, grading of access roads, well drilling, and ancillary facility construction associated with oil and gas development.

Mitigation

The adverse impacts to paleontological resources under Alternative D would be reduced to an acceptable level with implementation of the Paleontology Management Actions as described in Section 4.16.2.

Leases Subject to Settlement Agreement

Under Alternative D, BLM-managed areas that contain the 14 non-NSO leases, as identified in Case No. 11-06174 and Case No. 13-1749, are underlain by 12 of the 31 major fossil-bearing geologic units described in Chapter 3 (Affected Environment). The units include the Panoche Formation, Moreno Formation, Laguna Seca Formation, Martinez Formation, Lodo Formation, Domengine Formation, Kreyenhagen Formation, Temblor Formation, Monterey Group, Oro Loma Formation, Paso Robles Formation, and Quaternary Older Alluvium, which have sensitivity classifications ranging from PFYC 3a to 5. Adverse impacts to paleontological resources within the non-NSO leases would be reduced with implementation of the Paleontology Mitigation and Management Actions as described in Section 4.16.

4.16.7 Impacts of Alternative E

Alternative E includes approximately 487,200 acres of Federal mineral estate in the CCFO Planning Area open for oil and gas leasing with CSU stipulations and 206,400 acres open and subject to NSO lease stipulations. According to geologic mapping by Jennings and Strand (1958) and Wagner et al. (1991), Alternative E is underlain by 22 of the 31 major significant fossil-bearing geologic units described in Chapter 3 (Affected Environment). These units include the Franciscan Assemblage, Panoche Formation, Moreno

Formation, Laguna Seca Formation, Martinez Formation, Lodo Formation, Domengine Formation, Kreyenhagen Formation, Markley Formation, Temblor Formation, Vaqueros Formation, Monterey Group, San Pablo Group, Oro Loma Formation, Santa Margarita Formation, Jacalitos Formation, Purisima Formation, Etchegoin Formation, San Benito Gravels, Paso Robles Formation, Tulare Formation, and Quaternary Older Alluvium, which have sensitivity classifications ranging from PFYC 3a to 5.

The potential to encounter paleontological resources during oil and gas development within Federal mineral estate under Alternative E ranges from low to high based on the location of ground-disturbing activities. Oil and gas leases within Federal mineral estate under Alternative E would be subject to construction-related ground disturbances such as site and well pad preparation, excavations of pit and sumps, grading of access roads, well drilling, and ancillary facility construction associated with oil and gas development.

Mitigation

The adverse impacts to paleontological resources under Alternative E would be reduced to an acceptable level with implementation of the Paleontology Management Actions as described in Section 4.16.2.

Leases Subject to Settlement Agreement

Under Alternative E, BLM-managed areas that contain the 14 non-NSO leases, as identified in Case No. 11-06174 and Case No. 13-1749, are underlain by 12 of the 31 major fossil-bearing geologic units described in Chapter 3 (Affected Environment). The units include the Panoche Formation, Moreno Formation, Laguna Seca Formation, Martinez Formation, Lodo Formation, Domengine Formation, Kreyenhagen Formation, Temblor Formation, Monterey Group, Oro Loma Formation, Paso Robles Formation, and Quaternary Older Alluvium, which have sensitivity classifications ranging from PFYC 3a to 5. Adverse impacts to paleontological resources within the non-NSO leases would be reduced with implementation of the Paleontology Management Actions as described in Section 4.16.2.

4.17 Social and Economic Conditions

4.17.1 Introduction

This section presents an analysis of social and economic impacts of the management alternatives proposed as part of the Central Coast Oil and Gas Leasing and Development RMPA. Each alternative is evaluated in light of oil and gas extraction forecasts for Federal mineral estate in the 2015 Reasonably Foreseeable Development (RFD) Scenario over the 15- to 20-year period of analysis. This analysis discusses potential effects to existing social patterns, employment, labor income, and sectors in the impact area economy that encompass the Central Coast Field Office (CCFO), with an emphasis on the areas designated as having high potential for oil and gas development shown in Figure 5-1. Environmental justice impacts to communities within the localized study area are also discussed.

The social analysis focuses on the interests and concerns of identified communities relative to the alternatives, particularly those identified during the Social and Economic Workshop held on February 4, 2015 (included as Appendix F of this EIS). The economic analysis focuses on the potential for RMPA alternatives to result in changes to the local economies affected by the oil and gas industry associated with the 2015 RFD Scenario by alternative (refer to Table 2-3). Continued employment patterns can be seen as a benefit to the local community. Other economic benefits are also present, although some are not easily measured or tied to economic activity. An example of where effects are difficult to quantify are equity effects, impacts to social values, and non-market values. Regardless, these are discussed at qualitative and programmatic level despite the inability to measure them quantitatively.

Methods of Analysis

In order to accurately portray the relationship of current BLM management and the community, the social and economic geographic scope of analysis must be defined. The social and economic effects from changes on Federal mineral estate feasibly extend beyond the immediate vicinity of their location. However, based on the information provided in Section 2.3, overall, the 2015 RFD Scenario assumes that the current development trends in this region are likely to continue for the next 15 to 20 years. It is estimated that during the life of this RMPA, 37 total exploratory and development wells would be developed on up to 206 acres. This estimate includes all anticipated forms of ground disturbance such as the construction of well pads, roads, onsite facilities, and pipelines. Well stimulation technologies (e.g., hydraulic fracturing, acid matrix stimulation, acid fracturing) and enhanced oil recovery techniques (e.g., cyclic steam, steam flood, water flood) may be used on any or all of the 37 wells during their life cycle.

When considering the existing oil and gas industry within the CCFO Planning Area, the local study area for social and economic impacts includes the portions of Fresno, Monterey, and San Benito Counties that encompass the area of high oil and gas occurrence potential shown in Figure 5-1. The local study area includes communities proximate to existing oil and gas development: the City of Coalinga (Fresno County), the cities of Greenfield and Kings City (Monterey County), and the communities of Bradley, San Ardo, and San Lucas (Monterey County). These local study area communities are also those identified as potentially affected social groups during the Social and Economic Workshop held on February 4, 2015 (BLM, 2015).

The programmatic analysis within this chapter is primarily qualitative and based on a set of indicators and attributes (many of which were identified in Section 3.17 for existing conditions). The analysis of oil and gas development effects on social and economic conditions is based on the following indicators:

- Demographic conditions in the regional and local study areas;
- Social conditions within the regional and local study areas pertaining to the oil and gas industry;
- Economic conditions in the regional and local study areas; and

The analysis of oil and gas development effects on social and economic conditions is based on the following attributes:

- Direct oil and gas-related employment;
- Secondary jobs related to oil and gas;
- Total population in regional and local study areas and population by location;
- Direct and indirect revenue resulting from the BLM-managed activities;
- Direction, magnitude and rate of change in social and economic conditions; and
- Geographic concentration of land use, demographic, and economic changes.

Environmental justice impacts are evaluated by identifying populations, communities or groups that contain a high number of minority or low-income population (based on the data presented in Section 3.17) that could be subject to disproportionate adverse effects of BLM oil and gas management actions identified for RMPA alternatives.

Assumptions

The following assumptions were used to complete the analysis for social and economic impacts from the proposed RMPA:

- Future environmental analyses would be conducted, as appropriate, for project- and site-specific actions proposed in the CCFO Planning Area administrative boundary. Applications for Permit to Drill would address potential social and economic effects of oil and gas development on identified affected communities.
- Social and economic effects are based on the assumption of full implementation of the 2015 RFD Scenario on the varying BLM land designations allowing for leases on BLM-administered mineral estate by alternative.
- As described in Section 2.5.2, the same range of oil and gas development under the 2015 RFD Scenario (i.e., up to 37 exploratory and development wells on up to 206 acres of disturbance) would apply to all alternatives except Alternative B, which would include only up to 32 wells drilled.
- All surface-disturbing activities related to the 2015 RFD Scenario would most likely occur on BLM-administered mineral estate in Fresno, Monterey, and San Benito Counties within the area of high oil and gas occurrence potential (shown in Figure 5-1) for the CCFO Planning Area but may potentially occur anywhere that is open to oil and gas leasing.
- New oil and gas well locations developed under the 2015 RFD Scenario would most likely be within, or proximate to, established producing oil and gas fields or near lands that are already leased for such activities but may potentially occur anywhere that is open to oil and gas leasing.
- Development of ancillary oil and gas facilities (e.g., pipelines, compressor stations, etc.) are assumed to be proportional to number of new wells developed. A total of 37 exploratory and development wells under the 2015 RFD Scenario would primarily utilize existing pipeline infrastructure and refineries.

4.17.2 Impacts Common to All Alternatives

Oil and Gas Development Social Effects

As discussed in Section 2.3, under the 2015 RFD Scenario a maximum of 37 exploratory and development wells would occur on new Federal oil and gas leases over the next 15 to 20 years. As discussed in Section 3.17 (Table 3.17-2), active oil and gas wells on Federal mineral estate account for only 110 (0.6%) of the total 18,229 active wells within the CCFO Planning Area. The increase of 37 new wells occurring under the 2015 RFD Scenario for all alternatives would continue to account for a negligible number of total wells within the CCFO Planning Area occurring on Federal mineral estate.

It is likely that current oil and gas companies operating within the CCFO Planning Area would undertake all new wells. Therefore, the 2015 RFD Scenario is not expected to create a significant number of new jobs or induce population to new lease areas from employment. However, any new amount of long-term

direct or indirect job creation and associated population in-migration that may occur at this programmatic scale would depend on the number of new wells created and frequency of stimulation treatments at existing wells (as a result of RMPA approval).

Employment

Changes in employment patterns within a community can have a direct and indirect effect on many social conditions. Because both the regional and local study areas contain significant existing oil and gas development, when considering the oil and gas activities occurring under the 2015 RFD Scenario for all alternatives, one key component to analyze for social and economic effects is any change in employment patterns or levels. The development of an individual well and potential stimulation activities do not typically require large numbers of on-site employees for extended periods. Table 4.17-1 provides a summary of typical workforce and timeline for well development and stimulations.

Table 4.17-1. Typical Oil and Gas Well Development and Stimulation Treatment in California

Oil and Gas Activity	Timeline	Workforce
Oil and Gas Well Development	Exploration: 3–5 years Planning: 1–1.5 years Site and well construction: 2–3 months Well completion: 1–2 days	8-10 Persons
Well Stimulation Treatment	Total stimulation treatment: 10 days Total work hours: 16 Work hours per stage (up to 5 stages):[1] 30–60 minutes	2-5 Persons

1 - Within the Monterey Formation, wells are expected to be much deeper, with up to 20 hydraulic fracturing stages executed.
Source: DOC, 2015

During well development, exploration and planning activities occur temporarily during the 3- to 5-year and 1- to 1.5-year timeframes shown in Table 4.17-1, respectively. For both well and well stimulation activities, with the exception of any specialized labor needs, it is likely any new employees necessary for creation of new wells would already be residents in the regional or local study areas and are not expected to contribute to an increase or change in population or demographic makeup. New well development and stimulation activities occurring under the 2015 RFD Scenario within an existing oil and gas field, or at new locations, would not all occur at the same time. Therefore, workforce needs would fluctuate. Wells are developed individually and need various services at various times. This variability and the need to schedule services would reduce the potential for new employment and associated worker in-migration, as employers would first make efficient use of existing employees. Therefore, the oil and gas activities and well development intensity identified under the 2015 RFD Scenario would not introduce new population at a level that could adversely alter existing or projected population, housing demand, or demographic makeup of affected communities.

Social Disruption

As discussed within Section 3.17, the southern portion of the CCFO Planning Area has a number of well-established oil and gas fields and development areas that have shaped the social landscape of communities located proximate to them. The development of new wells and stimulation treatments under the 2015 RFD Scenario are expected to occur within or proximate to these existing fields within the CCFO Planning Area. Therefore, the oil and gas activities and well development intensity identified under the 2015 RFD Scenario would not introduce any new activities or industry that could adversely impact or change the existing social framework of affected local communities.

With such a relatively small labor force needed for a typical well development and stimulation treatment, minimal long-term population in-migration from new employment is expected. It is possible some specialized workers could come from outside the regional and local study areas. However, these workers are expected to seek lodging proximate to the work areas, which is assumed to be local study area com-

munities where social values and structure is already influenced by the oil and gas industry. Therefore, the presence of temporary oil and gas workers is not expected to disrupt existing social conditions or values of affected communities. While some CCFO Planning Area community interests likely would consider continued energy development to diminish quality of life, it is assumed the local study area communities identified in Section 3.17, Table 3.17-3, would not due to their communities developing with a continued oil and gas industry presence.

Oil and Gas Development Economic and Fiscal Effects

The oil and gas activities and well development intensity identified under the 2015 RFD Scenario would include the continued use of drilling-related employees of the energy development companies operating in the CCFO Planning Area and subcontract workers primarily in the oil and gas and construction industries. In addition to direct jobs associated with drilling and operating oil and gas wells and related infrastructure, oil- and gas-related economic activity would support other secondary jobs established in the local communities. These jobs result from:

- Both indirect economic effects of oil and gas activity (purchases of goods and services by energy companies and their subcontractors)
- Induced economic effects (purchases of household goods by the employees of energy companies, subcontractors and indirectly affected firms).

Based on the data shown in Section 3.17, the greatest proportion of secondary jobs currently occur within the local study area (Monterey County, Fresno County, and San Benito County) and local study area communities (Coalinga, Greenfield, King City, Bradley CDP, San Ardo CDP, and San Lucas CDP) due to extensive oil and gas activity in the area of high oil and gas occurrence potential within the CCFO Planning Area. The local study areas discussed in Table 3.17-3 represent the areas where a number of oil and gas workers are expected to reside and direct and indirect economic effects are prevalent. The continued direct and indirect economic effects from oil and gas activities and worker wages and spending under the 2015 RFD Scenario is considered a beneficial impact, particularly within local study area communities that have established economies influenced by oil and gas activities.

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 (local study area) where new oil and gas wells developed under the 2015 RFD Scenario would most likely be located within. As shown in Table 3.17-4, as the number of total oil and gas wells per county is increased, the average economic and fiscal contribution per well decreases. Therefore, new wells occurring under the 2015 RFD Scenario are estimated to have the greatest beneficial economic effect in San Benito County, second greatest in Monterey County, and less in Fresno County. However, beneficial economic effects would occur as part of each new well developed. As noted in Table 3.17-4, a number of employment sectors are included as part of the direct employment, with secondary and induced sectors incurring benefits from oil and gas development through direct employee wage spending, operations and maintenance expenditures, and through government use of tax revenue.

To varying degrees, oil and gas development involving Federal mineral estate within the CCFO Planning Area would foster economic development within affected communities. The commercially viable oil and gas resources would, however, be exhausted within a finite time period. The longer-term sustainability and viability of community investments incurred to provide housing and other public services for the direct energy workforce (and the secondary workers supported by that workforce) would depend on the ability of the affected communities to diversify the local economic base over time.

Split Estate Leases

BLM issues a number of lease types for oil and gas extraction, with leases either being competitive or non-competitive. In split estate situations, the surface rights and subsurface rights (such as the rights to develop minerals) for a piece of land are owned by different parties. The BLM's split estate policy only

applies to situations where the surface rights are under private ownership and the rights to development of the mineral resources are publicly held and managed by the Federal government (in this case the BLM). In these situations, mineral rights are considered the dominant estate, meaning the owner of the mineral estate has the right to enter and occupy as much of the surface as is reasonably necessary to explore, drill, and remove the oil and natural gas resource on the leasehold, subject to obtaining the BLM's approval of the drilling and surface use plans (BLM, 2007). However, the mineral owner must conduct operations to minimize adverse effects to surface and subsurface resources and prevent any unnecessary surface disturbance (BLM, 2007).

Because split estate leases include privately owned surface lands, they can result in direct and indirect economic effects on landowners and local governments. By issuing a split estate lease, the development of oil and gas activities within the leased area can preclude the existing or planned surface land uses. While split estate leases are negotiated with the affected surface owner, they would affect revenue and taxes potentially generated by the precluded existing or planned surface land uses. Lease sales and fees generate revenue for the BLM. Split-estate leases are considered to have the greatest potential for economic effects to local jurisdictions and private parties due to land use incompatibilities and/or land use conversion. This was the primary issue raised by participants during the Social and Economic Workshop held on February 4, 2015 (BLM, 2015).

Non-market Values

Non-market values are associated with several of the resources managed by the BLM in the CCFO Planning Area, as well as with recreation and open space on both public and private lands. Non-market values include the benefits received by people from participating in recreational/tourist activities and the overall high-value visual context of these lands throughout the CCFO Planning Area. Additionally, individuals derive passive or non-use benefits from the existence of abundant wildlife, waterways, scenic resources, and extensive agricultural lands with little development and other amenities in many areas within the CCFO Planning Area. Both tourism and recreation have market components individually, which are heavily affected by BLM land use decisions within the CCFO Planning Area.

All areas currently closed to oil and gas leasing under the 2007 Hollister Field Office RMP would remain closed under all alternatives. Additionally, all areas designated as No Surface Occupancy (NSO) would further maintain and perhaps enhance non-market values associated with natural amenities protected on these lands. The BLM management decisions occurring under the existing RMP that offer more protection for the following resource categories (unchanged by the proposed amendment) provide protection for non-market values and non-quantifiable benefits:

- Special status species;
- Wild and Scenic Rivers;
- Cultural resources;
- Paleontological resources;
- Agricultural resources;
- Visual resources; and
- Recreation resources.

Oil and Gas Development Environmental Justice Effects

In analyzing potential environmental justice impacts, the U.S. Census data for minority and low-income populations in Section 3.17 was used. For this analysis, a population is considered a potential environmental justice population if the percentage of the minority or low-income population of the potentially affected area is significantly greater than the corresponding percentage of the population in the larger jurisdiction or region in which it is located. As discussed earlier, it is assumed most surface-disturbing activities related to the 2015 RFD Scenario would likely occur in Fresno, Monterey, and San Benito Counties within the area of high oil and gas occurrence potential shown in Figure 5-1 for the CCFO Plan-

ning Area. As described in Section 3.17.3, all three of these counties are considered minority areas of concern with respect to environmental justice. Both Fresno and Monterey Counties are also considered low-income areas of concern. Additionally, the development of new wells and stimulation treatments under the 2015 RFD Scenario are expected to occur within or proximate to existing oil and gas fields within the CCFO Planning Area. Based on these assumptions, the areas with potentially elevated environmental burdens from oil and gas extraction activities and vulnerable populations are the local study area communities of King City, San Ardo, and San Lucas (based on baseline data presented in Chapter 3.17, Table 3.17-3). Additionally, Coalinga is considered to have a high percentage of low-income population for consideration of environmental justice at the local study area level.

The location of existing oil and gas fields is dependent on the location and availability of underground hydrocarbon resources and the characteristics of geologic formations. The location of underground resources dictates where oil and gas wells are developed, and where well stimulation may occur. Most of the existing fields in the CCFO Planning Area are decades old, with some nearly a century old. Therefore, the presence of these oil and gas fields has been static in relation to the development and changes of the population around them. In particular, the demographic makeups of Coalinga, King City, San Ardo, and San Lucas have developed over time with nearby oil and gas fields present throughout. Activities that would occur under the 2015 RFD Scenario already occur at a greater magnitude within existing fields under existing conditions. Therefore, RMPA activities would not introduce new types of environmental impacts not already occurring from current well drilling, extraction, and stimulation treatments.

The major consideration is whether any adverse impacts from oil and gas activities under the 2015 RFD Scenario would be borne disproportionately by these communities when compared to the general population of the region. An important aspect when considering disproportionate effects within these communities over existing conditions is the life cycle of existing oil and gas extraction. As the availability of oil and gas resources decline, production decreases. Any adverse impacts from current field activities, including well stimulations, also would decrease as compared to periods of higher oil and gas production. As most of the recoverable resource is removed, well stimulation is no longer effective in increasing flow to a level that would justify its continued use. Therefore, as new activities (and any adverse impacts) that occur under the 2015 RFD Scenario are introduced, existing activities (and any adverse impacts) would be reduced as production declines and wells are decommissioned. Given the small number of new wells (up to 37) and land disturbed (up to 206 acres) under the 2015 RFD Scenario, this offsetting may not introduce any new or disproportionate adverse environmental impacts over existing conditions within the communities of Coalinga, King City, San Ardo, and San Lucas.

Existing Mitigation Strategies

A number of existing BLM and California permit procedures, environmental analyses requirements, BMPs, and other processes are currently in place or being planned to directly and indirectly mitigate the adverse effects of oil and gas development. These requirements would apply to all future environmental analyses, wells, well stimulations, and other enhanced oil recovery techniques occurring under the 2015 RFD Scenario on Federal mineral estate for all alternatives, and would reduce adverse social, economic, and environmental justice effects. These programs and requirements include, but are not limited to:

- BLM Land Use Planning Handbook, Appendix D: currently available for viewing at [http://www.blm.gov/style/meDialib/Blm/Ca/Pdf/Pa/Planning.Par.45838.File.dat/landuse_hb.pdf]
- The BLM Oil and Gas Management Program: currently available for viewing at [http://www.blm.gov/ca/st/en/prog/energy/og/electronic_permittin.html]
- BLM Approved Resource Management Plan Amendments/Record of Decision for Designation of Energy Corridors on Bureau of Land Management–Administered Lands in the 11 Western States: currently available for viewing at [http://corridoreis.anl.gov/documents/docs/Energy_Corridors_final_signed_ROD_1_14_2009.pdf]

- California Department of Oil, Gas & Geothermal Resources (DOGGR) Laws and Regulations: currently available for viewing at [http://www.conservation.ca.gov/dog/pubs_stats/Pages/law_regulations.aspx]
- DOGGR Well Stimulation Treatment Final Regulations: currently available for viewing at [ftp://ftp.consrv.ca.gov/pub/oil/laws/Final%20Text%20of%20SB%204%20WST%20Regulations.pdf]

4.17.3 Impacts of Alternative A (No Action)

Under Alternative A, approximately 725,500 acres of Federal mineral estate would be open to oil and gas leasing with CSU or NSO stipulations. This alternative maintains the management direction of the 2007 HFO RMP under which all Federal mineral estate would be available for oil and gas leasing with the exception of 67,500 acres of exclusion areas (i.e., Wilderness Areas, Wilderness Study Areas, Clear Creek Serpentine ACEC, and Fort Ord National Monument).

Alternative A would designate the largest acreage of Federal mineral estate open to leasing, which would provide the BLM with greater flexibility in identifying sites for locating ground disturbance activities. Under Alternative A, more BLM-administered mineral estate is available for locating the 37 future wells under the 2015 RFD Scenario. While utilizing a larger management area may avoid concentrating disturbance impacts in a given area, it is unlikely new wells would be developed outside areas currently producing. Social and economic effects of Alternative A would be negligible in the regional and local study areas relative to existing conditions. Based on the small number of wells developed on BLM-administered mineral estate over the 20-year 2015 RFD Scenario, negligible direct and secondary jobs would be added due to increased oil and gas development under Alternative A.

Under Alternative A, split estate leases are possible under the 2015 RFD Scenario as all areas currently open would remain open to oil and gas leasing. As discussed in Section 4.17.2, split estate leases can have adverse effects to private landowners and local jurisdictions should the direct and indirect economic effects on land owners and local governments should they preclude existing or planned land uses and result in potential effects to the economic/social goals and direction sought by the local jurisdiction for the area. Under Alternative A, existing BLM management strategies during split estate lease negotiations and processing would occur.

Within both the regional and local study areas of the CCFO Planning Area, there are different groups (such as farmers, recreationists, and energy workers) that could have differing values and objectives concerning the use of public lands for oil and gas extraction. Conflicts between these differing values and objectives are likely to be exacerbated by changes such as population growth, shifting demographics, localized land development and planning, and increasing energy-related activity. However, future environmental analyses, necessary permits, and continued adherence to BLM best management practices (BMPs) and programs linked to energy development are intended to mitigate adverse social effects during the 2015 RFD Scenario.

With respect to environmental justice, the BLM does not manage environmental justice resources. Rather, it manages public lands and the resources and uses that occur on them. As discussed in Section 4.17.2, the groups most likely to suffer adverse effects under Alternative A are the local study area communities of King City, San Ardo, and San Lucas, which contain a disproportionately high concentration of minority and low-income populations when compared to the larger region. However, as discussed in Section 4.17.2, the environmental effects from oil and gas extraction already occur within these areas. Any adverse effects from the development of 37 wells on 206 total acres over the next 20-years are not considered to be disproportionately higher in intensity than that occurring in the local study area: the number of existing producing wells within Fresno (11,550 existing wells), Monterey (3,596 existing wells), and San Benito Counties (388 existing wells) as shown in Table 3.17-2. Furthermore, any adverse environmental effects may be offset as production is reduced within existing fields. Because the 2015 RFD Scenario only includes the development of up to 37 wells, the conversion of this land to oil and gas

lease areas (assumed not open to public use) is not considered to be borne at a disproportionately higher level by these communities when considering the overall amount of land currently developed with oil and gas facilities and the amount of BLM public lands available to these sensitive communities. As discussed above in Section 4.17.2 under existing mitigation strategies, future site-specific environmental analyses by the BLM would be conducted to determine if any specific groups are affected and represent a disadvantaged community from an environmental justice standpoint for new leases occurring under Alternative A.

Leases Subject to Settlement Agreement – Subalternative 1

Under Alternative A Subalternative 1, the 14 non-NSO leases subject to the settlement agreement would be issued. The nearest incorporated communities to these leases are Coalinga (Fresno County) and King City (Monterey County). It is unknown how many wells may be developed within these leases. However, because these leases are located within the expected areas where the majority of oil and gas development would occur within BLM-administered mineral estate under the 2015 RFD Scenario, social and environmental effects from development of these leases are the same as those described in Section 4.17.2. Alternative A Subalternative 1 would not change the current management goals, objectives, and direction of the lease areas as specified in the 2007 HFO RMP. The existing BLM mitigation strategies discussed above in Section 4.17.2 would apply to any oil and gas developments and activities within these leases.

Leases Subject to Settlement Agreement – Subalternative 2

The two non-NSO leases as identified in Case No. 11-06174 should not have been issued, and the 12 prospective non-NSO leases as identified in Case No. 13-1749 would not be issued. As such, no resource impact would occur.

4.17.4 Impacts of Alternative B

Relative to Alternative A, Alternative B would include only up to 32 wells drilled under the 2015 RFD Scenario. However, Alternative B only includes approximately 39,000 acres of Federal mineral estate open to oil and gas leasing with CSU stipulations. Open lease areas are restricted to Federal mineral estate within the boundaries of oil and gas fields plus a 0.5-mile buffer as defined by DOGGR. This alternative would designate the least acreage of Federal mineral estate available for oil and gas leasing among all of the alternatives.

When considering the proposed locations of Federal mineral estate lands open to oil and gas leasing under Alternative B on Figure 2-2, all designated areas are located within the southern portion of the CCFO Planning Area in Monterey, San Benito, and Fresno County. As described in Sections 4.17.1 and 4.17.2, these are the areas where most oil and gas development on BLM-administered mineral estate is expected to occur under the 2015 RFD Scenario. Therefore, the impacts described in Section 4.17.2 describe those expected under Alternative B. As described in Section 4.17.2, a number of existing BLM and California permit procedures, environmental analyses requirements, BMPs, and other processes are currently in place or being planned to directly and indirectly mitigate the adverse effects of oil and gas development under Alternative B.

As described programmatically in Section 4.17.2, split estate leases have the potential to result in direct and indirect adverse (and beneficial) economic effects on landowners and local governments. By issuing a split estate lease, the development of oil and gas activities within the leased area can preclude existing or planned land uses and result in potential effects to the economic/social goals and direction sought by the local jurisdiction for the area. This issue was raised during the Social and Economic Workshop held on February 4, 2015 (BLM, 2015).

Under Alternative B, split estate leases are possible under the 2015 RFD Scenario, but limited to lands open to leasing within a 0.5-mile buffer around existing oil and gas fields as defined by the California DOGGR. Land within existing oil and gas fields are not expected to require split estate leases. Further-

more, lands within a 0.5-mile buffer around existing oil and gas fields would reduce potential impacts from any split estate leases conflicting with local jurisdiction land use planning or economic goals related to other uses of these lands. While the number of wells developed under the 2015 RFD scenario are considered negligible and would be limited to lands within oil and gas fields and 0.5-mile buffer areas currently defined by DOGGR, future split estate leases occurring under the 2015 RFD Scenario under Alternative B may result in minor adverse social and economic impacts to affected local jurisdictions. Mitigation Measure SE-1 is proposed to ensure the enhancement of outreach and coordination efforts with surface owners, vested parties, and local jurisdictions throughout the split estate lease process to reduce adverse social and economic impacts from split estate leases under Alternative B. While these impacts could also occur under Alternative A (No Action), Alternative B allows for an amendment to the RMP and therefore mitigation is proposed.

It should be noted that Alternative B includes more designated open lease area within San Benito and Fresno Counties, resulting in less potential for social and economic effects to occur within Monterey County as compared to Alternative A. Furthermore, Alternative B may provide the greatest benefit to non-market values throughout the CCFO Planning Area compared to all other alternatives by including the most areas closed to oil and gas leasing. However, this determination is contingent on those areas closed for oil and gas leasing not being developed with allowable uses that may diminish important resources such as recreation use and visual quality.

Mitigation

SE-1 **Enhance Surface Owner and Local Jurisdiction Outreach During Split Estate Lease Processing.** In addition to existing BLM plans, procedures, and recommendations related to implementation of fluid mineral leasing and land use planning, including the Instruction Memorandum (IM) providing guidance and procedures for implementation of fluid mineral leasing and land use planning recommendations within the Split Estate Report to Congress dated December 2006, BLM CCFO staff shall take the following actions to further enhance public outreach and agency coordination during preparation and finalization of each issued split estate lease:

- The CCFO shall initiate outreach efforts (e.g., mailed notices, in-person meetings, site visits) to split-estate surface owners and all vested parties to ensure their fullest involvement in the decision-making process for all split estate leases.
- The CCFO will meet and/or contact local government officials for each new split estate lease application to seek ways of ensuring split estate leases are consistent with the land use planning and community goals of the affected jurisdiction. CCFO staff will maintain a consistent rapport (e.g., through regular coordination and update notifications) with local officials regarding the status of the split estate lease until the lease is issued.

Leases Subject to Settlement Agreement

Under Alternative B, a portion of the area of 14 non-NSO leases, as identified in Case No. 11-06174 and Case No. 13-1749, would be available for oil and gas development (Section 2.7.2) and subject to resulting impacts as discussed above. The remaining areas of the leases would be closed to oil and gas development. Depending on location, some entire leases would be open for development, others would be all or nearly all closed. Many would have a mixture of open and closed areas. Of the total lease area of approximately 17,600 acres, 22 percent would be open with CSU stipulations and 78 percent would be closed. It is unknown how many wells may be developed within the areas open for leasing. However, because these leases are located within the expected areas where the majority of oil and gas development would occur within BLM-administered mineral estate under the 2015 RFD Scenario, social and environmental effects from development of these leases are described in Section 3.17.2. Existing stipulations and mitigation strategies (as identified earlier) would be used to avoid and minimize impacts.

4.17.5 Impacts of Alternative C

Under Alternative C, approximately 368,800 acres of Federal mineral estate would be open to oil and gas leasing with CSU stipulations and 29,800 would be open with NSO. The designated open lease areas would include Federal mineral estate within high oil and gas occurrence potential areas or within the boundaries of oil and gas fields plus a 0.5-mile buffer as defined by DOGGR. The alternative would designate a moderate acreage of Federal mineral estate as available for oil and gas leasing compared with the other alternatives (i.e., less than Alternatives A and E, more than Alternatives B and D). It should be noted that Alternative C distributes designated open lease area similar to Alternative A within Monterey, San Benito, and Fresno Counties. However, a significant portion of the proposed acreage is open with restrictions.

When considering the proposed locations of Federal mineral estate open to oil and gas leasing under Alternative C on Figure 2-3, the majority of designated lands are located within the southern portion of the CCFO Planning Area in Monterey, San Benito, and Fresno County. As described in Sections 4.17.1 and 4.17.2, these are the areas where most oil and gas development on BLM-administered mineral estate is expected to occur under the 2015 RFD Scenario. Therefore, the impacts described in Section 4.17.2 describe those expected under Alternative C.

As described in Section 4.17.2, a number of existing BLM and California permit procedures, environmental analyses requirements, BMPs, and other processes are currently in place or being planned to directly and indirectly mitigate the adverse effects of oil and gas development under Alternative C.

Under Alternative C, split estate leases under the 2015 RFD Scenario could occur within high oil and gas occurrence potential areas open to leasing. Lands with moderate, low and no oil and gas occurrence potential areas would be closed. Compared to Alternative B, the significant increase in land acreage open for leasing directly increases the potential for split estate leases to occur and potentially result in adverse effects. Based on concerns raised during the Social and Economic Workshop held on February 4, 2015, future split estate leases occurring under the 2015 RFD Scenario under Alternative C may result in minor adverse social and economic impacts to affected local jurisdictions (as described programmatically in Section 4.17.2 and similar to that described earlier for Alternative B). Mitigation Measure SE-1 is proposed to further enhance the outreach and coordination efforts with surface owners, vested parties, and local jurisdictions throughout the split estate lease process to reduce adverse social and economic impacts from split estate leases under Alternative C.

Mitigation

SE-1 Enhance Surface Owner and Local Jurisdiction Outreach During Split Estate Lease Processing.

Leases Subject to Settlement Agreement

Under Alternative C, the 14 non-NSO leases would be implemented in BLM-managed areas that are open to oil and gas leasing with CSU stipulations. The nearest incorporated communities to these leases are Coalinga (Fresno County) and King City (Monterey County). It is unknown how many wells may be developed within these leases. However, because these leases are located within the expected areas where the majority of oil and gas development would occur within BLM-administered mineral estate under the 2015 RFD Scenario, social and environmental effects from development of these leases are described in Section 3.17.2. The existing and proposed mitigation strategies discussed above would apply to any oil and gas developments and activities within these leases.

4.17.6 Impacts of Alternative D

Under Alternative D, approximately 121,200 acres of Federal mineral estate would be open to oil and gas leasing with CSU stipulations and 16,400 acres would be open with NSO. Open lease areas are restricted to Federal mineral estate underlying BLM surface estate. All BLM split estate lands and the Ciervo Panoche Natural Area would be closed to leasing.

When considering the proposed locations of Federal mineral estate open to oil and gas leasing under Alternative D on Figure 2-4, the majority of designated areas are located within the southern portion of the CCFO Planning Area in Monterey, San Benito, and Fresno County. As described in Sections 4.17.1 and 4.17.2, these are the areas where most oil and gas development on BLM-administered mineral estate is expected to occur under the 2015 RFD Scenario. Therefore, the impacts described in Section 4.17.2 describe those expected under Alternative D.

As described in Section 4.17.2, a number of existing BLM and California permit procedures, environmental analyses requirements, BMPs, and other processes are currently in place or being planned to directly and indirectly mitigate the adverse effects of oil and gas development under Alternative D. Based on concerns raised during the Social and Economic Workshop held on February 4, 2015, no minor adverse social and economic impacts would occur on split estate leases to affected local jurisdictions (as described programmatically in Section 4.17.2 and identical to that described earlier for Alternative B). As shown in Table 2-3, all split estate lands would be closed to oil and gas leases under Alternative D. While the inclusion of Mitigation Measure SE-1 under Alternatives B, C, and E is proposed to reduce potential adverse socioeconomic effects from split estate leases, closing split estate lands under Alternative D is considered to reduce potential impacts in comparison to the other alternatives evaluated.

It should be noted that Alternative D would designate the second smallest acreage of Federal mineral estate available for oil and gas leasing among all of the alternatives. Therefore, Alternative D may provide the second greatest benefit to non-market values throughout the CCFO Planning Area compared to all other alternatives by including a significant amount of area closed to oil and gas leasing. However, this determination is contingent on those areas closed for oil and gas leasing not being developed with allowable uses that may diminish recreation use and visual quality.

Leases Subject to Settlement Agreement

Under Alternative D, a portion of the area of the 14 non-NSO leases, as identified in Case No. 11-06174 and Case No. 13-1749, would be available for oil and gas development (Section 2.9.2) and subject to resulting impacts as discussed above. The remaining areas of the leases would be closed to oil and gas development. One lease would be entirely open; one would be entirely closed. Most leases would have a mixture of open and closed areas. Of the total lease area of approximately 17,600 acres, approximately 25 percent would be open with CSU stipulations and 75 percent would be closed. It is unknown how many wells may be developed within the areas open for leasing. However, because these leases are located within the expected areas where the majority of oil and gas development would occur within BLM-administered mineral estate under the 2015 RFD Scenario, social and environmental effects from development of these leases are described in Section 3.17.2. Existing stipulations and mitigation strategies (as identified earlier) would be used to avoid and minimize impacts.

4.17.7 Impacts of Alternative E

Under Alternative E, approximately 487,200 acres of Federal mineral estate would be open to oil and gas leasing with CSU stipulations and 206,400 acres would be open with NSO. The designated open lease areas would include Federal mineral estate outside of a California DWR Bulletin 118, Groundwater Basin or Sub-basin. The alternative would designate the second largest acreage of Federal mineral estate available for oil and gas leasing among all of the alternatives.

When considering the proposed locations of Federal mineral estate open to oil and gas leasing under Alternative E on Figure 2-5, the majority of designated lands are located within the southern portion of the CCFO Planning Area in Monterey, San Benito, and Fresno County. As described in Sections 4.17.1 and 4.17.2, these are the areas where most oil and gas development on BLM-administered mineral estate is expected to occur under the 2015 RFD Scenario. Therefore, the impacts described in Section 4.17.2 describe those expected under Alternative E. When compared to all other alternatives, Alternative E would be similar in potential for social and economic effects with the exception of Alternatives B and D, which have the greatest proposed acreage closed to oil and gas leases and may increase non-market value benefits.

As described in Section 4.17.2, a number of existing BLM and California permit procedures, environmental analyses requirements, BMPs, and other processes are currently in place or being planned to directly and indirectly mitigate the adverse effects of oil and gas development under Alternative E.

Under Alternative E, split estate leases under the 2015 RFD Scenario could occur within Federal mineral estate lands outside of California Department of Water Resources (DWR) Bulletin 118 groundwater basins & sub-basins open to leasing. Compared to Alternative B, the significant increase in land acreage open for leasing directly increases the potential for split estate leases to occur and potentially result in adverse effects. Compared to Alternative C, the potential for split estate leases to result in adverse effects would be greater for Alternative E as they could occur in areas not designated with high oil and gas occurrence potential (acknowledging that new wells would likely not be developed outside these areas). Based on concerns raised during the Social and Economic Workshop held on February 4, 2015, future split estate leases occurring under the 2015 RFD Scenario under Alternative E may result in minor adverse social and economic impacts to affected local jurisdictions (as described programmatically in Section 4.17.2 and similar to that described earlier for Alternative B). Mitigation Measure SE-1 is proposed to further enhance the outreach and coordination efforts with surface owners, vested parties, and local jurisdictions throughout the split estate lease process to reduce adverse social and economic impacts from split estate leases under Alternative E.

Mitigation

SE-1 Enhance Surface Owner and Local Jurisdiction Outreach During Split Estate Lease Processing.

Leases Subject to Settlement Agreement

Under Alternative E, a portion of the 14 non-NSO leases would be open to leasing. Of the total lease area of approximately 17,600 acres, approximately 57 percent would be open with CSU stipulations, 41 percent would be open with NSO, and 2 percent would be closed. Alternative E would incorporate new restrictions in the current management goals, objectives, and direction of the lease areas from what was specified in the 2007 HFO RMP. The existing and proposed mitigation strategies discussed above would also apply to any oil and gas developments and activities within these leases. The nearest incorporated communities to these leases are Coalinga (Fresno County) and King City (Monterey County). It is unknown how many wells may be developed within these leases. However, because these leases are located within the expected areas where the majority of oil and gas development would occur within BLM-administered mineral estate under the 2015 RFD Scenario, social and environmental effects from development of these leases are described in Section 3.17.2. Existing stipulations and mitigation strategies (as identified earlier) would be used to avoid and minimize impacts.

4.18 Transportation and Access

This section focuses on BLM roads and trails that provide access to, and through, BLM public lands. There is considerable overlap of travel management and all BLM uses on public lands. For example, many users of public lands are there for recreation. For visitors, a route system may serve as either a route to a destination or as the recreation location itself. For destination recreation, vehicle routes are the means to get to a starting point to engage in the activity, such as a parking area or trailhead. The route itself also can serve as the focus of the activity (e.g., pleasure driving, four-wheel vehicle driving, motorcycling, all-terrain vehicle (ATV) riding, biking, horseback riding, hiking, snowmobiling, and cross-country skiing. To reduce the duplication of narrative between travel management and the other sections of this RMPA/EIS, this section addresses only public travel and access concerns in relation to the development of the 2015 Reasonably Foreseeable Development (RFD) Scenario for oil and gas development on Federal mineral estate within the Central Coast Field Office (CCFO) Planning Area (Planning Area).

4.18.1 Introduction

Approach to Impact Assessment

This impact analysis evaluates the proposed RMPA alternatives for potential conflicts with BLM travel management goals or objectives. As discussed in Section 3.18, BLM's Comprehensive Travel and Transportation Management (CTTM) program and Executive Orders 11644 and 11989 establish core guidelines and management strategies that BLM utilizes for travel management. A discussion of the regional transportation network, including highways, major roads, County roads, rail, and aviation is not included. The discussion of hazardous materials transport is in Sections 3.4 and 4.4 (Hazardous Materials and Public Safety).

The management goals for Transportation and Access from the 2007 HFO RMP are restated here:

- The goals for transportation and access are to (1) maintain roads for administrative purposes; (2) support local counties and the State of California in providing a network of roads for movement of people, goods, and services across public lands; and (3) manage motorized access use to protect resource values, promote public safety, provide responsible motorized access use opportunities where appropriate, and minimize conflicts among various user groups.

The Area-wide Transportation and Access Management Actions from the 2007 HFO RMP include:

- **TRANS-COM1.** Public vehicle use on all BLM lands would be limited to designated routes, except as noted. As outlined in the Interim Management Policy (IMP) for Lands Under Wilderness Review and wilderness legislation, WSAs and Wilderness Areas would be closed to vehicle use, except on designated pre-existing vehicle ways.
- **TRANS-COM2.** Complete route maintenance and improvement work in accordance with implementation standards and references from the following sources:
  - BLM Manuals 9113, H-9113-2, and 9114
  - Federal Highway Administration (FHWA) Standard Specifications for Construction of Roads and Bridges on Federal Highway Projects Standards
  - U.S. Forest Service Trails Handbook 2309.18 (Section 2.32 (a)(b)(c))
- **TRANS-C1.** Reclaim redundant road systems or roads that no longer serve their intended purpose to protect sensitive resources, reduce sediment transport, and control erosion.
- **TRANS-C2.** Implement BMPs to reduce off-site water quality impacts from roads and trails that no longer serve their original purpose or exceed State soil loss standards.

- **TRANS-C3.** Temporarily close roads to vehicle use during periods of extreme wet weather in areas where sustained vehicle use may compromise the integrity of the road surface.
- **TRANS-C4.** Mitigate or relocate travel routes that traverse riparian areas or cross critical habitat, and occupied or potential habitat, of special status species.

BLM Best Management Practices (BMPs) and Standard Operating Procedures (SOPs) are listed in Appendix D of this EIS. They are BLM 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. Several BMPs and SOPs listed in Appendix D, Section 1.6 (Oil and Gas Standard Operating Procedures, Implementation Guidelines and Conditions of Approval) would apply to reducing potential impacts to BLM transportation facilities and land accessibility from oil and gas leases.

Assumptions

The following assumptions were used to complete the analysis for transportation and access impacts from the proposed Resource Management Plan Amendment (RMPA):

- Future environmental analyses would be conducted, as appropriate, for project- and site-specific actions proposed in the CCFO administrative boundary. Applications for Permit to Drill would address potential loss of access or disruption to existing transportation routes from oil and gas development on BLM affected transportation facilities.
- As described in Section 2.5.2, the same level of oil and gas development under the 2015 RFD Scenario would apply to Alternatives A, C, D, and E (i.e., 37 exploratory and development wells on 206 acres of disturbance). Alternative B would have 32 development wells and up to 179 acres of disturbance.
- All surface-disturbing activities related to the 2015 RFD Scenario would most likely occur on BLM-administered mineral estate in Fresno, Monterey, and San Benito Counties within the area of high oil and gas occurrence potential (shown in Figure 5-1) for the CCFO but may potentially occur anywhere that is open to oil and gas leasing.
- New oil and gas well locations developed under the 2015 RFD Scenario would most likely be within or near established producing oil and gas fields but may potentially occur anywhere that is open to oil and gas leasing.

4.18.2 Impacts Common to All Alternatives

Development of New Roads

Under the 2015 RFD Scenario, up to 37 exploratory and development wells would be developed on a maximum of 206 acres of disturbance. This disturbance area includes any new access roads needed to access the new well sites. This amount of oil and gas development would require only short (approximately 0.25 to 0.5 miles long) segments of new roads, which would likely be closed to the public and for oil and gas worker use only. New access roads would most likely be located within, or adjacent to, existing oil and gas fields.

In general, the heavy equipment and materials needed for well development and stimulations do not pose unique transportation challenges. New access roads or improvements may be necessary if new well sites are not served by existing roadways, or access routes are not built to support heavy truck traffic up to the Federal limit of 80,000 pounds gross vehicle weight for the National Network (Title 23 Code of Federal Regulations [CFR] Part 658). In addition, a small number of one-time oversized and overweight shipments may be required for larger earthmoving equipment used in site preparation.

The construction of new roads is not considered to have secondary maintenance and system management impacts, as the well developer would likely maintain these roads to ensure site access. Changes in the level and types of traffic could result in secondary impacts on the governmental entities that manage the road system if added sign maintenance or patrol becomes warranted in order to institute these restrictions.

Alter the Availability or Accessibility of BLM Routes of Travel

Under all alternatives, the BLM's management of travel routes and access would remain identical to that under the existing 2007 HFO RMP. Some level of use restriction to existing open travel routes and access points on BLM lands may be necessary to varying degrees under the various alternatives with the 2015 RFD Scenario. This may include temporary or permanent closure of roads due to the presence of new wells, or due to a new private access roadway restricting public traffic flow or access requiring a change in travel route designations (i.e., open, limited, or closed). Site closure is typically necessary for well development, which limits travel to and from off-site locations. Depending on the location, this disruption may create minor or negligible adverse effects, as some users may prefer to use existing BLM open routes year-round. Furthermore, the development of wells and facilities under the 2015 RFD Scenario may alter the amount and distribution of oil and gas-related traffic on existing roads.

User conflicts could potentially occur in areas where there is public non-motorized and motorized use within the same travel ways as oil and gas related traffic and uses. It is anticipated that motorized recreational vehicle traffic on roads and trails remaining open would increase incrementally over time, and may increase as a result of road closures redirecting traffic to open roadways.

It is possible that portions of new lease areas could be fenced or marked to prohibit public use. This could occur in areas currently used by the public for access to recreational opportunities or for travel on BLM-administered lands. While related to transportation and access, this type of potential impact is also considered a land use conflict, which is specifically discussed in Sections 4.14 (Special Management Areas) and 4.19 (Lands and Realty). Because most access in the CCFO Planning Area is dependent on motor vehicles, the location of travel routes and the potential loss of access to recreation assets must be considered with new oil and gas leasing activity. As identified in the assumptions presented in Section 4.18.1, this would occur during future environmental analyses for all lease applications and permits to drill. While other land uses are allowed within the areas proposed for open oil and gas leasing, these uses must be compatible with the resources and values that the land designation is intended to protect. Depending on the alternative, management actions may apply to protect lease areas for Recreation and Public Purposes (ENERG-COM3 in Alternatives A and D) or to minimize or eliminate conflict between oil and gas development and existing surface uses (CSU stipulations in each alternative except Alternative A). The analysis of land use issues is provided in Sections 4.14 (Special Management Areas) and 4.19 (Lands and Realty).

Traffic Generation

Activities under the 2015 RFD Scenario may increase traffic on nearby roads. The majority of trips generated would be temporary, occurring primarily during well development and any stimulation treatments. Once operational, each well would generate a negligible amount of daily vehicle trips. The primary impact of concern would be any performance degradation of roadways providing key access to the well sites. Because the location of future wells is unknown, a quantitative trip analysis is not feasible as the utilized roadways are unknown. However, the distance of well sites from major roads will to some extent determine the potential for traffic to change local circulation patterns or degrade local roads and cause congestion problems, especially from heavy-duty trucks. In general, commuting workers and equipment and materials deliveries to each well during development would cause a small increase in the existing volume of traffic on roadways and highways providing local and regional access. For a well stimulation treatment, the maximum trips generated per well stimulation project would be approximately 51 trips per day (DOC, 2015).

An important aspect when considering traffic volume increases over existing conditions is the life cycle of existing oil and gas extraction. As the availability of oil and gas resources decline, production decreases. Existing traffic volumes from current field activities, including well stimulations, also would decrease as compared to periods of higher oil and gas production. As most of the recoverable resource is removed, well stimulation is no longer effective in increasing flow to a level that would justify its continued use. Therefore, as new activities (and any new traffic volumes) that occur under the 2015 RFD Scenario are introduced, existing activities (and any existing traffic volumes) would be reduced as production declines and wells are decommissioned. Therefore, over the life of the 2015 RFD Scenario (15-20 years), no net traffic increases may occur from the development of up to 37 new wells.

Existing Mitigation Strategies

Existing BLM strategies in place as part of the existing RMP guide management of transportation and access facilities. These management actions would indirectly mitigate the adverse effects of oil and gas development and their effects on BLM transportation facilities. These requirements would apply to all future environmental analyses, wells, well stimulations, and other enhanced oil recovery techniques occurring under the 2015 RFD Scenario on BLM-administered mineral estate for all alternatives. As stated within the existing RMP, the primary management strategy is that public vehicle use on all BLM lands would be "limited" to designated routes, except as noted. BLM lands closed to vehicle use, except on designated pre-existing vehicle ways, are also discussed in Sections 4.14 (Special Management Areas) and 4.19 (Lands and Realty).

Existing BLM standards regarding road design, construction, and maintenance are described in BLM Manual 9113 (BLM, 1985). An access road siting and management plan should be prepared incorporating these standards, as appropriate. Generally, roads should be required to follow natural contours; be constructed in accordance with standards described in BLM Manual 9113; and be reclaimed to BLM standards. As described in BLM Manual 9113, BLM roads should be designed to appropriate standards no higher than necessary to accommodate their intended functions.

4.18.3 Impacts of Alternative A (No Action)

This alternative maintains the management direction of the 2007 HFO RMP. As described in Section 4.18.1, the same level of oil and gas development under the 2015 RFD Scenario would apply to the No Action Alternative (i.e., 37 wells and 206 acres of disturbance). Therefore, the level of traffic volumes from 2015 RFD Scenario activities would be the same for all alternatives, with common impacts described in Section 4.18.2.

Alternative A would designate the largest acreage of Federal mineral estate open to oil and gas leasing, which would provide the BLM with greater flexibility in identifying sites for locating ground disturbance activities. Utilizing a larger area available for the 206 acres of surface disturbance under the 2015 RFD Scenario may avoid the need for new access roads and potential conflicts regarding public transportation routes and access to BLM resources. Disruption to existing BLM transportation routes and access impacts associated with oil and gas development may be less severe under Alternative A when compared to the other alternatives. See Sections 4.14 (Special Management Areas) and 4.19 (Lands and Realty) for a discussion of land use issues.

Leases Subject to Settlement Agreement – Subalternative 1

Under Alternative A Subalternative 1, the 14 non-NSO leases subject to the settlement agreement would be issued. The nearest incorporated communities to these leases are Coalinga (Fresno County) and King City (Monterey County). It is unknown how many wells may be developed within these leases. As discussed in Section 3.18.4, the eight non-NSO leases in San Benito County are within 7 miles of the active Vallecitos oil and gas field boundary, as shown in Figure 2-1 (detailed view), and the six non-NSO leases

in Monterey County are located within 10 miles of the active San Ardo oil and gas field. Because these leases are located proximate to areas with existing oil and gas development, relatively minor lengths of new access roads would be needed, as described in the 2015 RFD Scenario. Vehicle trip volumes from these leases are expected to be minor and would occur under the 2015 RFD Scenario, as described in Section 4.18.2.

Alternative A Subalternative 1 would not change the current transportation management goals, objectives, and direction of the lease areas as specified in the 2007 HFO RMP. The existing BLM mitigation strategies discussed above in Section 4.18.2 and surface transportation management within the existing RMP would apply to oil and gas activities within these leases. As described in Section 4.19 (Lands and Realty), the implementation of these leases under Alternative A Subalternative 1 would not create a land use conflict. Therefore, all facilities (including new access roads) associated with these leases are not expected to adversely affect current BLM transportation routes or access management.

Leases Subject to Settlement Agreement – Subalternative 2

The two non-NSO leases as identified in Case No. 11-06174 should not have been issued, and the 12 prospective non-NSO leases as identified in Case No. 13-1749 would not be issued. As such, no resource impact would occur.

4.18.4 Impacts of Alternative B

Relative to Alternative A, Alternative B would also have oil and gas development occurring under the 2015 RFD Scenario but only up to 32 wells. Alternative B includes approximately 39,000 acres of Federal mineral estate open to oil and gas leasing with CSU stipulations. Open lease areas are restricted to Federal mineral estate within the boundaries of oil and gas fields plus a 0.5-mile buffer as defined by DOGGR. This alternative would designate the least acreage of Federal mineral estate available for oil and gas leasing among all of the alternatives.

When considering the proposed locations of Federal mineral estate open to oil and gas leasing under Alternative B on Figure 2-2, all designated areas are located within the southern portion of the CCFO Planning Area in Monterey, San Benito, and Fresno County. As described in Section 4.18.1, these are the areas where most oil and gas development on BLM-administered mineral estate is expected to occur under the 2015 RFD Scenario. Therefore, the common impacts described in Section 4.18.2 describe those expected under Alternative B. It is likely that new leases and wells under Alternative B could utilize existing transportation routes already providing access to existing oil and gas extraction areas. However, the construction of any new access roads is included within the total disturbance area of 206 acres under the 2015 RFD Scenario.

As discussed in Section 4.18.2, the minor to negligible adverse effects of development of wells and other facilities under the 2015 RFD Scenario include potentially decreasing use of transportation routes and accessibility to surrounding lands. Depending on the location of a lease and well facility, existing BLM travel routes and access points may be altered. While well facilities may be configured to allow some public access through the lease area, it's possible new leases under the 2015 RFD Scenario result in minor adverse effects by establishing new restrictions on existing transportation routes and access points.

As described in Section 4.18.2, existing BLM management strategies are currently in place under the 2007 HFO RMP for transportation routes and access. In addition to these management strategies, Mitigation Measure TR-1 could be implemented to reduce the disruption of existing BLM transportation routes or access points as a result of oil and gas development under Alternative B. With the implementation of this measure, impacts on local transportation networks from the 2015 RFD Scenario under Alternative B would be negligible. Furthermore, any adverse effect may be offset somewhat should new access roads be available to the public as part of new oil and gas leases. New or improved access roads may provide valuable new backbone routes through BLM affected portions of the CCFO Planning Area.

Mitigation

TR-1 **Travel Routes and Access to Open Lands.** Existing roads should be used to the maximum extent possible, but only if in safe and environmentally sound locations and manners. If existing BLM travel routes or access points currently available for public use under the applicable RMP are disrupted temporarily or permanently by oil and gas leases, developers and/or lease holders shall be required to provide alternate replacement transportation routes and ensure continued public access to previously accessible public lands. All new transportation routes or access roads required as part of developing an oil and gas lease area shall be designed and constructed to all appropriate BLM standards.

Leases Subject to Settlement Agreement

Under Alternative B, a portion of the area of 14 non-NSO leases, as identified in Case No. 11-06174 and Case No. 13-1749, would be available for oil and gas development (Section 2.7.2) and subject to resulting impacts as discussed above. The remaining areas of the leases would be closed to oil and gas development. Depending on location, some entire leases would be open for development, others would be all or nearly all closed. Many would have a mixture of open and closed areas. Of the total lease area of approximately 17,600 acres, 22 percent would be open with CSU stipulations and 78 percent would be closed. CSU stipulations would be used to avoid and minimize impacts to certain sensitive biological resources.

4.18.5 Impacts of Alternative C

Under Alternative C, approximately 368,800 acres of Federal mineral estate would be open to oil and gas leasing with CSU stipulations and 29,800 acres would be open with NSO. The designated open lease areas would include Federal mineral estate within high oil and gas occurrence potential areas or within the boundaries of oil and gas fields plus a 0.5-mile buffer as defined by DOGGR. The alternative would designate a moderate acreage of Federal mineral estate as available for oil and gas leasing compared with the other alternatives (i.e., less than Alternatives A and E, more than Alternatives B and D). It should be noted that Alternative C distributes designated open lease area similar to Alternative A within Monterey, San Benito, and Fresno Counties.

When considering the proposed locations of Federal mineral estate open to oil and gas leasing under Alternative C on Figure 2-3, the majority of designated lands are located within the southern portion of the CCFO Planning Area in Monterey, San Benito, and Fresno County. As described in Section 4.18.1, these are the areas where most oil and gas development on BLM-administered mineral estate is expected to occur under the 2015 RFD Scenario. Therefore, the common impacts described in Section 4.18.2 describe those expected under Alternative B. When compared to Alternative A and B, the transportation and access impacts associated with Alternative C would be similar or identical programmatically.

Mitigation Measure TR-1 could be implemented to reduce the disruption of existing BLM transportation routes or access points within the CCFO Planning Area from oil and gas development under Alternative C. With the implementation of this measure, impacts on local transportation networks from the 2015 RFD Scenario under Alternative C would be negligible.

Mitigation

TR-1 **Travel Routes and Access to Open Lands.**

Leases Subject to Settlement Agreement

Under Alternative C, the 14 non-NSO leases would be implemented in BLM-managed areas that are open to oil and gas leasing with CSU stipulations. The nearest incorporated communities to these leases are Coalinga (Fresno County) and King City (Monterey County). It is unknown how many wells may be

developed within these leases. However, because these leases are located within the expected areas where the majority of oil and gas development would occur within BLM-administered mineral estate under the 2015 RFD Scenario, impacts to transportation and access from development of these leases are described in Section 4.18.2. The existing BLM transportation management actions and Mitigation Measure TR-1 could be implemented for oil and gas developments and activities within these leases under Alternative C if adopted by BLM.

4.18.6 Impacts of Alternative D

Under Alternative D, approximately 121,200 acres of Federal mineral estate would be open to oil and gas leasing with CSU stipulations and 16,400 acres would be open with NSO. Open lease areas are restricted to Federal mineral estate underlying BLM surface estate. All BLM split estate lands and the Ciervo Panoche Natural Area would be closed to leasing.

When considering the proposed locations of Federal mineral estate open to oil and gas leasing under Alternative D on Figure 2-4, the majority of designated areas are located within the southern portion of the CCFO Planning Area in Monterey, San Benito, and Fresno County. As described in Section 4.18.1, these are the areas where most oil and gas development on BLM-administered mineral estate is expected to occur under the 2015 RFD Scenario. Therefore, the common impacts described in Section 4.18.2 describe those expected under Alternative B. When compared to Alternatives A through C, the transportation and access impacts associated with Alternative D would be similar or identical programmatically.

Mitigation Measure TR-1 could be implemented to reduce the disruption of existing BLM transportation routes or access points within the CCFO Planning Area from oil and gas development under Alternative D. With the implementation of this measure, impacts on local transportation networks from the 2015 RFD Scenario under Alternative D would be negligible.

Mitigation

TR-1 Travel Routes and Access to Open Lands.

Leases Subject to Settlement Agreement

Under Alternative D, a portion of the area of 14 non-NSO leases, as identified in Case No. 11-06174 and Case No. 13-1749, would be available for oil and gas development (Section 2.9.2) and subject to resulting impacts as discussed above. The remaining areas of the leases would be closed to oil and gas development. Depending on location, some entire leases would be open for development, others would be all or nearly all closed. Many would have a mixture of open and closed areas. Of the total lease area of approximately 17,600 acres, approximately 25 percent would be open with CSU stipulations and 75 percent would be closed. CSU stipulations would be used to avoid and minimize impacts to certain sensitive biological resources.

4.18.7 Impacts of Alternative E

Under Alternative E, approximately 487,200 acres of Federal mineral estate would be open to oil and gas leasing with CSU stipulations and 206,400 acres would be open with NSO. The designated open lease areas would include Federal mineral estate outside of a California DWR Bulletin 118, Groundwater Basin or Sub-basin. The alternative would designate the second largest acreage of Federal mineral estate available for oil and gas leasing among all of the alternatives.

When considering the proposed locations of Federal mineral estate open to oil and gas leasing under Alternative E on Figure 2-5, the majority of designated lands are located within the southern portion of the CCFO Planning Area in Monterey, San Benito, and Fresno County. As described in Section 4.18.1, these are the areas where most oil and gas development on BLM-administered mineral estate is expected to

occur under the 2015 RFD Scenario. Therefore, the common impacts described in Section 4.18.2 describe those expected under Alternative B. When compared to Alternatives A through D, the transportation and access impacts associated with Alternative E would be similar or identical programmatically.

Mitigation Measure TR-1 could be implemented to reduce disruption of existing BLM transportation routes or access points within the CCFO Planning Area from oil and gas development under Alternative E. With the implementation of this measure, impacts on local transportation networks from the 2015 RFD Scenario under Alternative E would be negligible.

Mitigation

TR-1 Travel Routes and Access to Open Lands.

Leases Subject to Settlement Agreement

Under Alternative E, a portion of the 14 non-NSO leases would be open to leasing. Of the total lease area of approximately 17,600 acres, approximately 57 percent would be open with CSU stipulations, 41 percent would be open with NSO, and 2 percent would be closed. Alternative E would incorporate new restrictions in the current management goals, objectives, and direction of the lease areas from what was specified in the 2007 HFO RMP. The existing BLM transportation management actions and Mitigation Measure TR-1 could be implemented for oil and gas developments and activities within these leases under Alternative E if adopted by BLM.

4.19 Lands and Realty

The BLM's resource management program for Lands and Realty (i.e., Lands and Realty program) includes land tenure adjustments (e.g., disposals and acquisitions), land use authorizations (i.e., leases, permits, right-of-way grants), and withdrawals in order to facilitate management of public lands and resources in the planning area. As discussed in Section 3.19 (Lands and Realty), this RMPA/EIS analyzes the effects of land use authorizations pertaining to oil and gas leasing that would apply to each of the Draft RMPA alternatives (i.e., areas designated open or closed to leasing and applicable stipulations).

4.19.1 Introduction

Approach to Impact Assessment

The goal for lands and realty management presented in the 2007 HFO RMP, including withdrawals, is to provide lands, interests in land, and authorizations for public and private uses while maintaining and improving resource values and public land administration. Management of land tenure adjustments and withdrawals would not be affected by the Draft RMPA alternatives, and would remain consistent with the management actions established in the 2007 HFO RMP.

For this analysis, the area considered for land use authorizations consists of the BLM-administered surface land and split estate land where BLM manages the Federal mineral estate within the CCFO administrative boundary. The following types of Lands and Realty impacts may occur:

- Direct impacts are those that either reduce or enlarge the area upon which land use authorizations can occur (e.g., identification of exclusion areas reduces the locations in which use authorizations may be issued). As such, the number of acres where lands and realty actions are potentially restricted is used to indicate the impact of management actions and decisions.
- Indirect impacts would potentially occur from restrictions that limit the type of development allowed by a specific use authorization (e.g., requirements to comply with BMPs and SOPs). BMPs could be applied as Conditions of Approval (COA) at the time of permitting of oil and gas drilling or related operations or other activities.

Assumptions

The analysis is based on the following assumptions:

- The following areas identified in the 2007 HFO RMP would not change: land tenure adjustments (i.e., retention and disposal areas), areas identified for withdrawal, and avoidance and exclusion areas for non-oil and gas projects.
- Oil and gas lease stipulations and COAs that limit land use authorizations (e.g., ROWs, leases, and permits) to support oil and gas development would not preclude the BLM from granting land use authorizations for other purposes (not related to oil and gas).
- Future environmental analyses would be conducted, as appropriate, for project- and site-specific actions proposed in the CCFO Planning Area. Applications for Permit to Drill would address potential conflicts between oil and gas development and other resources within the site specific area.
- As described in Section 2.5.2, the same level of oil and gas development under the 2015 RFD Scenario would apply to each alternative (i.e., 37 exploratory and development wells on 206 acres of disturbance).
- All surface-disturbing activities related to the 2015 RFD Scenario would most likely occur on BLM-administered mineral estate in Fresno, Monterey, and San Benito Counties within the area of high oil and gas potential (shown in Figure 5-1) for the CCFO Planning Area but may potentially occur anywhere that is open to oil and gas leasing. New oil and gas well locations would most likely be within or near established producing oil and gas fields.

4.19.2 Impacts Common to All Alternatives

This section describes typical impacts to BLM lands and realty specifically associated with various oil and gas facilities and infrastructure that would be permitted under the Draft RMPA alternatives. For each alternative, the development of oil and gas facilities would establish a long-term industrial use at future lease sites, which may prevent the authorization of non-energy land uses in the area (e.g., recreation, agriculture).

Impacts from Oil and Gas Development

As discussed in the 2015 RFD Scenario, it is unlikely that more than 37 exploratory and development wells would be drilled on Federal oil and gas leases. The development of new wells within the CCFO Planning Area would create long-term impacts during well construction, operation, and decommissioning. Construction and decommissioning activities could disrupt existing land uses, prevent access to some locations, or conflict with BLM policies or regulations pertaining to non-energy land uses, leading to impacts that could range from minor to major. Operation and maintenance activities on BLM-administered mineral estate would require long-term land use that could convert BLM lands to permanent industrial use. Other long-term impacts may include closing public areas and removing BLM lands from non-energy land uses such as recreation. Long-term changes to established land uses would create a permanent, major impact. Many of these conflicts with existing land uses and surface land owners were identified as issues of concern during the BLM's Social and Economic Workshop held on February 4, 2015 (see Appendix F).

Potential oil and gas activities within the CCFO Planning Area would include seismic operations (i.e., geophysical exploration), exploration drilling, and field development and production. The total estimated surface disturbance for the 37 exploratory and development wells would be up to 206 acres. This estimate includes all anticipated forms of ground disturbance such as the construction of well pads, roads, onsite facilities, and pipelines.

Well stimulation technologies (e.g., hydraulic fracturing, acid matrix stimulation, acid fracturing) and enhanced oil recovery techniques (e.g., cyclic steam, steam flood, water flood) may be used on any or all of the 37 wells. While the equipment and methods vary for each technology, the well stimulation operations would occur entirely within the well pad and no additional ground disturbance would be anticipated beyond what has already been considered in the 206-acre estimate.

Impacts from Management Actions

As discussed in Section 3.19 (Lands and Realty), the area considered for land use authorizations includes approximately 793,000 acres of Federal mineral estate within the CCFO Planning Area. The total acreage that would be open for leasing (with or without stipulations) under the Draft RMPA/EIS alternatives ranges from 39,000 acres (Alternative B) to 725,500 acres (Alternative A). Sections 4.19.3 through 4.19.7 describe the range in total acreage open for leasing under each alternative, while a minimum of 67,500 acres would be closed to leasing under all alternatives. Areas closed to leasing limit the potential for oil and gas developments to preclude other land use authorizations not related to oil and gas in those areas. Current management decisions under the 2007 HFO RMP would continue to determine non-oil and gas land use authorizations within the CCFO Decision Area.

Best Management Practices

The BLM has developed requirements for conducting environmentally responsible oil and gas operations on BLM-administered surface land and split estate land. Appendix D (Best Management Practices) includes a compilation of existing BLM policies, guidelines, and practices designed to prevent unnecessary or undue degradation of public land resources. The BLM has also identified specific oil and gas development requirements to minimize environmental impacts, which are separately published in the Surface Operating Standards and Guidelines for Oil and Gas Exploration and Development (commonly referred to as

The Gold Book). For each Application for Permit to Drill (APD), the BLM would select and apply BMPs based on site-specific conditions to meet a variety of resource objectives for specific management actions.

4.19.3 Impacts of Alternative A (No Action)

Impacts from Oil and Gas Development

Under Alternative A, approximately 683,800 acres of Federal mineral estate would be open to oil and gas leasing with CSU stipulations and 41,700 acres would be open to oil and gas leasing with No Surface Occupancy (NSO). This alternative maintains the management direction of the 2007 HFO RMP under which all Federal mineral estate would be available for oil and gas leasing with the exception specific exclusion areas (i.e., Wilderness Areas, Wilderness Study Areas, Clear Creek Serpentine Area of Critical Environmental Concern, and Fort Ord National Monument).

As described in Section 2.5.2, the same level of oil and gas development would apply to each alternative (i.e., 206 acres of disturbance). Alternative A would designate the largest acreage of Federal mineral estate open to leasing, which would provide the BLM with greater flexibility in identifying sites for locating ground disturbance activities than the other RMPA alternatives. However, under each of the alternatives new oil and gas well locations would most likely be within or near established producing oil and gas fields. Surface disturbance impacts associated with oil and gas development would be long-term, but would be moderate under Alternative A given the expected proximity of new oil and gas development to existing production areas.

Impacts from Management Actions

New oil and gas related land use authorizations would be considered on a case-by-case basis, but denied in exclusion areas. Under Alternative A, approximately 41,700 acres would be subject to NSO stipulations, which are identified in Section 2.10 as the following:

- **ENERG-COM3.** Require No Surface Occupancy stipulations on all Recreation and Public Purposes (R&PP) lease areas.
- **ENERG-C1.** Oil and gas leases in Areas of Critical Environmental Concern (ACECs) would stipulate No Surface Occupancy in special status species habitat (BLM, 2007; Appendix D)

Areas subject to stipulations could restrict the placement or routing of oil and gas infrastructure (i.e., roads or pipelines), which may limit access or delay energy projects. However, the above stipulations would effectively avoid conflicts between oil and gas development and existing BLM land management and land use authorizations in ACECs and R&PP leases. Endangered species stipulations would apply to all areas open to oil and gas leasing. With application of these stipulations, impacts to land use authorizations would be negligible.

Mitigation

The BLM would require BMPs, stipulations, and other COAs during its project- and site-specific review and approval of oil and gas lease applications and APDs. No additional mitigation is recommended for Alternative A.

Leases Subject to Settlement Agreement – Subalternative 1

Under Alternative A, the 14 non-NSO leases subject to the settlement agreement would be issued. Alternative A would not change the current management goals, objectives, and direction of the lease areas as specified in the 2007 HFO RMP. Consequently, this alternative would not create a conflict with existing land-use authorizations. Endangered species stipulations would apply to each of the 14 leases, while new NSO stipulations would not apply. Given the application of the 2007 HFO RMP as well as endangered species stipulations, the 14 leases would have a negligible impact on land use authorizations under Alternative A.

Leases Subject to Settlement Agreement – Subalternative 2

The two non-NSO leases as identified in Case No. 11-06174 should not have been issued, and the 12 prospective non-NSO leases as identified in Case No. 13-1749 would not be issued. As such, no resource impact would occur.

4.19.4 Impacts of Alternative B

Impacts from Oil and Gas Development

Under Alternative B, 39,000 acres of Federal mineral estate would be open to oil and gas leasing with CSU stipulations. Open lease areas are restricted to Federal mineral estate within the boundaries of oil and gas fields plus a 0.5-mile buffer as defined by DOGGR.

As described in Section 2.5.2, the same level of oil and gas development would apply to each alternative (i.e., 206 acres of disturbance). Alternative B would designate the least acreage of Federal mineral estate open to leasing among all alternatives, which would restrict the BLM's options for locating ground disturbance activities. However, under each of the alternatives new oil and gas well locations would likely be within or near established producing oil and gas fields. Surface disturbance impacts resulting from Alternative B would be long-term, but would be moderate given the expected proximity of new oil and gas development to existing production areas.

Impacts from Management Actions

For each alternative, new oil and gas related land use authorizations would be considered on a case-by-case basis but denied in exclusion areas. Unlike Alternative A, Alternative B would require CSU stipulations on all Federal mineral estate open to oil and gas leasing, which are identified in Section 2.10 as the following:

- **ENERG-A2.** Public lands within oil and gas fields plus a 0.5-mile buffer defined by DOGGR would be open to mineral leasing; all other public lands would be closed to mineral leasing.
- **ENERG-A3.** Require CSU stipulations on all public lands open to mineral leasing.

Areas subject to stipulations could restrict the placement or routing of oil and gas infrastructure (i.e., roads or pipelines), which may limit access or delay energy projects. The above stipulations would severely restrict oil and gas extraction in areas of "high oil and gas occurrence potential," and the BLM would likely grant non-energy land use authorizations in areas closed to oil and gas leasing. However, the BLM would apply the above stipulations to all land management decisions under Alternative B, thereby avoiding conflicts between existing authorizations and future land uses. Impacts from management actions would be negligible.

Mitigation

The BLM would require BMPs, stipulations, and other COAs during its project- and site-specific review and approval of oil and gas lease applications and APDs. No additional mitigation is recommended for Alternative B.

Leases Subject to Settlement Agreement

Under Alternative B, approximately 78 percent of the 14 non-NSO leases would be closed to leasing. Unlike Alternative A, Alternative B would change the current management goals, objectives, and direction of the lease areas from what was specified in the 2007 HFO RMP. Non-energy land use authorizations that may be granted in this area could conflict with existing oil and gas activities, which may result in moderate impacts under Alternative B. Such impacts would be greater than the negligible impacts associated with Alternatives A and C.

4.19.5 Impacts of Alternative C

Impacts from Oil and Gas Development

Under Alternative C, approximately 368,800 acres of Federal mineral estate would be open to oil and gas leasing with CSU stipulations and 29,800 would be open with NSO. The designated open lease areas would include Federal mineral estate within high oil and gas occurrence potential areas or within the boundaries of oil and gas fields plus a 0.5-mile buffer as defined by DOGGR, with the exception of core population areas of the kangaroo rat in the vicinity of the Panoche, Griswold, Tumey, and Ciervo Hills which are closed to leasing.

As described in Section 2.5.2, the same level of oil and gas development would apply to each alternative (i.e., 206 acres of disturbance). Alternative C would designate more acreage of Federal mineral estate open to leasing than Alternatives B and D, which would provide the BLM with greater flexibility in identifying sites for locating ground disturbance activities than under those alternatives. However, under each of the alternatives new oil and gas well locations would most likely be within or near established producing oil and gas fields. Surface disturbance impacts associated with oil and gas development would be long-term, but would be moderate under Alternative C given the expected proximity of new oil and gas development to existing production areas.

Impacts from Management Actions

For each alternative, new oil and gas related land use authorizations would be considered on a case-by-case basis but denied in exclusion areas. Unlike Alternative A but similar to Alternative B, Alternative C would require CSU stipulations on all Federal mineral estate open to oil and gas leasing. Under Alternative C, approximately 29,800 acres would be subject to NSO stipulations, which are identified in Section 2.10 as the following:

- **ENERG-A3.** Require CSU stipulations on all public lands open to mineral leasing.
- **ENERG-A4.** Public lands within areas of high oil and gas potential or public lands within oil and gas fields plus a 0.5-mile buffer defined by DOGGR would be open to mineral leasing, with the exception of core population areas of the kangaroo rat in the vicinity of Panoche, Griswold, Tumey, and Ciervo Hills which are closed to leasing. Public lands within areas of moderate, low, and no potential would be closed to mineral leasing.
- **ENERG-A5.** Require NSO stipulations for public lands open to leasing which include: (1) threatened and endangered species critical habitat; (2) BLM developed recreation and administrative sites; and (3) special status split estate lands (e.g., state parks, county parks, conservation easements, land trusts, and scenic designations).

Areas subject to stipulations could restrict the placement or routing of oil and gas infrastructure (i.e., roads or pipelines), which may limit access or delay energy projects. The above stipulations would restrict oil and gas extraction in areas of "high oil and gas occurrence potential," and the BLM would likely grant non-energy land use authorizations in areas closed to leasing. However, the above stipulations would also avoid conflicts between oil and gas development and existing BLM land management and land use authorizations applicable to developed recreation sites and other areas of special designation (i.e., state parks, county parks, conservation easements, land trusts, scenic designations). With application of these stipulations, impacts to land use authorizations would be negligible.

Mitigation

The BLM would require BMPs, stipulations, and other COAs during its project- and site-specific review and approval of oil and gas lease applications and APDs. No additional mitigation is recommended for Alternative C.

Leases Subject to Settlement Agreement

Under Alternative C, the 14 non-NSO leases would be in BLM-managed areas that are open to leasing with CSU stipulations. Alternative C would not change the current management goals, objectives, and direction of the 14 leases, and no NSO stipulations would apply to the lease areas. Given the application of the 2007 HFO RMP, the 14 leases would have a negligible impact on land use authorizations under Alternative C.

4.19.6 Impacts of Alternative D

Under Alternative D, approximately 121,200 acres of Federal mineral estate would be open to oil and gas leasing with CSU stipulations and 16,400 acres would be open to oil and gas leasing with NSO. Open lease areas are restricted to Federal mineral estate underlying BLM surface estate. All BLM split estate lands and the Ciervo Panoche Natural Area would be closed to leasing. This alternative would designate the second smallest acreage of Federal mineral estate available for oil and gas leasing among all of the alternatives.

As described in Section 2.5.2, the same level of oil and gas development would apply to each alternative (i.e., 206 acres of disturbance). Alternative D would designate less acreage of Federal mineral estate open to leasing than Alternatives A, C, and E. The smaller acreage available for leasing would restrict the BLM's options for locating ground disturbance activities. However, under each of the alternatives new oil and gas well locations would most likely be within or near established producing oil and gas fields. Surface disturbance impacts under Alternative D would be long-term, but would be moderate given the expected proximity of new oil and gas development to existing production areas.

Impacts from Management Actions

For each alternative, new oil and gas related land use authorizations would be considered on a case-by-case basis but denied in exclusion areas. Unlike Alternative A but similar to Alternatives B and C, Alternative D would require CSU stipulations on all Federal mineral estate open to oil and gas leasing. Under Alternative D, approximately 16,400 acres would be subject to NSO stipulations, which are identified in Section 2.10 as the following:

- **ENERG-COM3.** Require No Surface Occupancy stipulations on all R&PP lease areas.
- **ENERG-C1.** Oil and gas leases in ACECs would stipulate No Surface Occupancy in special status species habitat (BLM, 2007; Appendix D).
- **ENERG-A3.** Require CSU stipulations on all public lands open to mineral leasing.
- **ENERG-A6.** Federal mineral estate underlying BLM surface estate would be open to mineral leasing. Split estate public lands would be closed to mineral leasing.

Areas subject to stipulations could restrict the placement or routing of oil and gas infrastructure (i.e., roads or pipelines), which may limit access or delay energy projects. The above stipulations would restrict oil and gas extraction in areas of "high oil and gas occurrence potential." However, the application of NSO stipulations over a larger management area under Alternative D would allow greater flexibility in the BLM's management of oil and gas resources compared to the restrictions that apply to Alternative B's smaller management area. Given that the BLM would apply the above stipulations to all land management decisions under Alternative D, impacts to land use authorizations would be negligible.

Mitigation

The BLM would require BMPs, stipulations, and other COAs during its project- and site-specific review and approval of oil and gas lease applications and APDs. No additional mitigation is recommended for Alternative D.

Leases Subject to Settlement Agreement

Under Alternative D, approximately 75 percent of the 14 non-NSO leases would be closed to leasing. Unlike Alternative A, Alternative D would change the current management goals, objectives, and direction of the lease areas from what was specified in the 2007 HFO RMP. Non-energy land use authorizations that may be granted in this area could conflict with existing oil and gas activities, which may result in moderate impacts under Alternative D. Such impacts would be greater than the negligible impacts associated with Alternatives A and C.

4.19.7 Impacts of Alternative E

Impacts from Oil and Gas Development

Under Alternative E, approximately 487,200 acres of Federal mineral estate would be open to oil and gas leasing with CSU stipulations and 206,400 acres would be open with NSO. The designated open lease areas would include Federal mineral estate outside of a California DWR Bulletin 118, Groundwater Basin or Sub-basin.

As described in Section 2.5.2, the same level of oil and gas development would apply to each alternative (i.e., 206 acres of disturbance). Alternative E would designate the second largest acreage of Federal mineral estate open to leasing (Alternative A being the largest), which would provide the BLM with greater flexibility in identifying sites for locating ground disturbance activities than under Alternatives B, C, and D. However, under each of the alternatives new oil and gas well locations would most likely be within or near established producing oil and gas fields. Surface disturbance impacts associated with oil and gas development would be long-term, but would be moderate under Alternative E given the expected proximity of new oil and gas development to existing production areas.

Impacts from Management Actions

For each alternative, new oil and gas related land use authorizations would be considered on a case-by-case basis but denied in exclusion areas. Unlike Alternative A but similar to the other alternatives, Alternative E would require CSU stipulations on all Federal mineral estate open to oil and gas leasing. Under Alternative E, approximately 206,400 acres would be subject to NSO stipulations, which are identified in Section 2.10 as the following:

- **ENERG-A3.** Require CSU stipulations on all public lands open to mineral leasing.
- **ENERG-A7.** Public lands outside of California DWR Bulletin 118 groundwater basins and sub-basins would be open to mineral leasing. Public lands within California DWR Bulletin 118 groundwater basins and sub-basins would be closed to mineral leasing.
- **ENERG-A8.** Require NSO stipulations for public lands open to leasing which include: (1) 12-digit Hydrologic Unit Codes (HUCs) intersecting EPA impaired, perennial surface waters (BLM surface and split estate); (2) 12-digit HUCs intersecting non-impaired, perennial surface waters that intersect split estate; (3) 12-digit HUC subwatersheds with the highest aquatic intactness score; (4) 0.25 miles from non-impaired, perennial surface waters; and (5) 0.25 miles from eligible Wild and Scenic Rivers.

Areas subject to stipulations could restrict the placement or routing of oil and gas infrastructure (i.e., roads or pipelines), which may limit access or delay energy projects. However, the above stipulations would effectively avoid conflicts between oil and gas development and existing BLM land management and land use authorizations. Of all the alternatives, Alternative E would establish the largest area to which stipulations would apply to oil and gas leases. With application of these stipulations, impacts to land use authorizations would be negligible.

Mitigation

The BLM would require BMPs, stipulations, and other COAs during its project- and site-specific review and approval of oil and gas lease applications and APDs. No additional mitigation is recommended for Alternative E.

Leases Subject to Settlement Agreement

Under Alternative E, approximately 57 percent of the 14 non-NSO leases would be open to leasing with CSU stipulations, 41 percent would be open in areas subject to NSO stipulations, and two percent would be closed to leasing. Unlike Alternative A, Alternative E would incorporate new restrictions in the current management goals, objectives, and direction of the lease areas from what was specified in the 2007 HFO RMP. While stipulations under Alternative E would not conflict with existing land-use authorizations, they would introduce restrictions to oil and gas extraction in areas of "high oil and gas occurrence potential." Non-energy land use authorizations that may be granted in this area could conflict with existing oil and gas activities, which may result in moderate impacts under Alternative E. Such impacts would be greater than the negligible impacts associated with Alternatives A and C.

4.20 Utility Corridors and Communication Sites

4.20.1 Introduction

This section describes the potential impacts to utility corridors and communication sites within the regions of the CCFO Planning Area that would be applicable to the Proposed RMPA. Impacts to transportation corridors within the CCFO Planning Area are discussed in Section 4.18 (Transportation and Access).

Methods of Analysis

When considering the existing oil and gas industry within the CCFO Planning Area, the regional study area for impacts to utility corridors and communication sites includes BLM-administered surface land and split estate land within the CCFO Planning Area. This area of analysis can be further defined to include only Federal mineral estate in the identified regions of high oil and gas occurrence potential, which is where future oil and gas development is most likely to occur (see Figure 3.20-1). Types of adverse effects on utility corridors and communication sites would include the following:

- Interference with the operations of existing utility infrastructure and communication facilities.
- Construction impacts from new utility infrastructure associated with oil and gas development under the Proposed RMPA.

Assumptions

The analysis is based on the following assumptions:

- The same level of oil and gas development under the 2015 RFD Scenario would apply to each alternative (i.e., 37 exploratory and development wells on 206 acres of disturbance).
- All surface-disturbing activities related to the 2015 RFD Scenario would likely occur on BLM-administered mineral estate in Fresno, Monterey, and San Benito Counties within the area of high oil and gas occurrence potential (shown in Figure 5-1) for the CCFO Planning Area.
- New oil and gas well locations developed under the 2015 RFD Scenario would likely be within, or proximate to, established producing oil and gas fields or near lands that are already leased for such activities.
- Ancillary facilities for oil and gas production (e.g., pipelines, compressor stations, etc.) and downstream activities such as oil processing at refineries and natural gas transmission and distribution are separate activities that would not be substantially affected by the RFD Scenario, aside from the need to carry produced oil and gas to the existing transmission pipeline network over a distance that is likely to be less than 10 miles.
- Electricity providers identified in Section 3.20 are assumed to have sufficient capacities to serve an increased electricity demand from oil and gas development within the CCFO Planning Area.

4.20.2 Impacts Common to All Alternatives

None of the Proposed RMPA alternatives would alter the use or designation of existing utility corridors within the CCFO Planning Area. Future expansion of utility rights in existing facilities and easements would have negligible impacts, because utility corridors would maintain their current designation and would continue to meet the needs of the State and local communities.

As discussed in Section 2.4, the 2015 RFD Scenario assumes that the current development trends in this region are likely to continue for the next 15 to 20 years. It is estimated that during the life of this RMPA, 37 total exploratory and development wells would be developed on up to 206 acres. This estimate includes all anticipated forms of ground disturbance such as the construction of well pads, roads, onsite

facilities, and pipelines. Well stimulation technologies (e.g., hydraulic fracturing, acid matrix stimulation, acid fracturing, etc.) and enhanced oil recovery techniques (e.g., cyclic steam, steam flood, water flood) may be used on any or all of the 37 wells during their life cycle. Utility-related impacts that would be the same for all alternatives include the following:

- **Oil and Gas Pipelines.** Under Alternatives A through E, the proposed 37 wells (32 wells for Alternative B) would be a minor expansion of existing oil and gas development and are not expected to require new or extensive pipeline infrastructure. New oil and gas leases would generally construct connectors to existing pipeline facilities over a distance that is likely to be less than 10 miles. Surface disturbance from the construction of pipeline connectors is included in the total estimate of up to 206 acres of disturbance.
- **Transmission Lines.** Under Alternatives A through E, well stimulation activities that may occur with the proposed oil and gas developments would require electricity from local providers. Extending existing power lines to provide a permanent supply of electricity to a new well pad or facility may be necessary. Since a new distribution power line ties into an existing distribution line or substation, the tie-in location generally occurs in previously disturbed areas and along existing ROWs or roads where the existing power line or substation is located. Electric distribution line extensions consist of the installation of new power poles, and may include vehicular travel for power pole installation in undisturbed areas. Surface disturbance from the construction of tie-ins is included in the total estimate of up to 206 acres of disturbance.
- **Communication Sites.** Under Alternatives A through E, communication facilities and ancillary equipment are permitted on public lands through ROW authorizations issued by the BLM. Per the discretion of the BLM, communication ROWs may be limited to currently occupied sites. Future oil and gas development would not be compatible with existing communication sites. As the BLM would review all ROW requests prior to their authorization, the BLM would avoid co-locating land uses or ROWs with conflicting operations.

Best Management Practices

The BLM has developed requirements for conducting environmentally responsible oil and gas operations on BLM-administered surface land and split estate land. Appendix D (Best Management Practices) includes a compilation of existing BLM policies, guidelines, and practices designed to prevent unnecessary or undue degradation of public land resources. The BLM has also identified specific oil and gas development requirements to minimize environmental impacts, which are separately published in the Surface Operating Standards and Guidelines for Oil and Gas Exploration and Development (commonly referred to as The Gold Book). For each Application for a Permit to Drill (APD), the BLM would select and apply BMPs based on site-specific conditions to meet a variety of resource objectives for specific management actions.

4.20.3 Impacts of Alternative A (No Action)

This alternative maintains the management direction of the 2007 HFO RMP. Any new lease applications would be reviewed by the BLM to avoid conflicts with existing land uses or ROW designations. With BLM's management of ROW authorizations, none of the alternatives would interfere with the operations of existing utility infrastructure and communication facilities. Impacts to existing utility corridors and communication sites would be negligible.

New oil and gas well locations would likely be within, or proximate to, established producing oil and gas fields or near lands that are already leased for such activities. Surface disturbance from the construction of ancillary oil and gas facilities (e.g., pipelines and connectors, compressor stations, transmission tie-ins) would represent a small portion of the total anticipated disturbance from oil and gas development (206 acres), which is a minimal area of impact given the size of the BLM's management area for the CCFO.

As part of each future permit or authorization for a facility, the BLM would identify BMPs (see Appendix D) to be implemented during construction and operation of all oil and gas ancillary facilities. Under Alternative A, surface disturbance impacts associated with oil and gas development would be long-term but moderate given BLM's compliance with 43 CFR 2806 (which directs the BLM to place new utility facilities within established corridors), and incorporation of BMPs for oil and gas operations.

As described in Section 2.5.2, the same level of oil and gas development would apply to each alternative (i.e., 37 wells and 206 acres of disturbance); consequently, adverse effects from the construction of new utility facilities associated with oil and gas development would be identical for Alternatives A through E.

Mitigation

The BLM would require BMPs, stipulations, and other COAs during its project- and site-specific review and approval of oil and gas lease applications and APDs. No additional mitigation is recommended for Alternative A.

Leases Subject to Settlement Agreement – Subalternative 1

Under Alternative A Subalternative 1, the 14 non-NSO leases subject to the settlement agreement would be issued. New oil and gas wells would be likely to require short segments of pipeline to reach existing pipeline infrastructure. Surface disturbance impacts associated with oil and gas development would be long-term, but would be moderate under Alternative A Subalternative 1 given BLM's compliance with 43 CFR 2806 (which directs the BLM to place new utility facilities within established corridors), and incorporation of BLM standards and guidelines for oil and gas operations. Adverse effects from new utility facilities would be less severe (i.e., minor) under Alternatives B and D, which would close more than three-fourths of the proposed lease areas to oil and gas development.

Leases Subject to Settlement Agreement – Subalternative 2

The two non-NSO leases as identified in Case No. 11-06174 should not have been issued, and the 12 prospective non-NSO leases as identified in Case No. 13-1749 would not be issued. As such, no resource impact would occur.

4.20.4 Impacts of Alternative B

Under Alternative B, approximately 39,000 acres of Federal mineral estate would be open to oil and gas leasing. New oil and gas well locations would be within, or proximate to, established producing oil and gas fields or near lands that are already leased for such activities. As part of each future permit or authorization for a facility, the BLM would identify BMPs (see Appendix D) to be implemented during construction and operation of all oil and gas ancillary facilities. Under Alternative B, surface disturbance impacts associated with oil and gas development would be long-term but moderate given BLM's compliance with 43 CFR 2806 (which directs the BLM to place new utility facilities within established corridors), and incorporation of BMPs for oil and gas operations. Slightly less oil and gas development would apply to Alternative B (i.e., 32 wells and 179 acres of disturbance); consequently, adverse effects from the construction of new utility facilities associated with oil and gas development under Alternative B could be slightly less.

Impacts to existing utility corridors and communication sites would be negligible. With BLM's management of ROW authorizations, none of the alternatives would interfere with the operations of existing utility infrastructure and communication facilities.

Mitigation

The BLM would require BMPs, stipulations, and other COAs during its project- and site-specific review and approval of oil and gas lease applications and APDs. No additional mitigation is recommended for Alternative B.

Leases Subject to Settlement Agreement

Under Alternative B, approximately 78 percent of the 14 non-NSO leases would be closed to leasing. Surface disturbance impacts associated with oil and gas development would be long-term, but minor under Alternative B given BLM's compliance with 43 CFR 2806 (which directs the BLM to place new utility facilities within established corridors), and incorporation of BLM standards and guidelines for oil and gas operations. The minor effects from Alternative B would be similar to Alternative D as both alternatives would allow less than one-quarter of the proposed leases to be open to oil and gas development. Impacts from the 14 non-NSO leases would be greater under Alternatives A, C, and E, which would allow between 98 to 100 percent of the 14 proposed lease areas to be open to oil and gas development.

4.20.5 Impacts of Alternative C

Under Alternative C, approximately 368,800 acres of Federal mineral estate would be open to oil and gas leasing with CSU stipulations and 29,800 would be open with NSO. New oil and gas well locations would likely be within, or proximate to, established producing oil and gas fields or near lands that are already leased for such activities. As part of each future permit or authorization for a facility, the BLM would identify BMPs (see Appendix D) to be implemented during construction and operation of all oil and gas ancillary facilities. Under Alternative C, surface disturbance impacts associated with oil and gas development would be long-term but moderate given BLM's compliance with 43 CFR 2806 (which directs the BLM to place new utility facilities within established corridors), and incorporation of BMPs for oil and gas operations. As described in Section 2.5.2, the same level of oil and gas development would apply to Alternatives A and C through E (i.e., 37 wells and 206 acres of disturbance); consequently, adverse effects from the construction of new utility facilities associated with oil and gas development would be identical for these alternatives.

Impacts to existing utility corridors and communication sites would be negligible. With BLM's management of ROW authorizations, none of the alternatives would interfere with the operations of existing utility infrastructure and communication facilities.

Mitigation

The BLM would require BMPs, stipulations, and other COAs during its project- and site-specific review and approval of oil and gas lease applications and APDs. No additional mitigation is recommended for Alternative C.

Leases Subject to Settlement Agreement

Under Alternative C, the 14 non-NSO leases would be in BLM-managed areas that are open to leasing. New oil and gas wells would be likely to require short segments of pipeline to reach existing pipeline infrastructure. Surface disturbance impacts associated with oil and gas development would be long-term, but would be moderate under Alternative C given BLM's compliance with 43 CFR 2806 (which directs the BLM to place new utility facilities within established corridors), and incorporation of BLM standards and guidelines for oil and gas operations. Adverse effects from new utility facilities would be less severe (i.e., minor) under Alternatives B and D, which would close more than 75 percent of the proposed lease areas to oil and gas development.

4.20.6 Impacts of Alternative D

Under Alternative D, approximately 121,200 acres of Federal mineral estate would be open to oil and gas leasing and 16,400 acres would be open with NSO. New oil and gas well locations would likely be within, or proximate to, established producing oil and gas fields or near lands that are already leased for such activities. As part of each future permit or authorization for a facility, the BLM would identify BMPs (see Appendix D) to be implemented during construction and operation of all oil and gas ancillary faci-

lities. Under Alternative D, surface disturbance impacts associated with oil and gas development would be long-term but moderate given BLM's compliance with 43 CFR 2806 (which directs the BLM to place new utility facilities within established corridors), and incorporation of BMPs for oil and gas operations. As described in Section 2.5.2, the same level of oil and gas development would apply to each alternative (i.e., 37 wells and 206 acres of disturbance); consequently, adverse effects from the construction of new utility facilities associated with oil and gas development would be identical for Alternatives A through E.

Impacts to existing utility corridors and communication sites would be negligible. With BLM's management of ROW authorizations, none of the alternatives would interfere with the operations of existing utility infrastructure and communication facilities.

Mitigation

The BLM would require BMPs, stipulations, and other COAs during its project- and site-specific review and approval of oil and gas lease applications and APDs. No additional mitigation is recommended for Alternative D.

Leases Subject to Settlement Agreement

Under Alternative D, approximately 25 percent of the proposed 14 non-NSO leases would be open to leasing with CSU stipulations. New oil and gas wells would be likely to require short segments of pipeline to reach existing pipeline infrastructure. Surface disturbance impacts associated with oil and gas development would be long-term, but minor under Alternative D given BLM's compliance with 43 CFR 2806 (which directs the BLM to place new utility facilities within established corridors), and incorporation of BLM standards and guidelines for oil and gas operations. The minor effects from Alternatives B and D would be similar as both alternatives would allow less than 25 percent of the proposed leases to be open to oil and gas development. Impacts from the 14 non-NSO leases would be greater under Alternatives A, C, and E, which would allow between 98 to 100 percent of the 14 proposed lease areas to be open to oil and gas development.

4.20.7 Impacts of Alternative E

Under Alternative E, approximately 487,200 acres of Federal mineral estate would be open to oil and gas leasing with CSU stipulations and 206,400 acres would be open with NSO. New oil and gas well locations would likely be within, or proximate to, established producing oil and gas fields or near lands that are already leased for such activities. As part of each future permit or authorization for a facility, the BLM would identify BMPs (see Appendix D) to be implemented during construction and operation of all oil and gas ancillary facilities. Under Alternative E, surface disturbance impacts associated with oil and gas development would be long-term but moderate given BLM's compliance with 43 CFR 2806 (which directs the BLM to place new utility facilities within established corridors), and incorporation of BMPs for oil and gas operations. As described in Section 2.5.2, the same level of oil and gas development would apply to each alternative (i.e., 37 wells and 206 acres of disturbance); consequently, adverse effects from the construction of new utility facilities associated with oil and gas development would be identical for Alternatives A through E.

Impacts to existing utility corridors and communication sites would be negligible. With BLM's management of ROW authorizations, none of the alternatives would interfere with the operations of existing utility infrastructure and communication facilities.

Mitigation

The BLM would require BMPs, stipulations, and other COAs during its project- and site-specific review and approval of oil and gas lease applications and APDs. No additional mitigation is recommended for Alternative E.

Leases Subject to Settlement Agreement

Under Alternative E, approximately 98 percent of the proposed 14 non-NSO leases would be open to leasing with CSU or NSO stipulations. New oil and gas wells would be likely to require short segments of pipeline to reach existing pipeline infrastructure. Surface disturbance impacts associated with oil and gas development would be long-term, but would be moderate under Alternative E given BLM's compliance with 43 CFR 2806 (which directs the BLM to place new utility facilities within established corridors), and incorporation of BLM standards and guidelines for oil and gas operations. Adverse effects from new utility facilities would be less severe (i.e., minor) under Alternatives B and D, which would close more than 75 percent of the proposed lease areas to oil and gas development.

4.21 Wild and Scenic Rivers

4.21.1 Introduction

As discussed in Section 3.21, the BLM determined that none of the 11 eligible river segments in the Central Coast Field Office (CCFO) Planning Area were suitable for inclusion in the National Wild and Scenic River (NWSR) System (BLM, 2014; Appendix VI). However, the BLM must implement the management direction provided in the Wild and Scenic Rivers Act to protect an eligible river's outstanding remarkable values until Congress designates the river or releases it for other uses. This section provides an analysis of the potential impacts of the Proposed RMPA on eligible Wild and Scenic Rivers within the CCFO Planning Area, and recommends mitigation if necessary to minimize or avoid impacts. Designated NWSRs would not cross or be located in the vicinity of Federal mineral estate (see Section 3.21.4), and as such would not be affected by the Proposed RMPA. Refer to Sections 4.8 (Surface Water Resources), 4.10 (Biological Resources – Vegetation), 4.11 (Biological Resources – Wildlife Habitat), 4.12 (Biological Resources – Special Status Species), and 4.13 (Visual Resource Management) for a discussion of additional mitigation that may be required to ensure resource protection within the CCFO Planning Area during oil and gas development.

Methods of Analysis

The area of analysis includes eligible NWSR segments that are within the CCFO Planning Area. Impacts to Wild and Scenic Rivers would include the following:

- Direct impacts include any action that would modify the watercourse/streambed (e.g., impoundments, channelization or diversions).
- Indirect impacts would result from actions (either BLM or others) that remove water from the river above the segment and reduce in-stream flows below an acceptable level, or contribute to degradation of the river's outstanding remarkable value.

Assumptions

The analysis is based on the following assumption:

- 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 outstandingly remarkable values in the stream corridors.

4.21.2 Impacts Common to All Alternatives

As discussed in Section 3.21.2, the BLM must provide protective measures to maintain the outstanding remarkable values of all eligible NWSR segments. Outstandingly remarkable values for eligible river segments within the CCFO Planning Area are listed in Table 3.21-1.

NWSR designation ensures that many forms of development do not compromise a river's free-flowing character, water quality and quantity, or social and ecological values. As described in Section 3.21.2, the designated NWSR boundary generally extends 0.25 miles from either bank. Activities such as mining and oil and gas drilling may be restricted by a NWSR designation if they cannot be undertaken without harming a river's free-flowing condition, water quality, or remarkable values.

None of the alternatives under the Proposed RMPA would alter the designation of eligible river segments, which can only be done through Congressional legislation. In compliance with the Wild and Scenic Rivers Act (see Section 3.21), the BLM would be required to enact management restrictions to protect eligible NWSRs and these restrictions would apply to all of the Proposed RMPA alternatives. The following impact analysis identifies whether an alternative would require additional stipulations to protect the characteristics and remarkable values of eligible NWSR segments.

4.21.3 Impacts of Alternative A (No Action)

Under Alternative A, the following eligible NWSR segments would extend into Federal mineral estate open to oil and gas development: Cantua Creek, Clear Creek, East Fork San Carlos Creek, Larious Creek, Picacho Creek, San Benito River, and White Creek. The majority of the Federal mineral estate that may be open to leasing would not be subject to NSO stipulations under Alternative A. Only a small area of Federal mineral estate subject to NSO stipulations would be crossed by the Cantua Creek segment.

Given the lack of stipulations along the eligible NWSR segments, major impacts could occur during oil and gas development activities under Alternative A. For example, surface disturbance during construction and maintenance (e.g., establishment of access roads, wellpads, flowlines, pipelines, etc.) could increase soil erosion, which may increase turbidity and sedimentation in nearby streams. Vegetation clearing required during construction activities would further contribute to soil erosion. During construction and operation, hazardous materials could be released from construction vehicles, wells, or flowlines, which may contaminate local waterways. These impacts would be long-term and could permanently degrade the rivers' outstanding remarkable value(s).

Without stipulations, impacts to eligible NWSRs under Alternative A would be the most severe of all the Proposed RMPA alternatives.

Leases Subject to Settlement Agreement – Subalternative 1

Under Alternative A, the 14 proposed leases would be open to oil and gas development and would not be subject to NSO stipulations. Of the 11 eligible NWSR segments in the CCFO Planning Area, two river segments are in close proximity to the non-NSO leases: the East Fork San Carlos Creek segment that extends into a non-NSO lease, and the Larious Creek segment that is less than one mile south of the non-NSO leases. Given the lack of stipulations that would apply to oil and gas development activities (e.g., sedimentation, water contamination) near eligible river segments, major impacts could occur. These impacts would be long-term and could permanently degrade the rivers' outstanding remarkable value(s). Impacts under Alternatives A (Subalternative 1) and C would be similar given the lack of NSO stipulations for both alternatives. Impacts would be less severe under Alternatives B, D, and E due to the application of stipulations or the closure of some lease areas to oil and gas development (see Sections 4.21.4 through 4.21.7).

Leases Subject to Settlement Agreement – Subalternative 2

The two non-NSO leases as identified in Case No. 11-06174 should not have been issued, and the 12 prospective non-NSO leases as identified in Case No. 13-1749 would not be issued. As such, no resource impact would occur.

4.21.4 Impacts of Alternative B

Under Alternative B, none of the eligible NSWR segments would extend into Federal mineral estate open to oil and gas development. All Federal mineral estate traversed by the eligible NWSR segments would be closed to leasing. Indirect impacts may occur if oil and gas activities along a non-designated upper river area would contribute to adverse effects on lower river segments under designation. However, these indirect effects are not likely to occur under the Proposed RMPA given that the upper reaches of the eligible river segments are located in the Clear Creek Serpentine ACEC, which is closed to oil and gas development. As no oil and gas development activities would occur in the vicinity of the eligible portions of the river segments, impacts would be expected to be negligible. Alternative B would have the least impact to NWSRs of all the Proposed RMPA alternatives.

Mitigation

No mitigation is recommended for Alternative B.

Leases Subject to Settlement Agreement

While 21 percent of the acreage for the proposed non-NSO leases would be open to oil and gas development under Alternative B, none of the open lease areas would be traversed by an eligible NWSR segment. As no oil and gas development activities would occur in the vicinity of the eligible portions of the river segments, impacts would be expected to be negligible. Negligible impacts under Alternative B would be similar to Alternative D, which would also close Federal mineral estate to leasing in the vicinity of eligible NWSRs, and to Alternative A (Subalternative 2) where no impacts would occur. Impacts would be more severe under Alternatives A (Subalternative 1), C, and E given that these alternatives include open lease areas near eligible NWSRs.

4.21.5 Impacts of Alternative C

Under Alternative C, the following eligible NWSR segments would extend into Federal mineral estate open to oil and gas development: Cantua Creek, East Fork San Carlos Creek, and White Creek. Federal mineral estate open to leasing under Alternative C would not be subject to NSO stipulations in the vicinity of eligible NWSRs.

Alternative C includes a greater area closed to oil and gas development along the eligible NWSR segments than Alternatives A, D, and E. However, given the lack of stipulations that would apply to the open areas around the eligible segments, major impacts could still occur during oil and gas development activities. For example, surface disturbance during construction and maintenance could increase soil erosion, which may increase turbidity and sedimentation in nearby streams. During construction and operation, hazardous materials could be released from construction vehicles, wells, or flowlines, which may contaminate local waterways. These impacts would be long-term and could permanently degrade the rivers' outstanding remarkable value(s).

Without stipulations, impacts to NWSRs under Alternative C would be more severe than Alternative B. Impacts may be less severe than Alternatives A and D due to the greater area closed to leasing near eligible NWSRs under Alternative C. The degree of impact for Alternatives C and E may be similar, as they both increase either the acreage of areas closed to leasing or subject to NSO stipulations.

Mitigation

In order to protect eligible NWSRs from impacts to their free-flowing conditions, water quality, or outstanding remarkable values, the following mitigation measure is recommended for Alternative C.

WSR-1 **Apply Lease Stipulations along Eligible NWSR Segments.** Oil and gas lease stipulations shall be required as a Condition of Approval within 0.25 miles[1] of an eligible NWSR segment. Prior to granting an oil and gas lease, the BLM shall identify one of the following stipulations to be applied to the lease permit: No Surface Occupancy or Controlled Surface Use. Lease stipulations shall comply with the guidelines that are fully described in Appendix C (Hollister Oil and Gas Stipulations).

Additionally mitigation in Sections 4.8 (Surface Water Resources), 4.10 (Biological Resources – Vegetation), 4.11 (Biological Resources – Wildlife Habitat), 4.12 (Biological Resources – Special Status Species), and 4.13 (Visual Resource Management) may be required and would help ensure resource protection for NWSRs.

[1] Designated protection boundaries for federally administered rivers generally average one-quarter mile on either bank in the lower 48 states and one-half mile on rivers outside national parks in Alaska (NWSRS, 2015a).

Leases Subject to Settlement Agreement

Under Alternative C, the 14 proposed leases would be open to oil and gas development and would not be subject to NSO stipulations. Two of the eligible NWSR segments (i.e., Larious Creek and San Carlos Creek) would be located in close proximity to the non-NSO leases in San Benito County. Of the 11 eligible NWSR segments in the CCFO Planning Area, two river segments are in close proximity to the non-NSO leases: the East Fork San Carlos Creek segment that extends into a non-NSO lease, and the Larious Creek segment that is less than one mile south of the non-NSO leases. Given the lack of stipulations that would apply to oil and gas development activities (e.g., sedimentation, water contamination) near eligible river segments, major impacts could occur. These impacts would be long-term and could permanently degrade the rivers' outstanding remarkable value(s). Impacts under Alternatives C and A (Subalternative 1) would be similar given the lack of NSO stipulations for both alternatives. Impacts would be less severe under Alternatives A (Subalternative 2), B, D, and E due to the application of stipulations or the closure of some lease areas to oil and gas development.

4.21.6 Impacts of Alternative D

Under Alternative D, the following eligible NWSR segments would extend into Federal mineral estate open to oil and gas development: Cantua Creek, East Fork San Carlos Creek, Picacho Creek, San Benito River, and White Creek. Federal mineral estate open to leasing under Alternative D would not be subject to NSO stipulations in the vicinity of eligible NWSRs.

For Alternatives A and D, the designation of Federal mineral estate open or closed to oil and gas development around eligible river segments is similar, with Alternative D having a small increase in the amount of public land closed to leasing near Larious Creek, and East Fork San Carlos Creek, and San Benito River. Alternatively, Alternative A would include a small area of Federal mineral estate subject to NSO stipulations that would be crossed by Cantua Creek.

Given the lack of stipulations along the eligible NWSR segments, major impacts could occur during oil and gas development activities under Alternative D. For example, surface disturbance during construction and maintenance could increase soil erosion, which may increase turbidity and sedimentation in nearby streams. During construction and operation, hazardous materials could be released from construction vehicles, wells, or flowlines, which may contaminate local waterways. These impacts would be long-term and could permanently degrade the rivers' outstanding remarkable value(s).

Without stipulations, impacts to NWSRs under Alternative D would be more severe than Alternatives B, C, and E. Impacts may be slightly less severe than Alternative A due to the small increase in acreage closed to leasing near eligible NWSRs under Alternative D.

Mitigation

In order to protect eligible NWSRs from impacts to their free-flowing conditions, water quality, or outstanding remarkable values, the following mitigation measure is recommended for Alternative D.

WSR-1 Apply Lease Stipulations along Eligible NWSR Segments. See full text for this measure under Section 4.21.3, Impacts of Alternative C.

Additionally mitigation in Sections 4.8 (Surface Water Resources), 4.10 (Biological Resources – Vegetation), 4.11 (Biological Resources – Wildlife Habitat), 4.12 (Biological Resources – Special Status Species), and 4.13 (Visual Resource Management) may be required and would help ensure resource protection for NWSRs.

Leases Subject to Settlement Agreement

Under Alternative D, the 14 proposed leases that would be in proximity to eligible NWSR segments would be closed to oil and gas development. As no oil and gas development activities would occur in the vicinity of the eligible portions of the river segments, impacts would be negligible. Negligible impacts under Alternatives B and D would be similar as they both close Federal mineral estate to leasing in the vicinity of eligible NWSRs, and Alternative A (Subalternative 2) would have no impacts. Impacts would be more severe under Alternatives A (Subalternative 1), C, and E, given that these alternatives include open lease areas near eligible NWSRs.

4.21.7 Impacts of Alternative E

Under Alternative E, the following eligible NWSR segments would extend into Federal mineral estate open to oil and gas development: Cantua Creek, Clear Creek, East Fork San Carlos Creek, Larious Creek, Picacho Creek, San Benito River, and White Creek. NSO stipulations would apply to a larger area of public land surrounding these river segments than under Alternatives A, C, and D.

Given the application of stipulations that would apply to much of the open lease areas around eligible river segments, impacts from oil and gas development would be moderate under Alternative E. Long-term and permanent effects could still occur from oil and gas development within non-NSO lease areas (e.g., sedimentation, water contamination). Without stipulations in some of the open lease areas along eligible NWSRs, impacts under Alternative E would be more severe than Alternative B. Impacts may be less severe than Alternatives A, C, and D due to the greater acreage of Federal mineral estate subject to NSO stipulations under Alternative E.

Mitigation

In order to protect eligible NWSRs from impacts to their free-flowing conditions, water quality, or outstanding remarkable values, the following mitigation measure is recommended for Alternative E.

WSR-1 **Apply Lease Stipulations along Eligible NWSR Segments.** See full text for this measure under Section 4.21.3, Impacts of Alternative C.

Additionally mitigation in Sections 4.8 (Surface Water Resources), 4.10 (Biological Resources – Vegetation), 4.11 (Biological Resources – Wildlife Habitat), 4.12 (Biological Resources – Special Status Species), and 4.13 (Visual Resource Management) may be required and would help ensure resource protection for NWSRs.

Leases Subject to Settlement Agreement

Under Alternative E, the 14 proposed leases in proximity to an eligible NWSR segment would be subject to NSO stipulations. Impacts to eligible portions of the river segments may occur over the long-term, but would be minor given the application of NSO stipulations that would provide protective management for these stream corridors. Impacts to eligible NWSRs would be less severe under Alternative E than Alternatives A (Subalternative 1) and C (due to their lack of stipulations in open lease areas), and more severe than Alternatives A (Subalternative 2), B and D (due to their larger acreage of areas closed to leasing).