7.14 Mineral Resources

This section describes the environmental setting and potential impacts on mineral resources that may result from changes in hydrology or changes in water supply.

Mineral resources are valuable and necessary economic commodities for the state. The use of large amounts of mineral resources in areas without adequate permitted reserves and other changes in the physical environment could make mineral resources unavailable. As discussed in this section, changes in hydrology and changes in water supply would not result in these effects on mineral resources.

Section 7.1, *Introduction, Project Description, and Approach to Environmental Analysis*, describes reasonably foreseeable methods of compliance and response actions, including actions that would require construction. These actions are analyzed for potential environmental effects in Section 7.21, *Habitat Restoration and Other Ecosystem Projects*, and Section 7.22, *New or Modified Facilities*.

7.14.1 Environmental Checklist

XI. Mineral Resources	Potentially Significant Impact	Less than Significant with Mitigation Incorporated	Less-than-Significant Impact	No Impact
Would the project:				
a. Result in the loss of availability of a known mineral resource that would be of value to the region and the residents of the state?	☐	☐	☐	☒
b. Result in the loss of availability of a locally important mineral resource recovery site delineated on a local general plan, specific plan, or other land use plan?	☐	☐	☐	☒

7.14.2 Environmental Setting

This section describes the mineral resources setting to inform the impact discussion in this section and in Section 7.21, *Habitat Restoration and Other Ecosystem Projects*; Section 7.22, *New or Modified Facilities*; and Chapter 9, *Proposed Voluntary Agreements*.

The focus of this section is on two mineral, or extractive, resources: (1) aggregate resources and (2) oil and natural gas. The reasons for this focus are the following.

- Aggregate resources (i.e., sand and gravel) are valuable economic commodities, necessary for most construction, not replaceable with other products, and most economical when used close to the area where they are mined because of the high cost of transportation. These resources are locally important because using them near their source is most economical; they are, however, also regionally important in areas where the demand is great.

- Oil and natural gas are important for our society to function and are valuable economic commodities. These resources are important on the local, regional, and statewide level.

Most data available for mineral resources are reported by county or production-consumption (P-C) region, which may include portions of two or more counties. A P-C region is made up of one or more aggregate production districts (a group of producing aggregate mines) and the market area they serve. The geology of the study area is described in Section 7.9, *Geology and Soils*.

7.14.2.1 Aggregate Resources

Aggregate is sand, gravel, and crushed rock used in construction. Deposits suitable for making Portland cement concrete and asphaltic concrete are the rarest and most valuable aggregate. Alluvial sand and gravel are preferred over crushed stone in some applications because the rounded particles cause less wear on equipment and form a mix that is easier to work with. Crushed rock is generally blocky and can be useful when stronger concrete is needed (Dupras 1999; ^Clinkenbeard and Guis 2018). Sustainable sources of aggregate reserves are essential for the construction of roads and building foundations, especially in fast-growing regions of the state. Due to the high costs of transporting aggregate, local supplies are important.

Aggregate is essential for construction; and buildings, roads, dams, and bridges cannot be constructed without it (^Clinkenbeard and Guis 2018). Urban development depends on the availability of affordable construction aggregate (Dupras 1999).

Land use compatibility and cost are two major factors that affect aggregate availability. Land development has made many aggregate deposits unavailable, either directly through construction of buildings and other high-cost structures on land with aggregate resources or through nearby development of incompatible land uses.

The system used to describe the quality of land for aggregate mining is based on California's Surface Mining and Reclamation Act of 1975 (SMARA) (Pub. Resources Code, §§ 2710–2796.5). SMARA was enacted to provide a comprehensive surface mining and reclamation policy for the regulation of surface mining operations to ensure that adverse environmental impacts are minimized while encouraging the production and conservation of minerals. SMARA includes water quality protection and management requirements. Mines that discharge or propose to discharge mine waste, as defined in the Porter-Cologne Water Quality Control Act, that could affect the quality of waters of the state, require waste discharge requirements from the applicable regional water board and compliance with the associated State Water Board/CIWMB Regulations (Cal. Code Regs., tit. 27).

To help implement SMARA, an area's mineral resources are evaluated using a system of Mineral Resource Zone (MRZ) classifications that reflect the known or inferred presence and significance of a given mineral resource. The MRZ classifications are based on available geologic information, including geologic mapping and other information on surface exposures, drilling records, and mine data, and on socioeconomic factors, such as market conditions and urban development patterns. The basic MRZ classification shown on California Geological Survey mineral land classification maps is defined as follows (Miller and Busch 2013).

- **MRZ-1.** Areas where available geologic information indicates there is little likelihood for the presence of significant mineral resources.
- **MRZ-2.** Areas where adequate information indicates that significant mineral deposits are present, or where it is judged that a high likelihood for their presence exists. This zone shall be

applied to known mineral deposits or where well-developed lines of reasoning, based upon economic-geologic principles and adequate data, demonstrate that the likelihood for occurrence of significant mineral deposits is high.

- **MRZ-3.** Areas containing mineral occurrences of undetermined mineral resource significance.
- **MRZ-4.** Areas where available information is inadequate for assignment to any other MRZ category.

The SMARA designations are used by governmental agencies in recognizing, developing, and protecting important mineral resources.

As part of the SMARA permitting process, a reclamation plan must be approved by the Department of Conservation's Division of Mine Reclamation before mining activities can be initiated. This reclamation plan describes the end use of the property after mining has been completed and the reclamation that will occur to make the property suitable for this land use. Examples of post-mining land uses include office parks, housing developments, park land, agriculture, and wildlife habitat (California Department of Conservation 2017; Schmidt pers. comm.). The final land use may be changed during the life of the mine, but this change must go through the State Mining and Geology Board's approval process.

The Sacramento River watershed is both a major producer and consumer of aggregate. Major producers of aggregate include the Yuba City–Marysville P-C Region and the Sacramento–Fairfield P-C Region. Much of the aggregate mined in the Sacramento River watershed is high-quality alluvial sand and gravel used for Portland cement concrete aggregate, the highest quality and rarest aggregate. However, consumption outpaces production in nearly all counties. For example, Sacramento County has 21 to 30 years of projected permitted reserves remaining (^Clinkenbeard and Guis 2018). Notable exceptions are Placer County and the Yuba City–Marysville P-C Region, both of which have more than 50 years of projected permitted reserves remaining. These areas are two of only five areas in the state that meet or nearly meet their forecast 50-year demand (^Clinkenbeard and Guis 2018). The Yuba City–Marysville P-C Region is an important source of aggregate for the Sacramento area (Habel and Campion 1988).

In the area of the Delta eastside tributaries, the Stockton–Lodi P-C Region in San Joaquin County is the largest aggregate producer. This P-C region has 21 to 30 years of projected permitted reserves remaining (^Clinkenbeard and Guis 2018).

The San Francisco Bay Area is covered by the North San Francisco Bay P-C Region and South San Francisco Bay P-C Region. Both the North and South San Francisco Bay P-C Regions have 21 to 30 years of projected permitted reserves remaining (^Clinkenbeard and Guis 2018).

Because high-quality alluvial Portland cement concrete aggregate is generally found on floodplains (^Clinkenbeard and Guis 2018) and close to the active channel (Dupras 1988, Plates 6–8, 13, 21, 22, 37, 38), some aggregate mines are located close to the stream channel, which is called *near-channel mining*. Examples of near-channel mining include Cache Creek and the Yuba Gold Fields. Near-channel mining along Cache Creek is made up of seven permitted off-channel mining operations between Capay Dam and the town of Yolo (Yolo County 2019). These mines occupy approximately 1,900 acres along Cache Creek (Yolo County 2019). Cache Creek is an important source of aggregate for both Yolo County and Solano County (Dupras 1988). Near-channel mining along the Yuba Gold Fields is made up of several mines operating along the Yuba River east of Marysville, such as Western Aggregates, Knife River, Silica Resources, Inc., and Teichert Hallwood. The types of mining

techniques that can be used for near-channel mines include dry-pit channel mining (using conventional bulldozers, scrapers, and loaders) and wet-pit channel mining (using a clamshell dredge on a dragline) (Kondolf et al. 2002). Near-channel mining can be affected by river water levels because high surface water levels can lead to high groundwater levels that cause flooding of mines along the river. For this reason, mining operations using dry-pit methods typically stop operations during winter and spring in wet years but remain operational year-round in dry years.

In the San Joaquin Valley (also known as the southern Central Valley), the production of and demand for aggregate varies substantially. In Merced County, the production is not nearly as high as in neighboring Stanislaus County, but the demand for aggregate is also much lower, and, therefore, Merced County has 21 to 30 years of projected permitted reserves remaining. In contrast, Stanislaus County has 11 to 20 years of projected permitted reserves remaining (^Clinkenbeard and Guis 2018).

Along the Central Coast, the San Luis Obispo–Santa Barbara P-C Region and Ventura County have 11 to 20 years of projected permitted reserves remaining (^Clinkenbeard and Guis 2018).

Southern California has both a large reserve of and demand for aggregate. The greatest volumes of aggregate extracted in the state are in the San Diego, Los Angeles, and Riverside areas. However, the greatest demand is also in these areas, and the permitted reserves fall short of the 50-year demand. The Western San Diego County P-C Region and the San Bernardino P-C Region have 11 to 20 years of projected permitted reserves remaining, and the San Gabriel Valley P-C Region has 21 to 30 years of projected permitted reserves remaining. As these areas have begun to run out of reserves, they have increased imports from neighboring areas, which increases truck traffic, emissions, and aggregate cost and depletes the aggregate reserves in those neighboring areas (^Clinkenbeard and Guis 2018).

7.14.2.2 Oil and Natural Gas

Oil and natural gas are vital energy sources for California and are important commodities for the state's economy. California's Geologic Energy Management Division (CalGEM; formerly known as the Division of Oil, Gas, and Geothermal Resources) oversees extraction of these resources in the state.

The occurrence of oil, oil and natural gas together, and natural gas extraction wells is related to geographic location. In general, most oil fields occur in Southern California. These oil fields may or may not also extract natural gas as a byproduct of oil production; natural gas extracted as an oil byproduct is known as *associated gas*. Natural gas extracted from fields developed primarily for gas production is known as *nonassociated* gas. Most nonassociated gas fields occur in Northern California (DOGGR 2001, 2018a).

California's largest producer of natural gas is located in the Delta. The Rio Vista Gas field, which is centered around the town of Rio Vista and spans portions of Sacramento, Solano, and Contra Costa Counties, produced 4.8 billion cubic feet of nonassociated natural gas in 2018. Numerous other fields in the Delta, such as Lindsey Slough Gas and French Camp Gas, are also substantial producers of nonassociated natural gas (DOGGR 2001, 2018b). This area also produces smaller amounts of oil (DOGGR 2018a).

The Sacramento River watershed is also a major producer of natural gas for the state. The four largest nonassociated gas–producing fields in California—Rio Vista Gas, Willows-Beehive Bend Gas, Grimes Gas, and Sutter Buttes Gas—are located in the Sacramento River watershed. These large fields occur in the valley between the vicinity of Sutter Buttes and the town of Corning. In 2018, they

produced more than 11 billion cubic feet of natural gas (DOGGR 2001, 2018b). Natural gas fields are present in the San Joaquin Valley between Chowchilla and Bakersfield and in the southern coastal area around Santa Barbara (DOGGR 2001, 2018a, 2018b).

Small natural gas fields, both active and abandoned, are scattered throughout many other locations in the study area, such as in Sacramento and Yolo Counties, near portions of the Delta eastside tributaries, and near San Francisco Bay in Alameda and Santa Clara Counties (DOGGR 2001, 2018a).

Two large oil-producing fields are located south of the Delta. One large oil-producing region is in the southern Central Valley in Kings and Kern Counties in the areas around Bakersfield, Kettleman City, and Coalinga. Many of the top oil-producing fields in California are located in this region. The region is also the largest producer of associated natural gas (DOGGR 2001, 2018a).

The other large oil-producing region is along the southern coastal area between Santa Maria and Costa Mesa (DOGGR 2001, 2018a).

CalGEM regulates the drilling, operation, maintenance, and abandonment of oil and gas wells. Title 14, Division 2 of the California Code of Regulations describes the requirements of CalGEM. These regulations require that wells be constructed with casings to keep oil and natural gas separate from groundwater. The regulations state:

> Each well shall have casing designed to provide anchorage for blowout prevention equipment and to seal off fluids and segregate them for the protection of all oil, gas, and freshwater zones. All casing strings shall be designed to withstand anticipated collapse, burst, and tension forces with the appropriate design factor provided to obtain a safe operation.

CalGEM is responsible for inspecting and testing well casings.

7.14.3 Impact Analysis

Changes in hydrology and changes in water supply would not result in the loss of availability of a known mineral resource that would be of value to the region and the residents of the state.

Changes in hydrology include changes in flows and reservoir levels. Increasing streamflow in the Sacramento/Delta may affect when existing mineral resources (aggregate) can be accessed because increased flow could keep a channel wet for a longer time or at different times of the year. However, these potential changes would not result in a loss of availability of a valuable resource for the region. Increased flow or longer duration flow in tributaries could temporarily inhibit mining in near-channel aggregate pits during certain times of the year. Flows could increase the instream water depth or decrease the depth to groundwater, which could result in water in a mine pit, precluding the use of equipment such as bulldozers and excavators. These mines already adjust their operations during high-peak flows and, therefore, can adapt to temporary disruptions. Mines using wet mining methods, such as dragline mining or dredge mining, can take place under wet conditions; therefore, the resource for the region would still be available.

Changes in hydrology could result in changes to reservoir levels; however, these changes would not affect extraction of, nor require use of, any aggregate resources and would not interfere with mining operations or affect land designated as MRZ-2.

Similarly, it is not expected that changes in hydrology would affect extraction of oil and natural gas resources. Although moderately high flows may increase (see Section 7.12.1, *Surface Water*), these flows would not overtop levees and would affect waterways but not the surrounding land.

Therefore, oil and gas resources would not be affected by changes in streamflow or reservoir elevation. There would be no impact from changes in hydrology under Impact MR-a.

Changes in water supply include reduced Sacramento/Delta water supply for some agricultural and municipal uses. Changes in water supply would not make land unavailable for mining, affect mining activities, or use large quantities of aggregate resources because the actions would not involve land use changes relevant to mineral resources.

Responses to changes in water supply also may result in increased groundwater pumping and use of other water management actions (i.e., groundwater storage and recovery, water transfers, water recycling, and water conservation); however, these actions would not interfere with extraction of oil and natural gas resources. Oil and natural gas wells must be sealed from interaction with surface water and groundwater. There would be no impact from changes in water supply under Impact MR-a.

For the reasons already described, changes in hydrology or changes in water supply would not result in the loss of availability of a locally important mineral resource recovery site delineated in a local general plan, specific plan, or other land use plan because the conditions at these sites would be the same as for the regionally important resource sites. There would be no impact from changes in hydrology or changes in water supply under Impact MR-b.

Section 7.21, *Habitat Restoration and Other Ecosystem Projects*, and Section 7.22, *New or Modified Facilities,* describe and analyze potential mineral resources impacts from various actions that involve construction.

7.14.4 References Cited

7.14.4.1 Common References

^Clinkenbeard, J., and F. Guis. 2018. *Map Sheet 52 Aggregate Sustainability in California* and companion report. Updated 2018. Available: https://www.conservation.ca.gov/cgs/minerals/mineral-land-classification-smara. Accessed: October 6, 2020.

7.14.4.2 Printed Section References

California Department of Conservation. 2017. *SMARA FAQ.* Available: http://www.conservation.ca.gov/dmr/lawsandregulations/Pages/faq.aspx. Accessed: June 29, 2017.

Division of Oil, Gas, and Geothermal Resources (DOGGR). 2001. *Oil, Gas, and Geothermal Fields in California 2001*.

Division of Oil, Gas, and Geothermal Resources (DOGGR). 2018a. *Wells and Production by County*.

Division of Oil, Gas, and Geothermal Resources (DOGGR). 2018b. *2018 Report of California Oil and Gas Production Statistics*.

Dupras, D. 1988. *Mineral Land Classification: Portland Cement Concrete-Grade Aggregate in the Sacramento–Fairfield Production-Consumption Region.* California Department of Conservation, Division of Mines and Geology. Special Report 156. Sacramento, CA.

Dupras, D. 1999. *Mineral Land Classification: Portland Cement Concrete-Grade Aggregate and Kaolin Clay Resources in Sacramento County, California.* California Department of Conservation, Division of Mines and Geology. DMG Open-File Report 99-09. Sacramento, CA.

Habel, R., and L. Campion. 1988. *Mineral Land Classification: Portland Cement Concrete-Grade Aggregate in the Yuba City–Marysville Production-Consumption Region.* California Department of Conservation, Division of Mines and Geology. Special Report 132. Sacramento, CA.

Kondolf, G., M. Smeltzer, and L. Kimball. 2002. *White Paper, Freshwater Gravel Mining and Dredging Issues.* Prepared by Center for Environmental Design Research, Berkeley, CA. Prepared for Washington Department of Fish and Wildlife, Washington Department of Ecology, Washington Department of Transportation. Last revised: unknown.

Miller, R., and L. Busch. 2013. *Update of Mineral Land Classification: Aggregate Materials in the North San Francisco Bay Production-Consumption Region, Sonoma, Napa, Marin, and Southwestern Solano Counties, California.*

Yolo County. 2019. *Off-Channel Mining Plan (OCMP).* Last revised: Updated December 17, 2019. Available: https://www.yolocounty.org/home/showdocument?id=62106. Accessed: October 8, 2020.

7.14.4.3 Personal Communications

Schmidt, Jeffrey. Executive Officer. State Mining and Geology Board, Sacramento, CA. June 23, 2017—Email summary of phone conversation (topics included mines in urban areas, reclamation under SMARA and subsequent land use, general plan policies, and conflicting land uses).