

3.5 Geology, Soils, and Mineral Resources

3.5.1 Introduction

A geology and soils evaluation was completed for the Project (Ninyo & Moore 2013a; Appendix F). This evaluation identifies geologic and soil conditions and estimates the potential for impacts resulting from the Project. The geology and soils evaluation focuses on geologic reconnaissance, reviews of published and unpublished geologic, geotechnical, and hydrologic reports, aerial photographs, in-house data, site-specific geology and geotechnical studies, and an assessment of the potential geologic hazards to the Project. The evaluation also discusses measures that might be considered to reduce or mitigate the potential impacts. This evaluation is included in this EIR/EIS as Appendix F and is summarized in this section.

3.5.2 Applicable Laws, Regulations, and Standards

3.5.2.1 Federal

The Project site is located on public federal land under the jurisdiction of the Forest Service. Because the Project site is currently part of the SBNF, the following regulations and policies that govern mining on National Forest System land apply:

- The General Mining Law of 1872 conferred a statutory right for claimants to enter upon public lands open to location, stake mining claims in pursuit of locatable minerals, and conduct mining activities in compliance with Federal and State statutes and regulations.
- The 1897 Organic Administration Act grants the Secretary of Agriculture the authority to regulate the occupancy and use of National Forest System lands. It provides the public with continuing rights to conduct mining activities under general mining laws and in compliance with rules and regulations applicable to National Forest System lands. It also recognizes the rights of miners and prospectors to access National Forest System lands for prospecting, locating, and developing mineral resources.
- The Multiple-Use Mining Act of 1955 confirms the ability to conduct mining activities on public lands, locate necessary facilities, and conduct reasonable and incidental uses to mining on public lands, including National Forest System lands.
- The Multiple-Use Sustained-Yield Act of 1960 requires that National Forest System lands be administered in a manner that includes consideration of relative values of various resources as part of management decisions. Furthermore, it specifies that nothing in the act be construed to affect the use of mineral resources on National Forest System lands.
- The 1970 Mining and Minerals Policy Act established the Federal Government's policy for mineral development "to foster and encourage private enterprise in the development of economically sound and stable industries and in the orderly development of domestic resources to help assure satisfaction of industrial, security, and environmental needs."
- Forest Service mining regulations at 36 CFR 228 Subpart A provide direction on the administration of locatable mineral operations on National Forest System lands.

3.5.2.2 State

Surface Mining and Reclamation Act

The Surface Mining and Reclamation Act of 1975 (SMARA) was enacted to promote conservation of the State's mineral resources and to ensure adequate reclamation of lands once they have been mined. SMARA requires a State Geologist to classify land in California for mineral resource potential. The four categories of mineral resource potential include these Mineral Resource Zones (MRZ):

- MRZ-1: Areas where adequate information indicates that no significant mineral deposits are present or where it is judged that little likelihood exists for their presence.
- MRZ-2: Areas where adequate information indicates significant mineral deposits are present or where it is judged that a high likelihood exists for their presence.
- MRZ-3: Areas containing mineral deposits, the significance of which cannot be evaluated from available data.
- MRZ-4: Areas where available information is inadequate for assignment to any other MRZ.

Alquist-Priolo Earthquake Fault Zoning Act

The Alquist-Priolo Earthquake Fault Zoning Act was passed in 1972 to address the hazard of surface faulting to structures for human occupancy. Its main purpose is to prevent the construction of buildings used for human occupancy on the surface trace of active faults.

California Building Code

The Project site is located in the state of California and is governed by the California Building Code (CBC). The CBC is circulated under CCR, Title 24, Parts 1 through 12, also known as the California Building Standards Code. The California Building Standards Commission (CBSC) is responsible for administering California's Building Standards Codes.

3.5.2.3 Local

San Bernardino County General Plan

The General Plan's Safety Element provides goals and policies related to geologic hazards.

GOAL S 4 – The County will minimize damage due to wind and water erosion where possible.

- POLICY S 4.2: Apply the provisions of the Revised Erosion and Sediment Control Ordinance countywide.
- POLICY S 4.3: Tailor grading, land clearance, and grazing to prevent unnatural erosion in erosion susceptible areas.

GOAL S 6 – The County will protect residents from natural and manmade hazards.

- POLICY S 6.1: Require development on hillsides to be sited in such a manner that minimizes the extent of topographic alteration required to minimize erosion, to maintain slope stability, and to reduce the potential for offsite sediment transport.

- POLICY S 6.2: Utilize the Hazard and Resources Overlay Maps to identify areas suitable or required for retention as open space. Resources and issues identified on the Overlays which indicate open space as an appropriate use may include: flood, fire, geologic, aviation, noise, cultural, prime soils, biological, scenic resources, minerals, agricultural preserves, utility corridors, water supply, and water recharge.

GOAL S 7 – The County will minimize exposure to hazards and structural damage from geologic and seismic conditions.

- POLICY S 7.1: Strive to mitigate the risks from geologic hazards through a combination of engineering, construction, land use, and development standards.
- POLICY S 7.2: Minimize the risk of potential seismic disaster in areas where inadequate structures exist.
- POLICY S 7.6: Protect life and property from risks resulting from landslide, especially in San Bernardino and San Gabriel Mountains that have high landslide potential.

The San Bernardino County General Plan Conservation Element provides the following goals and policies for mineral resources:

GOAL CO 7. The County will protect the current and future extraction of mineral resources that are important to the County's economy while minimizing impacts of this use on the public and the environment.

- POLICY CO 7.1: In areas containing valuable mineral resources, establish and implement conditions, criteria, and standards that are designed to protect the access to, and economic use of, these resources, provided that the mineral extraction does not result in significant adverse environmental effects and that open space uses have been considered for the area once mining operations cease.
- POLICY CO 7.2: Implement the state Mineral Resource Zone (MRZ) designations to establish a system that identifies mineral potential and economically viable reserves.
- POLICY CO 7.3: Mining operators/owners will provide buffers between mineral resources (including access routes) and abutting incompatible land uses. New mineral and non-mineral development in these zones will be designed and reviewed according to the compatibility criteria specified in this policy.
- POLICY CO 7.4 Review land development and mining proposals near potentially incompatible land uses with the goal of achieving land use compatibility between potentially incompatible uses.
- POLICY CO 7.5 Protect existing mining access routes by giving them priority over proposed alterations to the land, or by accommodating the mining operations with as good or better alternate access, provided the alternate access does not adversely impact proposed open space areas or trail alignment.
- POLICY CO 7.6 Provide for the monitoring of mining operations for compliance with the established operating guidelines, conditions of approval and the reclamation plan.

County of San Bernardino Development Code

The County of San Bernardino Building Division plans contain conservation and safety elements for the evaluation of geologic hazards. The procedures for construction related earthwork and excavation are established by local grading ordinances developed by the County of San Bernardino Department of Public Works, Land Development Division. Chapter 83.04 Conditional Grading Compliance, from the San Bernardino County, California Code of Ordinances are applicable to the South Quarry Project.

3.5.3 Affected Environment

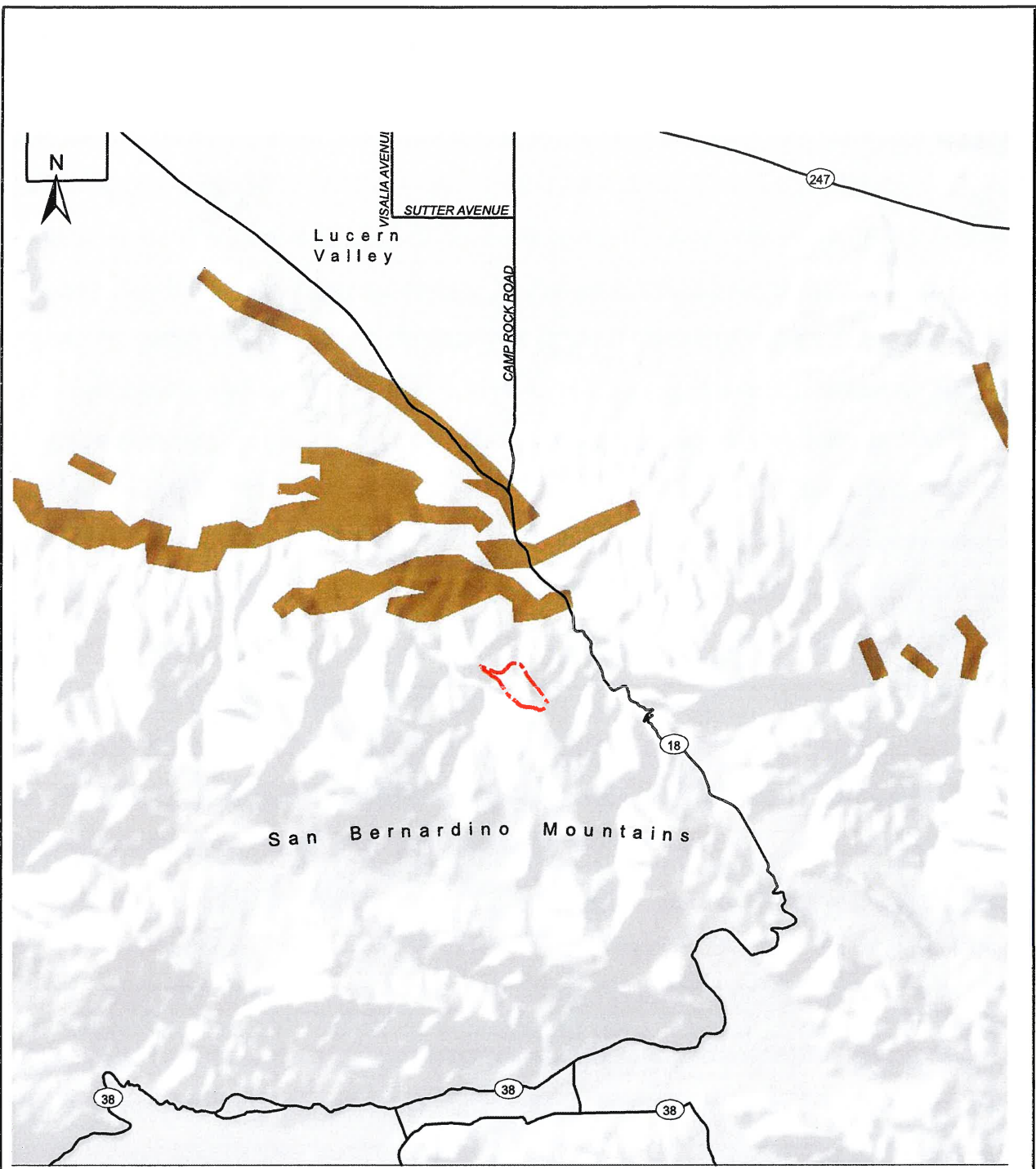
3.5.3.1 Regional Geologic Setting

The Project site is located in the San Bernardino Mountains, an eastern extension of the Transverse Ranges Geomorphic Province. The Transverse Ranges are a unique unit of several east- to west-trending mountain ranges with intervening valleys in Santa Barbara, Ventura, Los Angeles, and San Bernardino counties. The San Bernardino Mountains are located in the eastern portion of the province and are bounded by Cajon Pass on the west, Twentynine Palms Valley on the east, Mojave Desert on the north, and Morongo Valley on the south. The mountains are generally a complex of metamorphic rocks (rocks chemically and physically changed by heat), including Proterozoic (2.5 billion years before present [BP]) gneisses and schists and Late Paleozoic (570 to 250 million years BP) limestones and quartzites that have been intruded by Triassic (245 to 206 million years BP) to possibly Tertiary (66.4 to 1.6 million years BP) igneous rocks (rock formed when molten rock or magma has cooled and solidified). Cenozoic (66.4 million years BP to the present) deposits within the range include minor volcanics on the east end of the range and alluvial fans, lake bed deposits, and stream deposits within the intervening valleys. The Transverse Ranges province has been tectonically active during the late Tertiary and Quaternary (1.6 million years BP to the present) Periods (USGS 2013). Rapid rates of uplift along bounding faults have produced the current regional landscape of rugged highlands with eroded material accumulating in alluvial fans along the base of the mountains. The San Andreas and San Jacinto faults are major active fault systems located southwest of the Project area. The North Frontal Thrust, Helendale, and Lenwood- Lockhart are active fault zones located north and northeast of the Project (Figure 3.5-1). Major tectonic activity associated with these and other faults within this regional tectonic framework consists of south-dipping thrust faulting and right-lateral, strike-slip movement (Ninyo & Moore 2013a).

3.5.3.2 Site Geology



Surficial soils at the Project site consist of topsoils and minor fills. In addition, young landslide deposits have been mapped or observed within the Project site (Ninyo & Moore 2013a). These surficial materials are underlain by Paleozoic meta-carbonate rocks which are the source of ore for the planned quarry (Figure 3.5-2). The meta-carbonate rocks include various members of the Bird Spring, Monte Cristo, and Sultan Formations and range in age from Devonian (410 million years BP) to early Permian (290 million years BP) (Ninyo & Moore 2013a, National Geographic 2013). A brief description of the geologic units is presented below.

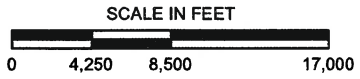
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SOURCE: EARTHQUAKE FAULT ZONES - CALIFORNIA DEPARTMENT OF CONSERVATION, CALIFORNIA GEOLOGICAL SURVEY, 2002

LEGEND

-  PROJECT AREA
-  EARTHQUAKE FAULT ZONE



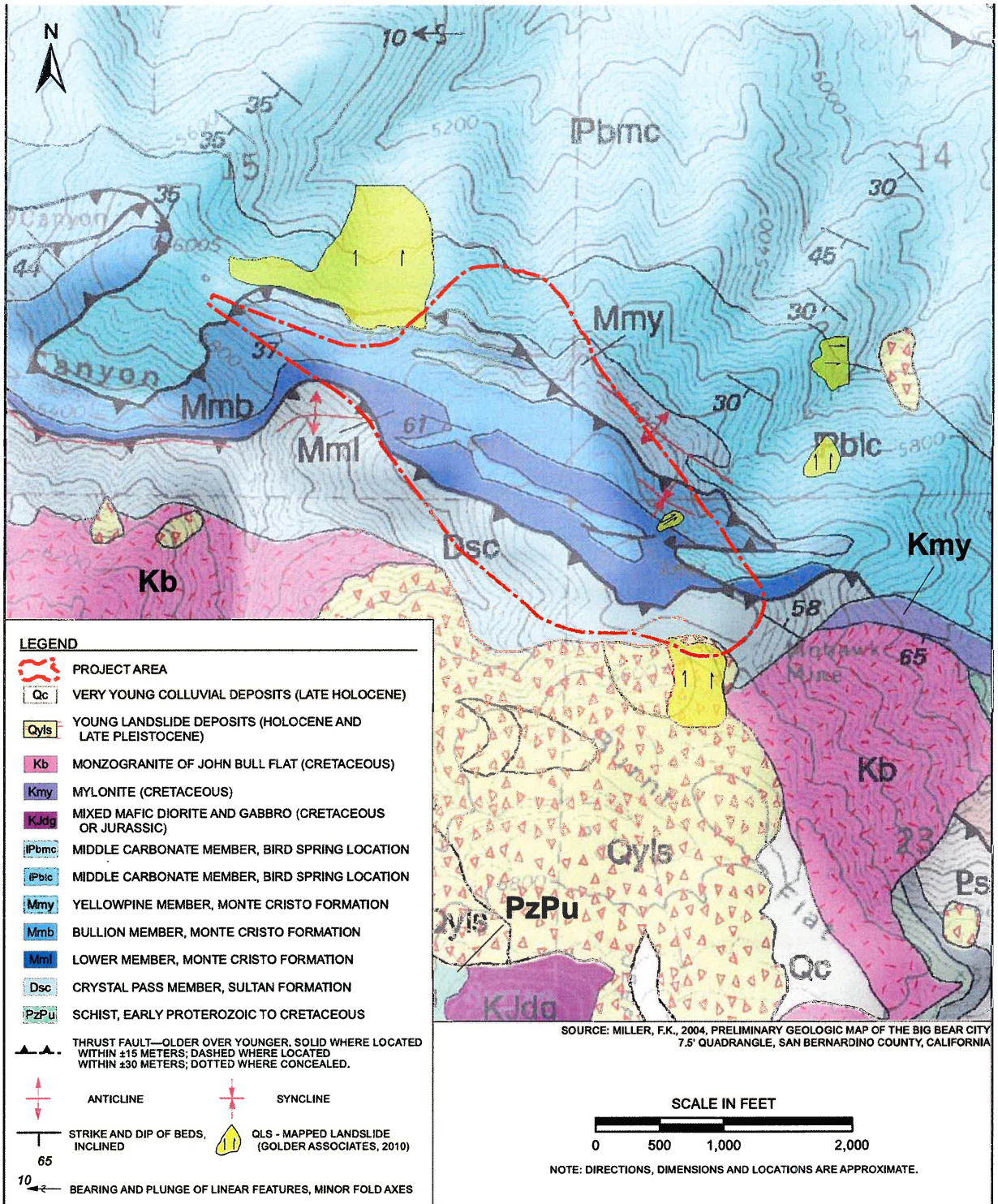
NOTE: DIRECTIONS, DIMENSIONS AND LOCATIONS ARE APPROXIMATE.

Map Date: 9/5/2013
Source: Ninyo & Moore 2012

Figure 3.5-1 Earthquake Fault Zones
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Source: Ninyo & Moore 2012

Figure 3.5-2 Geology
2012-017 Mitsubishi Cement Corporation South Quarry Project

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Young Landslide Deposits

Quaternary-age landslide deposits have been mapped within the southernmost portion of the proposed quarry. In addition, two other landslides within the proposed quarry have been identified. Although these landslide deposits were not observed during the site reconnaissance, they are expected to be derived from erosion of local bedrock and may consist of silty sands with gravels, cobbles, and boulders (Ninyo & Moore 2013a).

Bird Spring Formation

Two members of the Pennsylvanian-age Bird Spring Formation (the Lower and Middle/Carbonate Members) have been mapped within the proposed quarry. These metacarbonate rocks are characterized as medium- to thick-bedded calcite, dolomite and siliceous marble (Ninyo & Moore 2013a).

Monte Cristo Formation

Three members of the Mississippian-age Monte Cristo Formation (the Yellowpine, Bullion, and Lower Members) have been mapped across the majority of the site. These meta-carbonate rocks are characterized as medium- to very thick-bedded calcite and dolomite marble (Ninyo & Moore 2013a).

Sultan Formation

The Crystal Pass Member of the Sultan Formation has been mapped within the southern and southwestern portions of the proposed quarry. This Devonian-age meta-carbonate is composed of mostly thin-to thick bedded calcite marble with thin intervals of dolomite marble (Ninyo & Moore 2013a).

3.5.3.3 Faulting and Seismicity

Figures 3.5-1 and 3.5-3 show the approximate location of the site with respect to the regional active faults. Table 3.5-1 lists the principal known active faults that may affect the site, the maximum moment magnitude (M_{max}) and the fault types as published for the California Geological Survey. No known active or potentially active faults are present on the site. The site is not located within a currently designated Earthquake Fault Zone (Alquist-Priolo Special Studies Zone). The Project site is considered to be in a seismically active area, as is the majority of southern California. The closest active fault is the western section of the North Frontal Fault Zone (West). Segments of the North Frontal Fault Zone lie within the northern portion of the existing Cushenbury Mine. The closest mapped segment of this fault is located approximately one mile north of the proposed South Quarry. However, because the fault segments of the North Frontal Fault Zone trend east-west, they are not projected to underlie the site. The western section of the North Frontal Fault Zone is capable of generating a maximum moment magnitude earthquake of 7.2 (Ninyo & Moore 2013a).

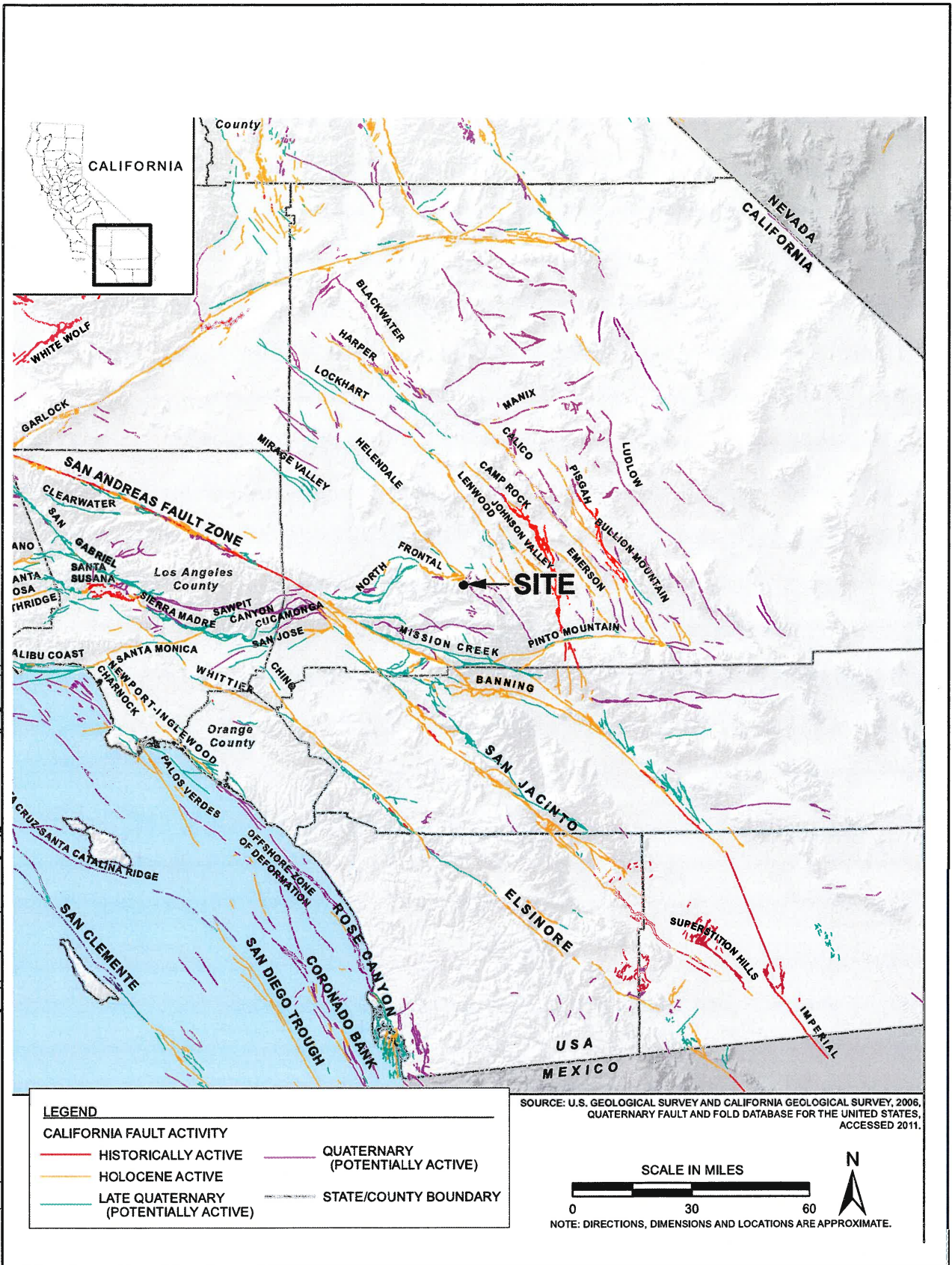
Several reverse faults have been mapped trending across the proposed South Quarry. Based on descriptions of these faults, and review of background data, they appear to be inactive and are not considered zones of significant structural weakness (Ninyo & Moore 2013).

**Table 3.5-1
Principal Active Faults Near the Project Site**

Fault	Approximate Distance miles (km)	Maximum Moment Magnitude (Mmax)	Fault Type¹
North Frontal Fault Zone (West)	1 (1.5)	7.2	B
Helendale-S. Lockhart	2 (4)	7.3	B
North Frontal Fault Zone (East)	3 (5)	6.7	B
Lenwood - Lockhart - Old Woman Springs	12 (19)	7.5	B
Johnson Valley (Northern)	16 (25)	6.7	B
Cleghorn 20 (32) 6.5 B	20 (32)	6.5	B
San Andreas - San Bernardino	20 (32)	7.5	A
Pinto Mountain	21 (34)	7.2	B
Landers	22 (36)	7.3	B
Emerson S. - Copper Mountain	23 (36)	7.0	B
Calico - Hidalgo	29(46)	7.3	B
Burnt Mountain	30 (48)	6.5	B
Eureka Peak	30 (49)	6.4	B
San Jacinto - San Jacinto Valley	31 (50)	6.9	A
San Jacinto - San Bernardino	31 (50)	6.7	A
Pisgah - Bullion Mountain - Mesquite Lake	34 (54)	7.3	B
Cucamonga	35 (56)	6.9	B
San Andreas - Coachella	36 (58)	7.2	A
Gravel Hills - Harper Lake	37 (60)	7.1	B
San Jacinto - Anza	41 (66)	7.2	A
Blackwater	48 (77)	7.1	B
San Jose	50 (80)	6.4	B
Sierra Madre	53 (84)	7.2	B
Chino - Central Avenue (Elsinore)	53 (86)	6.7	B
Elsinore (Glen Ivy)	54 (88)	6.8	A
Elsinore (Temecula)	55 (89)	6.8	A
Whittier	56 (90)	6.8	A
Clamshell - Sawpit	57 (91)	6.5	B

Source: Ninyo & Moore 2013a

Note: ¹As defined by the California Geological Survey, a Type A fault has the probability of an $M \geq 6.7$ earthquake within the next 30 years. A Type B fault has an estimated probability of an earthquake of $M \geq 6.7$ in the next 30 years greater than 5 percent, but the data are insufficient for modeling.



Location: N:\2012\2012-017 Mitsubishi Cement South Quarry\MAFS\Borders\MCCSouthQuarry_FaultLocations.mxd (Last Modified: 9/5/2013)

Map Date: 9/5/2013
Source: Ninyo & Moore 2012

Figure 3.5-3 Fault Locations
2012-017 Mitsubishi Cement Corporation South Quarry Project

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3.5.3.4 Soils

One soil series occurs at the Project site. This soil, lithic xerorthents, is developed on a calcareous-rock outcrop complex with 50 to 100 percent slopes (Figure 3.5-4). This soil type is not corrosive, expansive, or of agricultural value. Liquefaction of cohesionless soils can be caused by strong vibratory motion due to earthquakes. Research and historical data indicate that loose granular soils and non-plastic silts that are saturated by a relatively shallow groundwater table are susceptible to liquefaction. The materials underlying the Project site are dense in nature, and the groundwater depth is not shallow; therefore, liquefaction is not considered a hazard.

Thin fill soils occur along the ridge top in the southeasterly portion of the South Quarry location. As observed at the surface, the fill soils are generally composed of locally derived, reworked rock and are approximately one-foot thick. In undisturbed areas of the site, a mantle of topsoil was observed overlying the native bedrock. Where observed, topsoils generally consisted of light colored, silty fine to medium sand with organic debris (plant matter).

Up to three areas within the South Quarry location are underlain by young landslide deposits. One of these landslides is also mapped over a large area south of the site. During the review of topographic maps, aerial photographs, and the site reconnaissance in the mapped areas, geomorphic features typical of landslides were identified, such as topographic breaks and hummocky hills.

3.5.3.5 Mineral Resources

According to the USGS Mineral Resources Data System and the California Division of Mines and Geology, under SMARA, the Project is located in Mineral Resource Zone 3a (MRZ-3a) for limestone. MRZ-3a is defined as an area containing known mineral deposits that may qualify as mineral resources. MRZ-3a areas are considered to have a moderate potential for the discovery of economic mineral deposits where further exploration work could result in the reclassification of specific areas into the MRZ-2 categories (Ninyo & Moore 2012b).

3.5.4 Environmental Consequences

3.5.4.1 Impact Analysis Approach

CEQA Significance Criteria

Appendix G of the State CEQA Guidelines suggest that lead agencies evaluate the potential significance of geology, soils, and mineral resources impacts of a project by considering whether the project would:

- Expose people or structures to potential substantial adverse effects, including the risk of loss, injury, or death involving:
 - Rupture of a known earthquake fault, as delineated on the most recent Alquist-Priolo Earthquake Fault Zoning Map issued by the State Geologist for the area or based on other substantial evidence of a known fault (Refer to Division of Mines and Geology Special Publication 42),
 - Strong seismic ground shaking,

- Seismic-related ground failure, including liquefaction, or
- Landslides; or
- Result in substantial soil erosion or the loss of topsoil; or
- Be located on a geologic unit or soil that is unstable, or that would become unstable as a result of the project, and potentially result in on- or off-site landslide, lateral spreading, subsidence, liquefaction or collapse; or
- Be located on expansive soil, as defined in Table 18-1-B of the Uniform Building Code (1994), creating substantial risks to life or property; or
- Have soils incapable of adequately supporting the use of septic tanks or alternative waste water disposal systems where sewers are not available for the disposal of waste water.

Alternative waste water disposal systems are not part of any alternative. Therefore, impacts related to this threshold are not discussed further in this EIR/EIS.

According to CEQA Guidelines, a project would have a significant impact on mineral resources if it would:

- 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; or
- 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.

NEPA Analysis Approach

The NEPA analysis determines whether direct or indirect effects to geology, soils and mineral resources would result from the Project and provides a comparison of effects by alternative. As defined by the Council on Environmental Quality, significance of an effect is determined by the context and intensity of the resulting change relative to the existing environment (40 CFR 1508.27). As applicable, impacts are discussed in terms of spatial extent, duration and intensity. For geology, soils, and mineral resources, these effects are based on effects related to seismicity, unstable slopes and soils, and loss of mineral resources, similar to the CEQA thresholds. Therefore, the discussion of impacts in the sections below parallels the CEQA thresholds.

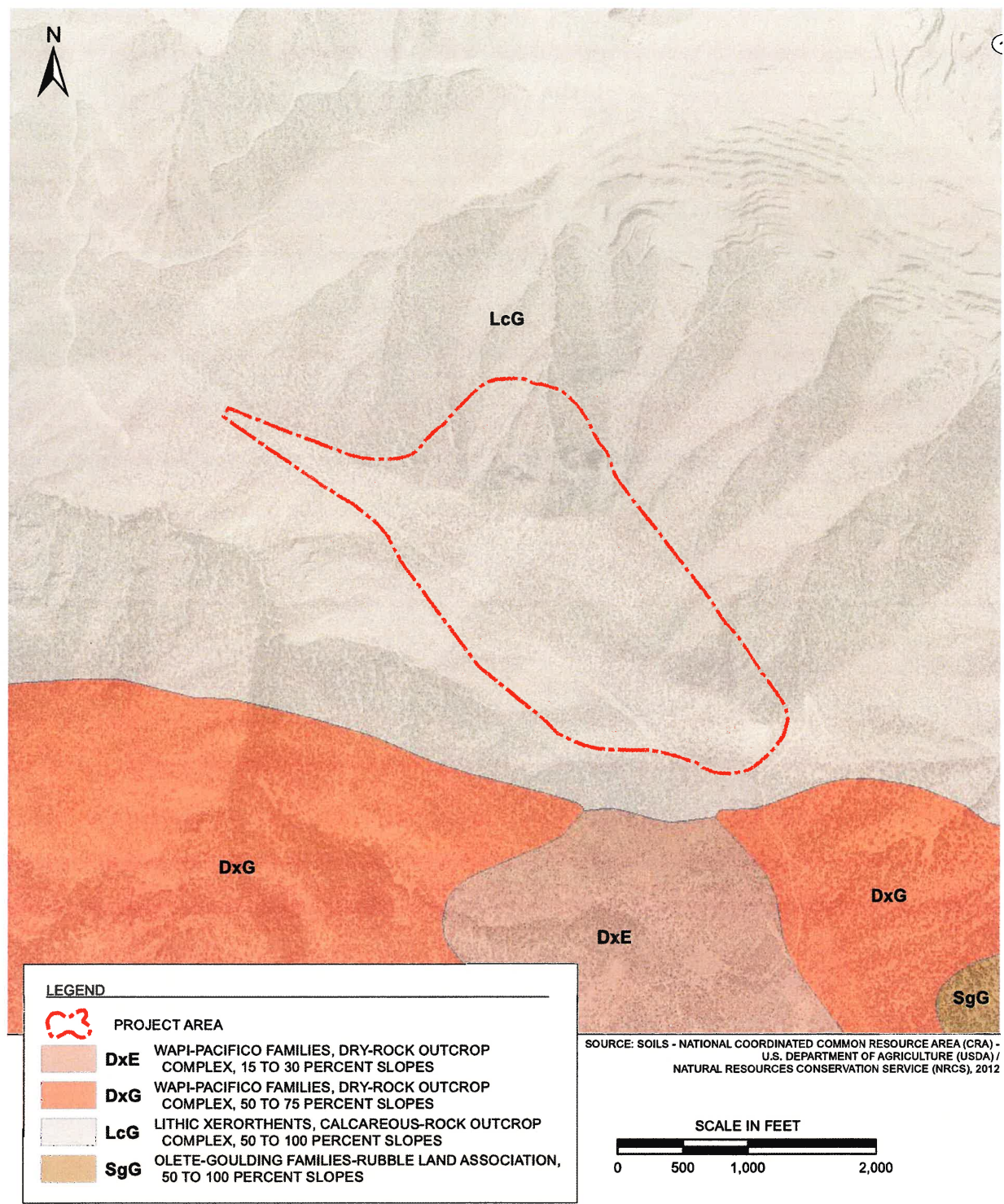
3.5.4.2 Alternative 1 – Proposed Action

Direct and Indirect Impacts

Geology and Soils

Faulting and Seismicity. As with most of southern California, the Project area has a high potential for strong ground motions (ground shaking) due to earthquakes on adjacent and nearby active faults. No active faults are known to cross or trend towards the Project site. Therefore, the potential for ground surface rupture due to faulting at the site is considered low. However, lurching or cracking of the ground surface as a result of nearby seismic events is possible (Ninyo & Moore 2013a). Geologic hazards related to faulting and seismicity would have the potential for a significant impact. With implementation of Design Features/Mitigation Measures GEO-2, GEO-3 and GEO-4, these impacts would be reduced to a less than significant level.

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NOTE: DIRECTIONS, DIMENSIONS AND LOCATIONS ARE APPROXIMATE.

Map Date: 9/5/2013
Source: Ninyo & Moore 2012

Figure 3.5-4 USDA Soils
2012-017 Mitsubishi Cement Corporation South Quarry Project

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Based on the dense nature of the underlying materials and anticipated depth to groundwater, the site is not subject to liquefaction or seismically induced settlement during a nearby seismic event provided proper drainage of the site is maintained. In addition, the soils underlying the Project site are not considered to be susceptible to seismically-induced lateral spread during a nearby seismic event (Ninyo & Moore 2013a).

Unstable Slopes. Surficial soils at the Project site consist of fill, topsoil, and landslide deposits, which are underlain by Paleozoic meta-carbonate rocks. The fill includes relatively thin material placed during light grading operations. Landslide deposits are mapped at three locations within the proposed quarry. If fill soils are placed without engineering supervision they may be loosely or inadequately compacted, may contain oversize materials unsuitable for reuse in engineered fills, and may contain unsuitable organic materials and debris that may preclude their re-use in engineered fills. Three areas within the proposed South Quarry are underlain by young landslide deposits. These landslide deposits are not anticipated to affect the overall stability of the proposed quarry (Golder 2010, Ninyo & Moore 2013a). The landslide deposits within the proposed quarry would be removed during excavation as part of Alternative 1 – Proposed Action. Unstable soils in these landslide deposit areas could affect the stability of cut slopes in the quarry, resulting in a potentially significant impact. Design Features/Mitigation Measures GEO-2 and GEO-3 would reduce this impact to a less than significant level.

A site specific geotechnical study was conducted (Golder 2010) that determined that the slopes designed for Alternative 1 – Proposed Action would meet the stability criteria for sliding and earthquakes. As part of the Design Features/Mitigation Measures for Alternative 1 – Proposed Action, a geotechnical program of ongoing field mapping, drilling, geophysical surveys, and laboratory testing would be established and implemented as the quarry is excavated (GEO-2). The purpose of this type of site investigation would be to provide information for detailed slope stability assessments on a continual basis and stabilization of the slopes in areas where poor rock and/or adverse geologic structures are present. An annual report discussing the geotechnical program would be prepared for the Forest Service and the County. Therefore, impacts associated with unstable slopes in areas not underlain by landslide deposits are anticipated to be less than significant.

Soils. The site is underlain by metacarbonate rock. Soils developed from such materials are considered to have very low to low potential for expansion. Therefore, fill soils derived from existing site soils and bedrock are anticipated to have a very low to low potential for expansion (Ninyo & Moore 2013a). Based on review of regional geologic maps, geologic reconnaissance, and knowledge of the vicinity, the thin soils underlying the Project typically consist of silty sand and gravel, which are considered negligibly compressible under new loading (Ninyo & Moore 2013a). Compressible soils could lead to settlement during the operation of Alternative 1 – Proposed Action and potential instability of overlying slopes; however, no impacts from compressible soils are expected. Due to the alkaline nature of the on-site soils and rock, site soils should not be considered corrosive (Ninyo & Moore 2013a). The potential for soil erosion would be less than significant with the inclusion of Design Feature GEO-1.

The soil type found on the Project site, lithic xerorthents, is considered rocky with 50 to 100 percent slopes (Figure 3.5-4) (USDA 2012). This soil setting is not used for agricultural purposes, therefore, the potential for loss of agricultural soils due to further development of the study area is considered low and impacts would be less than significant (Ninyo & Moore 2013a). Soils encountered on site that may contain organic material would be salvaged by MCC, stored on the site, and applied in the reclamation and revegetation process.

Mineral Resources. The Project site is located in Mineral Resource Zone 3a (MRZ-3a), which is defined as an area containing mineral deposits, the significance of which cannot be evaluated from available data. (Ninyo & Moore 2013a). Based on drilling conducted in 2009 and 2010, the South Quarry site has an estimated proved and inferred reserved of over 200 million tons of mostly high grade to medium grade limestone. With Alternative 1 – Proposed Action, the higher grade limestone would be blended with the existing Cushenbury Mine lower grade limestone at a ratio of approximately 50/50 to meet limestone specifications to feed the adjacent Cushenbury Cement Plant. With Alternative 1 – Proposed Action, the South Quarry would be mined at an average production rate of 1.3 MTPY of ore and would operate for 120 years, ultimately excavating approximately 156 million tons of ore. The Cushenbury Cement Plant requires a limestone feed of approximately 2.6 MTPY. The amount of limestone excavated from the existing Cushenbury Mine would be reduced to an average of 1.3 MTPY of ore, therefore the total limestone production of 2.6 MTPY would remain the same (MCC 2012b). A Plan of Operations for Mining Activities on National Forest System Lands, and a Reclamation Plan per the County’s Mine and Reclamation Plan have been submitted for Alternative 1 – Proposed Action. The CEQA significance criteria associated with the loss of availability of a known mineral resource is based on the state’s interest in ensuring that important mineral resource deposit areas not be lost to the development of incompatible land uses. The California Department of Conservation Division of Mines and Geology has classified the Project area as MRZ-3a, an area of mineral resources of statewide or regional significance, for limestone deposits. The SBNF Land Management Plan allows development of mineral resources under a Plan of Operations, which is processed under the authority of the Forest Service mining regulations (36 CFR 228.A) to avoid or minimize impacts to the environment. Development of this resource is consistent with the policies of the SBNF, SMARA, and the County and would result in a beneficial impact with respect to the availability of mineral resources.

As part of Alternative 1 – Proposed Action, MCC would convey conservation easements and relinquish unpatented mining claims on over 540 acres to compensate for potential impacts to carbonate plant species. These compensation lands also contain unknown limestone reserves, some of which are also classified as MRZ-3a, which would be withdrawn from public use and would be unavailable for future mineral extraction. The withdrawal of these mining claims is consistent with the requirements of the SBNF Land Management Plan and the Carbonate Habitat Management Strategy, which allows use of the withdrawal of mining claims and other land acquisition strategies to increase the carbonate plant habitat reserve while allowing for future mining in other areas. The loss of these lands is unlikely to affect the regional or statewide availability of limestone, and a less than significant impact would occur.

Cumulative Impacts

Past mining activities in the area surrounding the Project site have already brought about changes to the geology, soils and mineral resources in the area. In addition to past mining activities, current mining activities occur in the area surrounding the Project site. These activities would continue to alter the geology, soils, and mineral resources in the area. Alternative 1 – Proposed Action would contribute to the cumulative actions identified above because it would alter the geology, soils and mineral resources in a similar way. The potential for geology, soil and mineral resource impacts, including geologic hazards, from Alternative 1 – Proposed Action were evaluated above. It was determined that the effects are less than significant with implementation of Design Features/Mitigation Measures GEO-1 through GEO-4, as listed in Section 2.3.2.13 and are restricted to the Project site.

There are other mining projects within the Project vicinity. While geologic hazards due to seismic shaking and fault rupture are common throughout Southern California, each project site has unique conditions that influence susceptibility to these hazards. With respect to mining projects in particular, each mine is subject to the same general hazards and each operation is required to reduce potential hazards to acceptable levels, including compliance with mine safety programs administered by Mine Safety and Health Administration (MSHA) and Occupational Safety and Health Administration (OSHA).

Each excavation at each project site is unique; therefore, the potential impacts of mining due to geologic hazards and potential slope instability vary depending on the site. The potential impacts are not cumulative the same way other impacts are, such as air quality or biological resources. For example, the height of a cut slope proposed at one mine may require mitigation to achieve an acceptable factor of safety, but it does not influence the stability of slopes at other locations. The mines in the vicinity of the Project site are spread over large areas, which tend to diffuse impacts due to geologic hazards. Cumulative impacts related to geology, soils, and mineral resources are considered less than significant.

Mitigation Measures

The NEPA design features from Section 2.3.2.14 for geology, soils, and minerals are listed below for convenience. Design features indicated with an asterisk (*) are also CEQA Mitigation Measures that would avoid, minimize, rectify, reduce, and/or compensate for effects to geology, soils, and mineral resources anticipated with Alternative 1- Proposed Action.

- GEO-1*: Control of surface drainage, erosion, and sedimentation of the proposed haul road and quarry operations will involve the following primary components currently being implemented for existing operations:
- a. Limiting surface disturbance to the minimum area required for active operations.
 - b. Diverting runoff, where operationally feasible, such that runoff from undisturbed areas does not enter the area of active operations.
 - c. Using ditches, sediment basins, and localized control and maintenance measures to intercept and control runoff along the haul road.
 - d. Stabilizing disturbance areas through re-grading, revegetation, and other restoration practices.
- GEO-2*: A geotechnical program of ongoing field mapping, drilling, and geophysical surveys and laboratory testing will be established and implemented as the quarry is excavated. This type of site investigation during the mining operation will provide information for detailed slope stability assessment on a continual basis and stabilization of slopes in areas where poor rock and/or adverse geologic structures are present. An annual report discussing the geotechnical program will be prepared for the Forest Service and the County.
- GEO – 3*: Areas mapped as underlain by landslides shall be further evaluated. Should landslides be found present within the quarry, appropriate mitigating engineering measures shall be employed to stabilize cuts into quarry walls. Such measures may include removal of landslide debris, construction of buttresses, or other

stabilization measures. Monitoring of cut slopes by an Engineering Geologist shall also be performed during excavation of the quarry so that further recommendations for slope stabilization can be provided as appropriate.

GEO-4*: There is a high potential for ground shaking at the Project during a nearby seismic event, and this would include the proposed quarry and haul road. Engineering measures designed by a geotechnical engineer to mitigate the effects of ground shaking shall be included in slope design and construction.

Residual Impacts after Mitigation

Impacts would be less than significant with implementation of Design Features/Mitigation Measures GEO-1 through GEO-4.

3.5.4.3 Alternative 2 – Partial Implementation

This alternative was developed in response to public comments requesting an alternative with a shorter duration and/or smaller footprint. The footprint of the quarry would be approximately 20 acres smaller and would not be as deep as with Alternative 1 – Proposed Action. Mining in the quarry would last 40 years rather than 120 years. As a result, reclamation and revegetation at the South Quarry site would be completed nearly 80 years sooner and localized impacts related to mining, such as fugitive dust and noise, would also end earlier at this site. With Alternative 2 – Partial Implementation, a higher grade limestone would still be required for blending at the existing Cushenbury cement plant and would be trucked to the plant after Phase 2 is completed, from approximately year 41 through year 120.

Direct and Indirect Impacts

Direct and indirect impacts to geology, soils, and mineral resources from Alternative 2 – Partial Implementation would be similar to the effects that would result from the implementation of Alternative 1 – Proposed Action although they would occur over a smaller area. Direct and indirect impacts of Alternative 1 – Proposed Action, discussed in Section 3.5.3.2, resulted in less than significant impacts with implementation of Design Features/Mitigation Measures GEO-1 through GEO-4. Therefore, the geology, soils and mineral resource impacts of Alternative 2 would also be less than significant with implementation of Design Features/Mitigation Measures GEO-1 through GEO-4.

The effects of using limestone from an off-site location after Phase 2 (year 41 to 120) would occur outside the area of analysis and would have a neutral effect on geology, soils and mineral resources on the site. Effects of mining limestone at an unknown offsite location would be subject to the same regulations as at the Project site and would be expected to be less than significant.

Cumulative Impacts

Cumulative impacts for Alternative 2 – Partial Implementation would be similar to those described for Alternative 1 – Proposed Action. Impacts would be less than significant with implementation of Design Features/Mitigation Measures GEO-1 through GEO-4.

Mitigation Measures

The Geology and Soils Design Features from Section 2.3.2.14 listed for Alternative 1 – Proposed Action in Section 3.5.4.2 are also CEQA Mitigation Measures that would avoid, minimize, rectify, reduce, and/or compensate for effects to geology and soils resources anticipated with Alternative 2- Partial Implementation.

Residual Impacts after Mitigation

Impacts would be less than significant with implementation of Design Features/Mitigation Measures GEO-1 through GEO-4.

3.5.4.4 Alternative 3 – No Action/No Project

Direct and Indirect Impacts

If Alternative 3 – No Action/No Project is implemented and the South Quarry is not developed under this Plan of Operations, there would be no direct or indirect effect on geology, soils, or mineral resources in the South Quarry area. Minerals and geologic resources within the Project area would remain undisturbed. However, MCC would maintain the legal right to develop the subject mining claims under a different Plan of Operations. With this alternative, high-grade limestone would be trucked in from another location in the region through year 120 to feed the existing Cushenbury Cement Plant. Mining limestone at the South Quarry site under a different Plan of Operations or at an unknown offsite location would be subject to the same regulations as at the Project site and the effects would be expected to be less than significant with similar mitigation as with Alternative 1 – Proposed Action.

Cumulative Impacts

No cumulative impacts would occur.

Mitigation Measures

No impacts would occur; therefore, mitigation measure would not be required.

Residual Impacts after Mitigation

No impacts would occur.

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