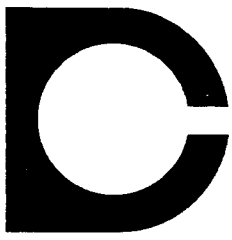
MINERAL LAND CLASSIFICATION OF THE TEMESCAL VALLEY AREA, RIVERSIDE COUNTY, CALIFORNIA

1991

SPECIAL REPORT 165



CALIFORNIA
DEPARTMENT
OF CONSERVATION

Division of Mines and Geology

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MINERAL LAND CLASSIFICATION OF THE TEMESCAL VALLEY AREA, RIVERSIDE COUNTY, CALIFORNIA

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CALIFORNIA DEPARTMENT OF CONSERVATION
DIVISION OF MINES AND GEOLOGY
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PREFACE

The Surface Mining and Reclamation Act of 1975 (SMARA) was enacted to promote the conservation of the State's mineral resources and to ensure adequate reclamation of mined lands. Among other provisions, SMARA requires the State Geologist to classify land in California for mineral resource potential. Presently, mineral land classification studies are being conducted in several areas of the state on a county basis.

Upon completion of each study, the State Geologist submits the mineral land classification report to the State Mining and Geology Board which transmits the information to appropriate local governments that maintain jurisdictional authority in mining, reclamation, and related land-use activities. Local governments are required to incorporate the report and maps into their general plans and consider the information when making land-use decisions.

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EXECUTIVE SUMMARY

The California Surface Mining and Reclamation Act of 1975 requires the State Geologist to classify land according to the presence or absence of significant mineral deposits. The classification is carried out without regard to existing land use. The primary objective of mineral land classification is to ensure that the mineral potential of land is recognized and considered in the land-use planning process.

This report covers approximately the western one-eighth of Riverside County, California, and includes a geologic map compilation showing mines and prospects (Plates 1A and 1B); Mineral Land Classification maps which show Mineral Resource Zone areas for Hydrothermal and Sedimentary Processes (Plates 2A and 2B), Industrial Mineral Resources (Plates 3A and 3B), and Aggregate Resources (Plates 4A and 4B); Aggregate Resource Areas (Plates 5A and 5B); a composite map of all areas classified MRZ-2a and MRZ-2b (Plates 6A and 6B); and a map of designated areas (Plate 7).

A total of 31 separate areas covering a combined 18 square miles of land (approximately 2% of the area) within the Temescal Valley area are classified as containing, or are likely to contain, significant mineral deposits.

There are 30 active mines within the Temescal Valley area. Nineteen of the active mines produce construction aggregate and the other 11 active mines produce industrial minerals such as clay, riprap, roofing granules, and industrial sand.

Major findings of this study relative to construction aggregate resources are:

- Twenty areas covering approximately 15-square miles of the Temescal valley area are classified MRZ-2a or MRZ-2b for construction aggregate resources. These areas represent about 1.5% of the study area.

- Of the area classified MRZ-2 for construction aggregate, about 7.5-square miles are identified as Aggregate Resource Areas. An Aggregate Resource Area (ARA) is an area that is classified MRZ-2a or MRZ-2b for construction aggregate by the State Geologist and is deemed available for mining based upon criteria for compatibility provided by the State Mining and Geology Board. This represents 0.75% of the Temescal Valley area.

- Of the areas identified as ARA's, eleven contain active aggregate mines and have been identified as Immediately Significant. There are nineteen active aggregate mines operated by thirteen different companies and the County of Riverside.

ARA-4 Stringfellow quarry (concrete aggregate)
Paul J. Hubbs Construction Company
ARA-15 Prado pit (concrete aggregate)
Owl Rock Products Company
ARA-21 Corona plant (concrete aggregate)
Fontana Paving, Inc.
ARA-22 Corona pit (concrete aggregate)
All American Asphalt and Aggregates, Inc.
Corona pit (concrete aggregate)
CalMat Corporation
Eagle Valley quarry (concrete aggregate)
Santa Ana River Rock Company - Boral Resources, Inc.
ARA-23 Harlow quarry (concrete aggregate)
Paul J. Hubbs Construction Company
ARA-24 Markham Road pit (base aggregate)
Riverside County Road Department
ARA-25 Mobil Sand pit (concrete aggregate)
Mobil Sand Company
Dawson Canyon pit (concrete aggregate)
C.L. Pharris Sand and Gravel, Inc.
ARA-27 Glen Ivy pit (concrete aggregate)
Chandler's Palos Verdes Sand and Gravel, Inc.
Maitri pit (concrete aggregate)
C.L. Pharris Sand and Gravel, Inc.
Coldwater Canyon pit (concrete aggregate)
R.J. Noble Company)
J.F. and T. Sand pit (concrete aggregate)
West Coast Sand and Gravel, Inc.
Foster Sand and Gravel pit (concrete aggregate) - Werner Corporation
ARA-30 McVicker Canyon pit (concrete aggregate)
Elsinore Ready Mix, Inc.
ARA-31 Railroad Canyon Road pit (base aggregate)
Riverside County Road Department
Christensen pit (base aggregate)
Riverside County Road Department
ARA-32 Bundy Canyon Road pit (base aggregate)
Riverside County Road Department

These eleven deposits total 5-square miles or 0.5% of the Temescal Valley area.

- Four deposits have been identified as Highly Significant. These areas total approximately 1-square mile or 0.10% of the Temescal Valley area.

- Eighteen areas have been identified as Significant. These areas total about 1.5-square miles or 0.15% of the Temescal Valley area.

Major findings relative to the life expectancy of construction aggregate reserves in the Temescal Valley area:

- The Temescal Valley area of western Riverside County consumes and exports large quantities of construction aggregate. The adjacent areas of Orange County, San Diego County, and the San Bernardino Valley all depend heavily on the Temescal Valley area as a source of construction aggregate.

- There are currently 19 active aggregate mining operations within the Temescal Valley area with combined reserves of 924,000,000 tons. Approximately two-thirds of the reserves are crushed stone and approximately one-third are sand and gravel.

- The currently permitted reserves of construction aggregate in the Temescal Valley area may be depleted by the year 2028, thirty-nine years from the time of this study. The expected longevity of these reserves is based on the assumption that mining will continue to be permitted until the reserves are depleted.

Major findings of this study relative to industrial minerals are:

- Sixteen areas covering about 4-square miles of land are identified as containing significant industrial mineral resources and are classified as either MRZ-2a or MRZ-2b. These deposits include kaolinite and common clay, specialty stone - including riprap and roofing granules, specialty sand, and limestone resources.

- Seven areas covering about 2-square miles contain significant measured and indicated reserves of kaolinite clay and have been classified MRZ-2a. These areas are the Corona clay deposit, the Cajalco clay deposit, the Liston and Corona clay pits area, the Harrington clay pit area, the Temescal clay mine area, the Pacific Clay Products property in the Alberhill area and the Alberhill area east of Lake Street (old Highway 71).

- One large area, between Lake Elsinore and Corona, covering about 10-square miles, contains inferred resources of kaolinite clay.

- Three areas covering about one-tenth of a square mile contain significant reserves of common clay and have been classified MRZ-2a. They are the Dominguez clay/shale deposit, the Thomas clay deposit, and the Alberhill shale/clay mine area.

- Three areas covering about three-tenths of a square mile contain significant measured reserves of riprap and have been classified MRZ-2a. The areas are the Stringfellow quarry, the Atkinson quarry, and the Harlow quarry.

- One area covering about four-tenths of a square mile, the Temescal rock quarry, contains significant reserves of stone suitable for manufacturing roofing granules and has been classified MRZ-2a.

- The Crestmore quarry owned by Riverside Cement Company covers about one-tenth of a square mile and contains demonstrated subeconomic resources of high-grade limestone. This area has been classified MRZ-2b.

- One area covering about two-tenths of a square mile, the Corona clay deposit area, contains significant reserves of specialty sand and has been classified MRZ-2a.

Major findings of this study relative to metallic mineral resources are:

- There are no areas in the Temescal Valley area that are classified MRZ-2a or MRZ-2b for metallic minerals.

- Nine areas covering about 5-square miles of land are classified as MRZ-3a or MRZ-3b for metallic mineral resources including gold, tin, silver, and copper. With the exception of the Good Hope mine area, which has been classified MRZ-3a, few metallic mines in the study area have been economic.

- One area covering 0.04-square miles is classified as MRZ-3a for manganese resources. The Bedford Canyon Formation northeast of the City of Lake Elsinore hosts several manganese prospects of limited thickness and areal extent. The largest deposit, the Beal-McClellan, was commercially mined during World War II and is classified MRZ-3a.

- Lode gold mining in the Temescal Valley area typically has been from vein deposits, the gold occurring in quartz veins as free gold or in association with sulphide minerals. The nature and degree of wall-rock alteration at some deposits suggest that mineralization has been largely confined to the veins and possibly to narrow zones of wallrock adjacent to the veins.

- The contact zone between the Silverado Formation and overlying basalt flows in the Elsinore Peak area 3 1/2 miles west of Wildomar carries anomalously high gold values. The nature and extent of the mineralization is not well known. The area has been classified MRZ-3a because of the potential for a large, low-grade, bulk-minable deposit.

- Most of the historic gold mining activity in the Temescal Valley area has been in the Pinacate and Menifee mining districts. Subsequent urban development on or near many of the old mines will make future gold mining in these districts very difficult.

PART I - MINERAL LAND CLASSIFICATION PROJECT DESCRIPTION

INTRODUCTION

The Temescal Valley area of western Riverside County is one of many geographic regions in California to be selected for Surface Mining and Reclamation Act (SMARA) mineral land classification studies. The study area is located in western Riverside County about 60 miles east of Los Angeles. The study area covers approximately 1,000-square miles and includes all or part of 21 U.S. Geological Survey 7 1/2' quadrangles (Figure 1). Included within the area are all or part of six incorporated cities - Corona, Lake Elsinore, Norco, Perris, Riverside, and Temecula.

BACKGROUND

Local, State, and Federal agencies are faced with difficult land-use decisions as competition for land for a variety of purposes increases. Since the availability of mineral resources is vital to our society, it is essential that mineral potential of land be considered in the land-use planning process. The California Surface Mining and Reclamation Act of 1975 (SMARA) requires the State Geologist to classify land according to the presence or absence of significant mineral deposits in certain areas of the state. These studies are carried out under guidelines adopted by the California State Mining and Geology Board (1983). As these studies are completed, the State Mining and Geology Board transmits the mineral land classification reports to appropriate lead agencies that are required to incorporate the information in their general plans and to use it in their land-use decision process.

SCOPE

This mineral land classification study addresses the overall mineral potential of land through the identification of local and regional geologic factors that control or influence the formation of mineral deposits.

FIELDWORK AND RESEARCH

The Mineral Land Classification study of the Temescal Valley area was conducted over an 18-month period from December, 1989 to May, 1991. The construction aggregate deposits were evaluated by R.V. Miller, the metallic resources were evaluated by R.L. Hill

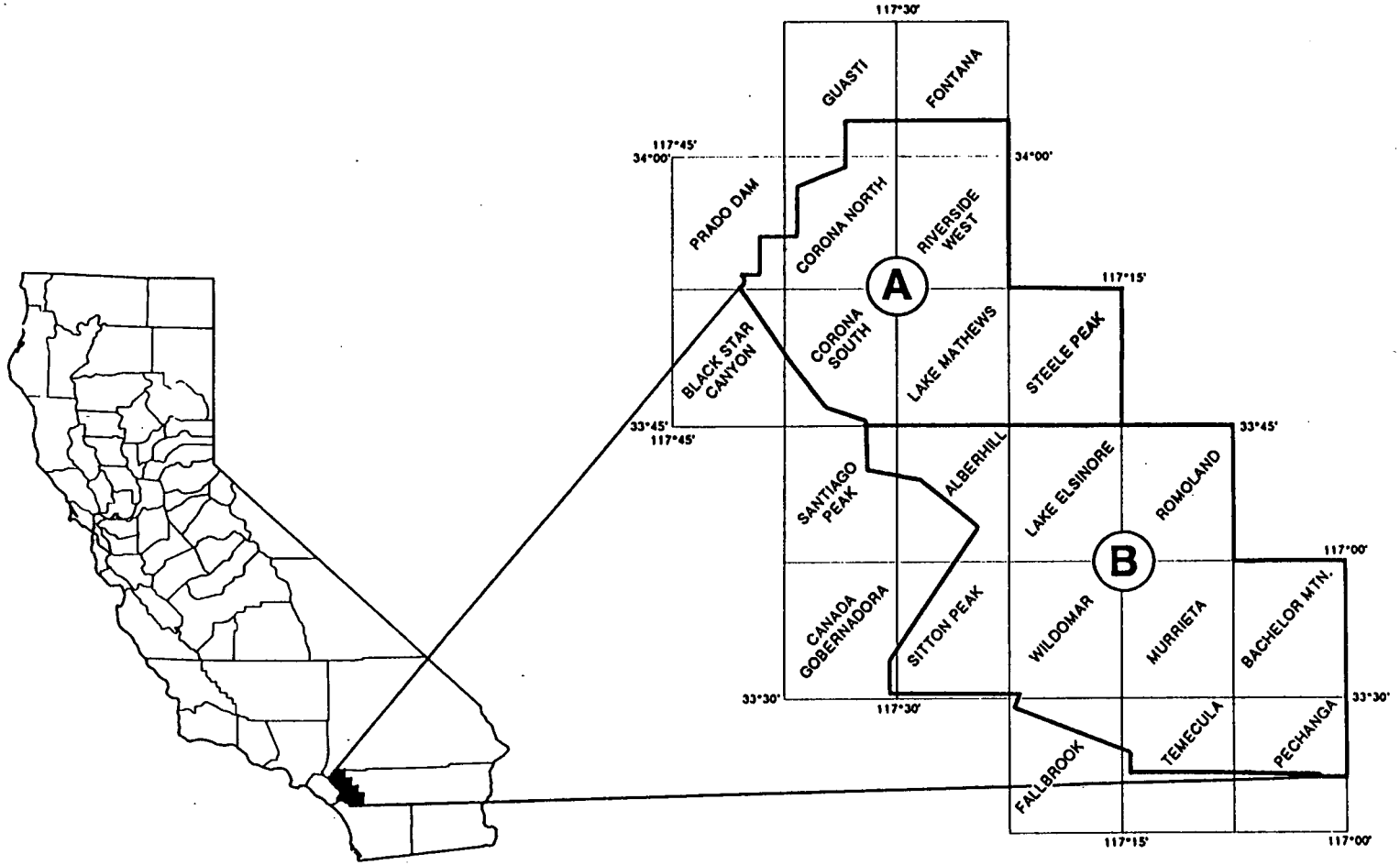


Figure 1. Location and index map of 7.5-minute quadrangles for the Temescal Valley area. The area has been subdivided into a northern area, A, and a southern area, B, which are shown on separate plates accompanying this report.

and D.O. Shumway, and the industrial minerals were studied jointly by all three authors.

The study involved research of geologic and mining related literature and Riverside County Planning Department documents. Compilation of geologic maps was accomplished using publications of the Division of Mines and Geology and the U.S. Geological Survey, and unpublished mapping by U.S. Geological Survey investigators and other geologists. Five classification reports by the Division of Mines and Geology, describing studies of two construction aggregate production-consumption regions covering part of the study area (Miller and Corbaley, 1981; Miller, 1987) and three petitioned clay properties within the study area (California Department of Conservation, Division of Mines and Geology, 1982; Joseph, 1982; and Joseph, 1985), were used extensively. The plotting of reported mines and prospects used data from the Division of Mines and Geology, the U.S. Geological Survey, the U.S. Bureau of Mines and the U.S. Bureau of Land Management. The study included field work which involved general field observations, site investigations, and interviews with operators of active mines. In the case of construction aggregate, current transportation rates were determined and past and present production was investigated. Limited sampling of rocks for fire assay and chemical analysis was done and the data were assessed in order to identify resources and/or the geologic factors which control or influence mineralization.

The field and analytical data were integrated and evaluated for assigning Mineral Resource Zones (MRZ's) in accordance with Mineral Land Classification guidelines adopted by the California State Mining and Geology Board (1983). A geologic map (scale 1:48,000, Plates 1A and 1B) and Mineral Land Classification maps (scale 1:48,000) were prepared and are included in this report (Plates 2A through 6B). An Aggregate Resource Area map is included, showing all aggregate deposits classified MRZ-2a or 2b deemed available for mining based upon criteria established by the State Mining and Geology Board. The maps (Plates 2A through 6B) show mine and prospect localities. Mine and prospect descriptions are presented in Appendix A. An alphabetical index of all mines and prospects is presented in Appendix B.

GEOGRAPHIC SETTING

The Temescal Valley area is located about 60 miles east of Los Angeles and includes the western-most part of Riverside County, from the western county line to the Perris Valley. The most prominent geographic feature is the Temescal Valley (often referred to as the Corona-Elsinore trough) which extends from Corona south to the Temecula area. The Temescal River is the major drainage of the study area. It drains the Lake Elsinore overflow and flows north into the Santa Ana River channel. The

southern part of the Temescal valley, south of Lake Elsinore, is drained by Murrieta Creek.

Included in the study area are the Chino Hills and the Jurupa Mountains in the northern part of the area and the east slopes of the Santa Ana Mountains and their southern extension - the Elsinore Mountains. The Temescal Mountains which separate the Temescal Valley from the Perris Valley to the east, occupy the central part of the study area and include the highlands of El Sobrante de San Jacinto (which itself includes Arlington Mountain, Estelle Mountain and the Gavilan Plateau area). The study area also includes the western and southern portion of Perris Valley. Parts of the San Mateo and Agua Tibia Wilderness Areas, which lie within the southern part of the area, were not included in this study.

Four lakes are located within the study area. Lake Mathews, in the northern half of the study area, is owned and controlled by the Western Municipal Water District and is an important reservoir in the region. Lake Elsinore, in the southern half, is used mainly for recreation and is the focus of rapid growth along its shoreline and surrounding countryside. Railroad Canyon Reservoir, east of Lake Elsinore, is used for water storage and recreation. Skinner Reservoir, in the southeastern part of the area, is used primarily for water storage.

Terrain in the Temescal Valley area consists of rugged mountains, rolling highlands, alluvial valley floors, and river bottom. Elevations range from 5,687 feet at Santiago Peak in the Santa Ana Mountains to 500 feet at the Prado Dam Flood Control Basin. Gavilan Plateau elevations average 2,600 feet. The elevation at Lake Elsinore is 1,200 feet. In the southern half of the study area, the elevations are around 2,200 feet in the hill country and around 1,000 in the Temescal Valley.

General access to the area is by Freeways (I-15, I-60, I-215), Highways (71, 74, and 79) and other major roadways. Unpaved roads are generally in excellent condition. Off-road investigation access is variable, ranging from extremely difficult in the Santa Ana Mountains to easy in developed quarries. Temperatures are mild in winter and frequently over 100-degrees fahrenheit in summer. Haze (smog and low fog) often restricts visibility during field investigations. Studies were also hampered by access problems to large areas of privately held land and by lack of exposure due to extensive areas of urban development. The study area is experiencing one of the highest rates of growth in the United States. During the decade of the 1980's, the Temescal Valley area population increased by 76%.

GEOLOGY

REGIONAL GEOLOGY

The Temescal Valley area is located in the northern part of the Peninsular Range province and is dominated by rocks of the southern California batholith. The multiple intrusives of the batholith have invaded older metasedimentary and metavolcanic rocks of Paleozoic through early Cretaceous age (570 to 98 million years ago)** (see Geologic Map, Plates 1A and 1B). Bodies of these metasedimentary and metavolcanic rocks now crop out along the edges of the batholithic rocks and as roof pendants within the batholithic rocks. Rocks of Late Cretaceous through Holocene age (98 million years ago to the present) were deposited over the eroded surfaces of these older rocks and crop out in the major drainages. These younger rocks are mostly conglomerates, claystones and sandstones of marine and continental origin.

Mineral resources of the Temescal Valley area are not only lithologically related but are often time related. Aggregate resource areas may encompass rocks which represent a great span of time (e.g. Paleozoic through Holocene). Some resources however, such as clay, may be restricted to a particular formation. Other deposits, such as tin or gold, may be related to one pluton or plutonic event. These physical occurrences effectively restrict an ore deposit in time. A knowledge of the geologic history of the area aids in the classification of Mineral Resource Zones. The reader interested in a detailed geologic history of the area is referred to Larsen (1948), Gray (1961), or Kennedy (1977). The following brief geologic history, however, should assist the reader to understand the relationship of the various mineral deposits to the geology of the area.

During Paleozoic time (approximately 570 to 245 million years ago) in the Temescal Valley area a sea deposited the sediments which now are the highly metamorphosed rocks of the Jurupa Complex, which include the valuable limestones of the Crestmore area. The geologic record resumes in the study area during Jurassic time (208 to 144 million years ago) with the deposition of the rocks of the Bedford Canyon Formation in a deep marine environment. During early Cretaceous time (144 to 98 million years ago), following deformation, metamorphism and erosion, the thick pile of the Santiago Peak Volcanics was deposited and contemporaneously or closely following this, the Temescal Wash quartz latite porphyry emplaced as a shallow intrusive body.

The rocks of the southern California batholith were intruded in the Cretaceous Period (from 144 to 66 million years ago). The gold veins associated with the plutonic rocks were formed within

** All geologic age dates are from Palmer, 1984.

and related to these plutons. Movement along the Elsinore fault may have occurred during the Late Cretaceous (from 98 to 66 million years ago)(Gray 1961). The batholithic rocks were eroded and deposited as part of the Cretaceous rocks. The oldest Cretaceous rocks in the area are of continental origin, but most of the Cretaceous strata are marine. The Tertiary section (deposited from 66 to 1.6 million years ago) is composed mainly of rocks of nearshore marine origin resulting from a lagoonal environment which was at the eastern edge of a developing and deepening Los Angeles Basin. The clay and specialty sand deposits and minor coal layers of the lower Tertiary were laid down in this environment.

Folding and block faulting began during Pliocene time (from 5.3 to 1.6 million years ago) and continues to the present. Quaternary deposits (1.6 million years ago to the present) host economic deposits of sand and gravel.

Geologic mapping by the following authors was used to compile Plates 1A and 1B: Larsen (1948 and 1951), Engel (1959), Gray (1961 and 1964), Proctor (1962), Durham and Yerkes (1964), Irwin, Greene, and Thurber (1970), Morton (1974), Morton and Baird (1976), Kennedy (1977), Weber (1977), Cox and Morton (1978), Morton (1978 and several works in progress), Schoellhamer, Vedder, Yerkes, and Kinney (1981), and Eaton (1989).

Pre-Batholithic Rocks

Metasedimentary and metavolcanic rocks within the study area crop out in the Santa Ana Mountains and in the highlands of the Perris Block (the Temescal Mountains), and in the Elsinore Mountains in the southern part of the study area (see Plates 1A and 1B). These rocks were metamorphosed prior to the intrusion of the igneous rocks of the batholith. The oldest rocks exposed in the Temescal Valley area are those of the Jurupa Complex of possible Paleozoic age which are exposed in the northern part of the study area. The marine metasedimentary rocks of the Bedford Canyon Formation and the overlying thick sequence of mixed volcanic rocks, the Santiago Peak Volcanics, comprise most of the older rocks in the study area.

Jurupa Complex

Scattered bodies of gneiss, schist, quartzite, and marble in the Jurupa Mountains are collectively referred to as the Jurupa Complex. These metasedimentary rocks are intruded by rocks of the southern California batholith. The general degree of metamorphism ranges from moderate to strong. Contact

metamorphism is negligible in all of the rock types but the marble. The contact metamorphic zone in the marble at the Crestmore quarry (appendix no. 218, map no. 10)** is world renowned for its unusually large number of mineral species, many of which are rare.

The age of the Jurupa Complex can only be estimated by tentative correlations with similar metamorphic rocks in nearby areas. If the Jurupa Complex is equivalent to the Bedford Canyon Formation in the Santa Ana Mountains to the south (MacKevett, 1951), then it could be assigned a probable Jurassic age. Or, if the Jurupa Complex is correlative to the metasedimentary rocks exposed in the northern part of the San Bernardino Mountains (Woodford, 1943, p.336), then it may be Paleozoic in age (Dibblee, 1982, p. 154). The presence in the Jurupa Complex of large, relatively pure limestone (marble) bodies, as is found at Crestmore, suggests that the complex is more likely correlative with the Paleozoic metasediments in the San Bernardino Mountains, which also contain large bodies of relatively pure limestone. The Bedford Canyon Formation does contain a few small limestone bodies, but, considering the extensive areal exposure of the formation, the lack of limestone bodies approaching the size of those in the Jurupa Complex weighs against a correlation between the units.

Bedford Canyon Formation

The rocks of the Bedford Canyon Formation are formed from sediments of marine origin which have been metamorphosed to black or grayish quartzites, slates, and argillites. Also bedded within the formation are beds of conglomerate and small, discontinuous lenses of limestone. Pyrite and iron oxides are common in the Bedford Canyon Formation. These rocks are probably of Jurassic age (Silberling and others, 1961) and crop out in the Santa Ana Mountains. Elsewhere in the study area are metasediments equivalent to but mapped separately from the Bedford Canyon Formation. These metasedimentary rocks occur in linear belts trending northwest-southeast, reflecting the regional geologic structural trend of the area (see Plates 1A and 1B).

Exposed thicknesses of the Bedford Canyon Formation range from 11,800 feet to over 20,000 feet (Larsen, 1948). Due to the

** Throughout the text, each reference to a mine or prospect will be followed by two numbers in parentheses. Every mine or prospect has been assigned two numbers - an appendix number and a map number. The appendix number identifies the mine or prospect in Appendix A, in which the mines and prospects are listed by commodity in alphabetical order. The map number identifies the map location of the mine or prospect. The maps (Plates 2A through 6B) show mine and prospect localities. The map numbers are assigned by geographic location, beginning in the northwestern part of the area and continuing in numerical order from west to east and north to south to the southeastern part of the area. Mine and prospect descriptions are presented in Appendix A. An alphabetical index of all mines and prospects is presented in Appendix B.

highly deformed nature of the formation and the fact that the bottom has never been observed, an accurate measure of thickness has not been reported. The Bedford Canyon Formation is unconformably overlain by the Santiago Peak Volcanics.

Santiago Peak Volcanics

The Santiago Peak Volcanics crop out as a belt between the northern-most Santa Ana Mountains and La Jolla. In the study area, the Santiago Peak Volcanics form rugged topography within the Santa Ana Mountains and along the east side of the Temescal Valley. They unconformably overlie the Bedford Canyon Formation and also occur in fault contact with the Bedford Canyon Formation. The volcanics are a thick pile of flows, tuffs and volcanic breccias of mostly andesitic composition; however, more siliceous dacitic, latitic and rhyolitic compositions have been recognized (Gray, 1961). The volcanics have been unevenly metamorphosed to greenstones. Pyrite and pyrrhotite are commonly disseminated throughout the rocks. Recent work has dated the Santiago Peak Volcanics as Cretaceous in age (130 million years old, Kimbrough and others, 1990).

Temescal Wash quartz latite porphyry

The Temescal Wash quartz latite porphyry crops out east of the Temescal Wash from the Cajalco area to south of Estelle Mountain (Plate 1A). It is a dark gray to bluish-gray, porphyritic quartz latite. Plagioclase and quartz phenocrysts, in an aphanitic groundmass, make 20% to 30% of the rock. Alteration minerals are pyrite, biotite, chlorite and epidote. The Temescal Wash quartz latite porphyry is an important resource of construction aggregate (crushed rock), rip-rap, and roofing granules.

Southern California Batholith Rocks

The southern California batholith is a complex series of intrusions with a range of compositions including gabbro, quartz diorite, granodiorite, and granite. The batholithic rocks have been dated at 68 to 138 million years old. In the study area, the batholithic rocks have been dated at 90 to 120 million years old (personal communication, R. Greenwood, 1990).

The major batholithic rocks of the study area were assigned to either the older Woodson Mountain granodiorite or the younger Bonsall tonalite by Larsen (1948) in his classic study of the rocks of the southern California batholith. These rocks have since been subdivided and renamed by later workers into separate plutons or plutonic complexes. These subdivisions have proved to

be important distinctions as mineral occurrences have been shown to be related to individual plutons. The Cajalco quartz monzonite is host to the famous Cajalco tin prospects. The Gavilan pluton hosts the prospects and mines of the Pinacate mining district.

Granites are rare as most rocks of the area are granodiorites or quartz diorites. The plutons were emplaced by the passive stoping of the overlying older rocks. The plutons in general conform to the existing regional, northwest-southeast structural trends.

The southern California batholith is famous for its unusual development of pegmatites. These are often sources of silica, feldspar, lithium minerals, micas and gemstones. In the study area some of these pegmatites have been explored and commercially exploited in the past. Some pegmatites are targets for mineral collectors, but no pegmatites with commercial possibilities were found within the study area. The batholithic rocks are important resources of construction aggregate and riprap.

Post-Batholithic Rocks

Plates 1A and 1B show the distribution of post-batholithic rocks in the study area. The post-batholithic rocks range in age from Late Cretaceous through Holocene. Of the Cretaceous and Tertiary formations, all but the oldest (the Trabuco Formation of Late Cretaceous age), are wholly or mainly of marine origin. These formations crop out in the northwestern portion of the study area and are important sources of a variety of mineral resources. In the central and southern part of the study area, only the upper Cretaceous through Eocene (58 to 37 million years ago) age rocks are preserved (Engel, 1959). The formations with potential for mineral resources are the Ladd Formation of Cretaceous age (aggregate and clay), the Silverado Formation of Paleocene age (66 to 58 million years ago) (clay and silica sand), the undifferentiated Vaqueros and Sespe formations (specialty sands), and undifferentiated rocks of Miocene-Pliocene age (34 to 1.6 million years ago) (specialty sands).

Cretaceous Formations

The oldest Cretaceous rocks in the area are the fanglomerates of the Trabuco Formation. Overlying the Trabuco Formation is the Ladd Formation of Cretaceous age which is composed of buff- to gray- colored sandstone, cobble and small boulder conglomerate, siltstone and shale (Gray, 1961). These rocks crop out in a northwest-trending band 1,500 feet to 5,000 feet wide from Mabey Canyon to Santa Ana Canyon (west of the Riverside County line). Thickness is about 3,500 feet. Areas

where Ladd Formation occurs have been classified for construction aggregate and clay resources.

Silverado Formation

The Silverado Formation crops out in the Temescal Valley (the Corona-Elsinore trough) from the north end of the Santa Ana Mountains to Lake Elsinore. The Paleocene-age rocks are in fault contact with underlying sedimentary rocks on the eastern flanks of the Santa Ana Mountains but farther east they rest on residual clays derived from intrusive and metamorphic rocks. The lower part of the formation is regarded as non-marine or brackish (Gray, 1961), but the major part of the formation is marine clays, silts, quartz and arkosic sands. Total thickness is difficult to determine because of structural complexities. Maximum thicknesses have been estimated to range from 2,000 to 200 feet (Gray 1961). The Silverado Formation is a major source of clay and silica sand resources in the Temescal Valley area.

Vaqueros and Sespe Formations, Undifferentiated

The undifferentiated Vaqueros and Sespe formations are exposed in two areas, at the north end of the Santa Ana Mountains and in the low hills in the central part of the Temescal Valley between Bedford and Brown Canyons. The unit consists of maroon, red, buff, gray, and greenish-gray sandstone and conglomerate. The unit probably ranges in age from late Eocene to early Miocene (Gray, 1961, p. 30). The Vaqueros and Sespe formations, undifferentiated, are a possible source of specialty sands.

Miocene-Pliocene Rocks, Undifferentiated

Undifferentiated Miocene-Pliocene rocks - a band of white sandstone - extend from the southern Puente Hills to Bedford Canyon Wash. The white, coarse sandstone is arkosic and is interbedded with conglomerate and thin beds of black or grayish-brown fine-grained sandstone, siltstone and shale. These sandstones have some potential as specialty sand resources.

METAMORPHISM AND ALTERATION

The rocks of the Temescal Valley area underwent low-grade regional metamorphism before the intrusion of the southern California batholith. The metamorphism increases in grade from west to east. The metamorphism is pre-batholithic and shows no relationship to the distribution of individual plutons of the batholith.

Contact metamorphism is the response of existing rocks to the intrusion of a hot, partially melted rock. The recrystallization of rocks by introduced heat from a magmatic source can be accompanied by introduction of hot water or water vapor and other magmatically derived gases. The addition of ions from magmatic fluids and gases can produce minerals of economic value. These areas of contact metamorphism are then of economic importance either intrinsically or as indicators of mineralization.

In the Temescal Valley area, contact metamorphic aureoles associated with plutons of the southern California batholith are generally small and economically insignificant. Locally, where batholithic rocks have intruded carbonate rocks, the contact metamorphic minerals produced are visually spectacular and scientifically interesting. The Crestmore quarry (appendix nos. 100 and 218, map no. 10) is an example where contact metamorphism has caused the formation of many exotic and famous minerals. Of more importance, however, for the purposes of this study, is the economic significance of these large limestone resources as a source of cement.

Hydrothermal alteration in the Temescal Valley area is also limited in occurrence. Within the batholithic rocks, quartz veins and pegmatitic veins are associated with argillic alteration of wallrocks, where the feldspars of the host rock are altered to clay minerals. Silicification of the host rocks is also common. In most cases, however the alteration halo is small and with few exceptions, does not indicate any economic mineralization. Extensive hydrothermal alteration occurred at the Cajalco Tin mine area, where the Cajalco quartz monzonite rocks have been subjected to tourmalinization and replaced by tourmaline and quartz from fluids and gases of the cooling magma. These tourmaline-quartz veins are associated with tin, copper, silver, and gold mineralization of minor economic importance.

The Santiago Peak Volcanics have been regionally metamorphosed to the greenschist facies and are described by Larsen (1948, p. 22-27) and Gray (1961, p. 14-15). Pyrite commonly occurs throughout these rocks. Locally pyritization is very intense, and the volcanics contain from several percent to as much as fifteen percent or more pyrite. Weathered outcrops as well as soil developed from these pyritic rocks commonly are stained reddish-brown with limonite. East of Santiago Peak in the Santa Ana Mountains a zone of intense pyritization associated with propylitic alteration of the Santiago Peak Volcanics occurs near the intrusive contact with the Woodson Mountain granodiorite. From a comparison of gold and silver analyses of strongly pyritic and weakly to non-pyritic volcanic rocks in the Santiago Peak area, relatively intense pyritization does not appear to be a pathfinder for precious metals (appendix no. 162, map no. 164). Data are insufficient, however, to extrapolate the

results of this comparison to other areas underlain by rocks of the Santiago Peak Volcanics.

STRUCTURE

The structural trend of geologic features in the Temescal Valley area is consistently northwest. The major structural features are shown on the geologic map (Plates 1A and 1B). The most prominent structural feature is the northwest trending Temescal Valley (the Corona-Elsinore trough) itself, which is defined and formed by a series of parallel faults known as the Elsinore fault zone. The major fault within the zone is the Elsinore fault which can be clearly observed along the northeast range front of the Santa Ana Mountains (see Plates 1A and 1B). The Elsinore fault merges with the Whittier fault at the northern end of the Santa Ana Mountains and merges with the Wildomar fault in the vicinity of Lake Elsinore. The southern end of the Elsinore fault defines the northeast shore of Lake Elsinore and the northern end of the Wildomar fault defines the southwest shore of the lake. The Chino fault splays off the Elsinore fault zone just north of Corona and continues north along the eastern flank of the Puente Hills. Dips on the faults range from near vertical to less that 30° southwest. Numerous segments of the Elsinore fault zone are regarded as active (Weber, 1977; Kennedy, 1977; Smith, 1978; and Saul, 1978).

The Elsinore fault zone has some economic value in that many faults in the zone are the focus of hot waters which have given rise to various spas, such as Murrieta Hot Springs and Glen Ivy Hot Springs. Also, along the northern flanks of the Santa Ana Mountains, older faults which are parallel or subparallel to the Elsinore fault zone are past sites of hot spring activity and have caused alteration of the Santiago Peak Volcanics. This hydrothermal alteration has formed zones of gypsum (or more accurately, gypsite) which has been intermittently mined in the past as a soil conditioner. None of these deposits are economic at this time.

The study area covers the western portion of the Perris Block, another structural feature of importance in the Temescal Valley area. The Perris Block is a fault block which is bounded by the Elsinore fault zone in the west, the San Jacinto fault zone in the east and terminates in the north at the Cucamonga fault zone, at the foot of the San Gabriel Mountains. The block is tilted - sloping gently to the northwest. As a result, from west to east, weathering has exposed progressively deeper regions of the plutons. The Perris Block interior is characterized by flat valleys underlain by alluvium at a uniform elevation of about 1,500 feet. At least three old, dissected weathered surfaces have been preserved on the Perris Block. These surfaces

have been studied to help unravel the geologic history of the area.

GEOPHYSICAL EVALUATION

Geophysical data for the Temescal Valley area were examined by Rodger Chapman and Les Youngs of the Division of Mines and Geology. Aeromagnetic data show numerous small- to medium-sized magnetic anomalies located mainly southwest of the Perris Valley and the Elsinore fault zone. Most of the anomalies are associated with exposures of mafic igneous rocks. Some anomalies, however, are apparently associated with other kinds of rocks, including granite. Some of these anomalies may indicate that mafic rocks, although not exposed, are present in the subsurface. The data exhibit no outstanding anomalies in this area that might represent possible hidden mineralization.

The gravity data show steep, prominent gradients associated with both the Elsinore and San Jacinto fault zones.

MINING HISTORY

The Pinacate mining district is the main historical gold district of the Temescal Valley area. The gold mines of the district, such as the Gavilan, the Santa Rosa, and the Good Hope are deeply entrenched in the mining history of the area. However, gold and precious metal mining in the Temescal Valley area was essentially over before 1900 and, with few exceptions, all the metal mines were, by then, long idle. Gold mining had a brief resurgence during the years of the depression and World War II - the 1930's and early 1940's - but activities were mainly limited to the prospecting of older mine areas. Few mines ever operated at a profit. It is the industrial minerals such as limestone, specialty sands, clays and rock products such as construction aggregate which have grown in economic importance within the area.

Gold and silver were mined by the early Mexican settlers from placer prospects in the San Jacinto and Cottonwood drainages. The quartz veins of the Pinacate mining district were worked in the mid to late 1800's. These mines included the Gavilan, (appendix no. 135, map no. 131), the Ida Leona (appendix no. 141, map no. 132), and the Rosalia (later the Santa Rosa - appendix no. 161, map no. 139). Mining and prospecting was intermittent into the early 1900's. A brief resurgence of prospecting during the 1930's and 1940's brought properties like the Little Maggie (appendix no. 147, map no. 143) under scrutiny but by the 1950's all the mines had been shut down.

The Good Hope mine (appendix no. 139, map no. 183) was the most important gold producer in the district. The Good Hope vein was discovered in 1874 by placer miners. Major production at the Good Hope was in the 1880's and 1890's with prospecting and production after those years intermittent at best. The reported production of two million dollars in gold is largely unsubstantiated. The Good Hope was dewatered and reopened in the 1930's and again in the 1940's with no reported production of gold.

One of the most famous mines in the Temescal Valley area was the Cajalco, or Temescal, Tin mine (appendix no. 259, map no. 92). Tin was first prospected in the 1860's and again after the Civil War in 1868. In 1890, an English syndicate developed the property. The mine changed hands numerous times between 1927 and the 1940's. Tin of very limited occurrence was found and some was even mined. The mine never made a profit; however, much publicity surrounded its early development in the late 1800's.

Copper was mined briefly at the Collins prospect (appendix no. 115, map no. 79) near Corona probably in the early 1900's with later development work in the early 1950's. Manganese was produced in the early 1940's at the Beal-McClellan prospect east of Lake Elsinore (appendix no. 221, map no. 192). Antimony also was said to have been produced in the 1890's from the northern Santa Ana Mountains. Lead and zinc were produced from the Old Dominion mine in the Santa Ana Mountains, just outside of Riverside County, in the 1890's and a small lead-zinc prospect of unknown age was located on the lower eastern slope of the Santa Ana Mountains (appendix no. 215, map no. 172).

During the late 1800's industrial minerals were important commodities produced in the Temescal Valley area. Along the eastern slopes of the Santa Ana Mountains, gypsum (gypsite) was produced from a number of small underground mines and open pits for local agricultural use. Feldspar was mined in the southern part of the area from pegmatites, usually in conjunction with the mining of silica. The mining of specialty sand began in the early 1900's and continues today. Foundry and glass sands were produced in the Corona area. The quarrying of dimension stone for building also began in the late 1800's and continued into the 1960's on a small scale with the mining of "Black Granite" in the Pinacate mining district.

Limestone, now quarried for cement production, was mined in the late 1890's for the beet sugar industry and for use as building stone. In 1909 the Riverside Portland Cement Company (now Riverside Cement Company) began to mine limestone from the Jensen quarry (appendix no. 220, map no. 8) and later from the Crestmore quarry (appendix nos. 100 and 218, map no. 10) for the production of cement. Small production of decorative stone and roofing granules continued at the Jensen quarry into the late

1960's. In 1985, flooding problems made further development uneconomic, leaving considerable resources in place.

The discovery of coal in the Temescal Valley area, produced primarily from the Alberhill area between 1894 and 1902, lead to the discovery of clay, one of the most important mineral commodities in the study area. Clay has been produced from the 1880's to the present for use in the ceramics, paper, and construction industries. The Pacific Clay Products, Inc. property in the Alberhill clay district has been in continual operation since the late 1800's. In the Corona area, clays have been produced since the early 1900's.

From the 1920's through the 1950's, stone for riprap was quarried for various coastal projects. Production from three quarries in the Temescal area continues at present. Major production of crushed stone for roofing granules from the Temescal rock quarry near Corona began in 1948. The mine is currently one of the most important suppliers of roofing granules on the West Coast.

The most valuable mineral commodity in the Temescal Valley area - construction aggregate - is the one with the most recent history. Construction aggregate (crushed rock and sand and gravel) has evolved from a total production of less than half-a-million tons in the early 1960's to over 12 million tons in 1989. This construction aggregate production combined with the continuing production of the industrial commodities of clay, specialty sands and specialty stone has elevated mining to a major industry in the Temescal Valley area.

PART II - CALIFORNIA MINERAL LAND CLASSIFICATION SYSTEM

Areas subject to California Mineral Land Classification studies are divided by the State Geologist into various Mineral Resource Zone (MRZ) categories that reflect varying degrees of mineral potential. The MRZ nomenclature and criteria adopted by the California State Mining and Geology Board (1983) are graphically portrayed on what is referred to as the California Mineral Land Classification Diagram (Figure 2). Definitions of terms used in the diagram are included in this section. The diagram is a modification of a mineral resource classification scheme developed by the U.S. Bureau of Mines and the U.S. Geological Survey (1980) that presents a relationship between mineral resource occurrence and economic significance. The horizontal axis of the diagram represents the degree of knowledge about mineral occurrence, and the vertical axis portrays economic characteristics of mineral deposits (grade and size). The diagram may be divided into four parts for the purpose of presenting basic information regarding mineral resource potential of land:

1) **Areas of No Mineral Resource Significance**
2) **Areas of Identified Mineral Resource Significance**
3) **Areas of Undetermined Mineral Resource Significance**
4) **Areas of Unknown Mineral Resource Significance**

MINERAL RESOURCE ZONE (MRZ) CATEGORIES

As shown on Figure 2, each of the above four divisions relates directly to and incorporates one of the four basic Mineral Resource Zone (MRZ) categories established through law and/or State Mining and Geology Board policy. The specific definitions of each MRZ category are given below. Note in both Figure 2 and in the MRZ definitions below that two of the categories (MRZ-2 and MRZ-3) are divided into two subcategories.

MRZ-1: Areas where available geologic information indicates there is little likelihood for the presence of significant mineral resources.

MRZ-2a: Areas underlain by mineral deposits where geologic data indicate that significant measured or indicated resources are present. As shown on the California Mineral Land Classification Diagram, MRZ-2 is divided on the basis of both degree of knowledge and economic factors. Areas classified MRZ-2a contain discovered mineral deposits that are either measured or indicated reserves as determined by such evidence as drilling records, sample analysis, surface exposure, and mine

information. Land included in the MRZ-2a category is of prime importance because it contains known economic mineral deposits.

MRZ-2b: Areas underlain by mineral deposits where geologic information indicates that significant inferred resources are present. Areas classified MRZ-2b contain discovered mineral deposits that are either inferred reserves as determined by limited sample analysis, exposure, and past mining history or are deposits that presently are sub-economic. Further exploration work and/or changes in technology or economics could result in upgrading areas classified MRZ-2b to MRZ-2a.

MRZ-3a: Areas containing known mineral occurrences of undetermined mineral resource significance. Further exploration work within these areas could result in the reclassification of specific localities into MRZ-2a or MRZ-2b categories. As shown on the California Mineral Land Classification Diagram, MRZ-3 is divided on the basis of knowledge of economic characteristics of the resources.

MRZ-3b: Areas containing inferred mineral occurrences of undetermined mineral resource significance. Land classified MRZ-3b represents areas in geologic settings that appear to be favorable environments for the occurrence of specific mineral deposits. Further exploration work could result in the reclassification of all or part of these areas into the MRZ-3a category or specific localities into MRZ-2a or MRZ-2b categories.

MRZ-4: Areas of no known mineral occurrences where geologic information does not rule out either the presence or absence of significant mineral resources.

The distinction between the MRZ-1 and MRZ-4 categories is important for land-use considerations. <u>It must be emphasized that MRZ-4 classification does not imply that there is little likelihood for the presence of mineral resources, but rather there is a lack of knowledge regarding mineral occurrence.</u> Further exploration work could well result in the reclassification of land in MRZ-4 areas to MRZ-3 or MRZ-2 categories.

MINERAL RESOURCE/RESERVE CLASSIFICATION NOMENCLATURE

Following are definitions of the nomenclature associated with the California Mineral Land Classification Diagram. It is important to refer to these definitions when studying the

different resource categories shown on the California Mineral Land Classification Diagram. Particular attention should be given to the distinction between a mineral deposit and a resource and to how a mineral deposit may relate to resources.

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MINERAL DEPOSIT: A mass of naturally occurring mineral material, e.g. metal ores or nonmetallic minerals, usually of economic value, without regard to mode of origin. The mineral material may be of value for its chemical and/or physical characteristics.

MINERAL OCCURRENCE: Any ore or economic mineral in any concentration found in bedrock or as float; especially a valuable mineral in sufficient concentration to suggest further exploration.

ECONOMIC: This term implies that profitable extraction or production under defined investment assumptions has been established, analytically demonstrated, or assumed with reasonable certainty.

MINERAL RESOURCE: A concentration of naturally occurring solid, liquid, or gaseous material in or on the Earth's crust in such form and amount that economic extraction of a commodity from the concentration is currently or potentially feasible. The terms <u>resource</u> and <u>mineral resource</u> are synonymous in this report.

RESERVES: That part of the resource base which could be economically extracted or produced at the time of determination. The term <u>reserves</u> need not signify that extraction facilities are in place and operative. In the case of aggregates the term includes only permitted resources.

IDENTIFIED MINERAL RESOURCES: Resources whose location, grade, quality, and quantity are known or estimated from specific geologic evidence. <u>Identified mineral resources</u> include economic, marginally economic, and subeconomic components. To reflect varying degrees of geologic certainty, these economic divisions can be subdivided into <u>demonstrated</u> and <u>inferred</u>.

DEMONSTRATED: A term for the sum of <u>measured</u> plus <u>indicated</u>.

MEASURED: Quantity is computed from dimensions revealed in outcrops, trenches workings, or drill holes; grade and/or quality are computed from the results of detailed

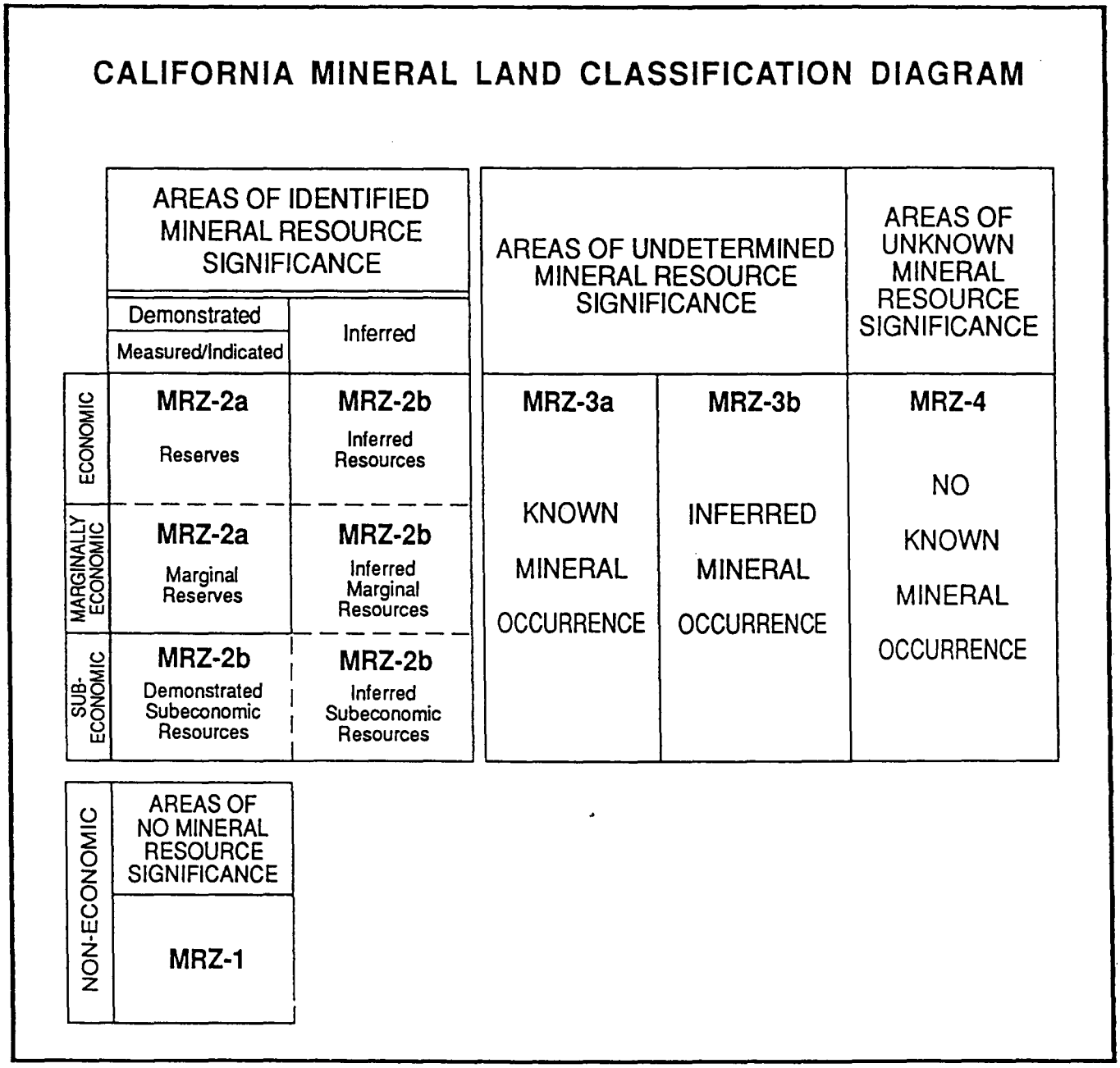


Figure 2. California Mineral Land Classification Diagram: Diagrammatic relationship of mineral resource zone categories to the resource/reserve classification system. Adapted from U.S. Bureau of Mines/U.S. Geological Survey (1980).

sampling. The sites for inspection, sampling, and measurement are spaced so closely and the geologic character is so well defined that size, shape, depth, and mineral content of the resource are well established.

INDICATED: Quantity and grade and/or quality are computed from information similar to that used for measured resources, but the sites for inspection, sampling, and measurement are further apart or otherwise less adequately spaced. The degree of assurance, although lower than that for measured resources, is high enough to assume continuity between points of observation.

INFERRED: Estimates are based on an assumed continuity beyond measured and/or indicated resources, for which there is geologic evidence. Inferred resources may or may not be supported by samples or measurements.

MARGINAL RESERVES: That part of the demonstrated reserve base that, at the time of determination, borders on being economically producible. Its essential characteristic is economic uncertainty. Included are resources that would be producible, given postulated changes in economic or technologic factors.

MARGINAL RESOURCES: That part of the inferred resource base that, at the time of determination, would be economically producible, given postulated changes in economic or technologic factors.

SUBECONOMIC RESOURCES: The part of identified resources that does not meet the economic criteria of marginal reserves and marginal resources.

CLASSIFICATION CRITERIA

To be considered **significant** for the purpose of Mineral Land Classification, a mineral deposit, or a group of mineral deposits that can be mined as a unit, must meet marketability and threshold value criteria adopted by the California State Mining and Geology Board (1983, p. 26). The criteria vary for different minerals depending on (1) whether they are strategic or non-strategic minerals, (2) their uniqueness or rarity, and (3) their commodity-type category (metallic minerals, industrial minerals, or construction minerals). For example, to be considered significant, the threshold value of the first marketable product for a metallic ore deposit is 500,000 1978 dollars, 1,000,000

1978 dollars for an industrial mineral deposit, and 5,000,000 1978 dollars for a construction aggregate deposit (multiply 1978 dollars by 1.94 to calculate threshold value in 1989 dollars).

PART III - MINERAL LAND CLASSIFICATION OF METALLIC, INDUSTRIAL, AND CONSTRUCTION AGGREGATE RESOURCES

The land within the Temescal Valley area (Figure 1) has been classified for the presence or likely occurrence of construction aggregate, and industrial and metallic mineral resources. Consideration is given to all non-fuel minerals of economic importance by determining what genetic classes of mineral deposits (Table 1) are likely to exist in the area.

Mineral land classification is based upon recognition and delineation of geologic environments present in an area and determination of those genetic types of mineral deposits likely to be hosted in those environments. In all, nine distinct genetic types of mineral deposits are recognized: industrial mineral deposits are classified as a group rather than on a genetic basis. Construction aggregate resources are also classified as a group and are discussed in the final section of this part of the report.

Only those genetic classes for which direct or indirect evidence indicates the presence or likely presence of significant mineral occurrences are addressed in the mineral land classification report. However other types of mineral occurrences may exist which, because of lack of evidence, are not presently recognized.

Of the eleven classes of mineral deposits (nine genetic classes, the industrial minerals group, and the construction aggregate group) listed in Table 1, only category 3 - deposits formed by hydrothermal processes (copper, tin and precious metals), category 5 - deposits formed by sedimentation, category 10 - industrial mineral deposits formed by diverse processes, and category 11 - construction aggregate, apply to the project area. Detailed descriptions of areas classified for these mineral resources are presented in this section.

MINERAL RESOURCE ZONE NOTATION

Mineral Resource Zones are delineated on the accompanying Plates (2A-4B, and 6A and 6B). Zone assignments are denoted by a Mineral Resource Zone category adapted from the California Mineral Land Classification Diagram (Figure 2). Genetic affinities of the Mineral Resource Zones are denoted by superscript notations loosely based on the genetic classifications of Bates (1960) (Table 2). For example, the

Table 1. Genetic classes of mineral deposits

1.	Magmatic concentration deposits
2.	Contact metasomatic deposits
3.	Hydrothermal mineral deposits (exclusive of volcanogenic deposits)
4.	Exhalative volcanic deposits (volcanogenic)
5.	Deposits formed by sedimentation
6.	Deposits of bacteriogenic origin
7.	Evaporates
8.	Residual and mechanical concentrations
9.	Deposits formed by metamorphism
10.	Industrial mineral deposits formed by diverse processes
11.	Construction aggregate deposits formed by diverse processes

Table 2. Mineral Resource Zone notation list for the Temescal Valley area

	Construction Aggregate
CS(b)	Crushed Stone - base aggregate (includes the uses base and subbase)
CS(c)	Crushed Stone - concrete aggregate (includes the uses asphaltic concrete aggregate and portland cement concrete aggregate)
SG(c)	Sand and Gravel - concrete aggregate (includes the uses asphaltic concrete aggregate and portland cement concrete aggregate)
	Industrial Minerals
CC(i)	Clay - common
CK(i)	Clay - kaolinite
L(i)	Limestone
SX(i)	Specialty Stone - roofing granules
SR(i)	Specialty Stone - riprap
SS(i)	Specialty Sand
	Metals
(h)	Hydrothermal Processes (Gold, Silver, Copper, Tin)
(s)	Sedimentary Processes (Manganese)

Mineral Resource Zone number

MRZ-3a $^{(h)}$

refers to an area classified MRZ-3a for hydrothermal processes.

Mineral Resource Zones for industrial minerals and aggregate commodities are further classified by the commodity or the use of the commodity. These use codes precede the genetic classification in the notation. For example, the Mineral Resource Zone number

MRZ-2a $^{L(i)}$

refers to an area classified MRZ-2a for the industrial mineral limestone.

Individual Mineral Resource Zones are assigned a geographic reference number which follows the genetic notation. For example, the Mineral Resource Zone number

MRZ-2b $^{CC(i-2)}$

refers to a specific area classified MRZ-2b for the industrial mineral commodity Common Clay. The geographic reference numbers proceed from west to east and from north to south.

AREAS CLASSIFIED FOR DEPOSITS FORMED BY HYDROTHERMAL PROCESSES

Ore deposits formed world-wide by hydrothermal processes represent a major source of metallic mineral resources and to a lesser extent non-metallic minerals. The metals formed include gold, silver, lead, zinc, copper, mercury, antimony, tin, tungsten, molybdenum, vanadium and minor elements. The more common non-metallic deposits include kaolin, barite, zeolite, and various types of clay. Of greatest significance in the study area are the metallic elements gold, silver, copper, and tin.

Hydrothermal ore deposits are formed from metal-enriched fluids which may originate in a cooling magma body or may be from connate or meteoric waters which are heated by a magma body. The fluids travel away from the heat source via fractures, faults, fault zones, porous rock or other open cavities in host rocks. The fluids precipitate the minerals in faults, fractures or open spaces as they travel through the rocks. The fluids undergo change by chemical reaction with the host rocks, through which they traverse and experience changes in temperature by cooling and by lowering of pressure. These combined effects cause the minerals in the fluids to precipitate out in the faults,

fractures and open spaces or to replace favorable rock by chemical reactions. Often the hydrothermal fluids will react with the host rock and cause significant changes (alteration). Alteration zones may have no resource value but may be used as an aid in finding hydrothermal ore deposits.

Areas Classified MRZ-3a$^{(h)}$:

Collins Copper Prospect Area, MRZ-3a$^{(h-1)}$: The Collins area is west of the Cajalco mine (appendix no. 259, map no. 92). Copper and silver mineralization occur in a shear zone in the Temescal Wash quartz latite porphyry. The zone extends north from the Collins prospect a distance of about 1 mile. Ore mineralization consists of chrysocolla, malachite, azurite and copper oxide minerals. The only production occurred in 1950 and 1956 and was restricted to oxidized zones. The greatest mineralization is in the vicinity of intersecting faults and in breccia zones.

The historical, though small, production of copper and silver from an oxidized zone of ore mineralization suggests that there is a possibility of primary/enriched copper and silver ore at depth.

Cajalco Mine Area, MRZ-3a$^{(h-2)}$: Located west of Lake Mathews and encompassing an area of approximately 1/4 mile, this area surrounds the old Cajalco (Temescal) Tin mine (appendix no. 259, map no. 92). The area is one of large-scale tourmaline replacement in quartz monzonite. Tourmaline veins, tourmaline-quartz veins and tourmaline-quartz breccias trend northeast. The area was prospected for tin, primarily for its resemblance to the famous Cornwall tin district in Britain. Mining in 1869 and again in 1891 to 1892, yielded a total production of 125 to 145 tons. The only producing area, however, was the area immediately surrounding Cajalco Hill. Minor quantities of chalcopyrite, pyrite, arsenopyrite, galena were observed in the course of this study. The U.S. Geological Survey conducted an exhaustive study (Page and Thayer, 1945) concluding that the veins of the district carry small but consistent values of tin, therefore there is a possibility, although remote, that the ore grade for tin and silver may improve with depth.

Monument Peak Area, MRZ-3a$^{(h-3)}$: The Monument Peak area is a zone which lies on the southern perimeter of the Cajalco - Black Rocks (appendix no. 259 and 258, map no. 92 and 98) tin/tourmaline areas. The area has been prospected in the past. The mineralization seems to be confined to a narrow, unnamed fault or shear zone and is associated with pyritization within the shear and in a 4-foot zone of altered wallrock. The shear could extend a total distance of approximately 2 miles. The fault is in quartz latite in the west end of the east-west trending zone, and between quartz monzonite and metasedimentary rocks in the east

end. A sample collected at a prospect at the western end (appendix no. 175, map no. 99). Assayed 0.062 ounces per ton gold and 0.32 ounces per ton silver.

The possibility that the fault/shear may be continuous and the assay values suggest a possibility of a precious metal resource in this area.

Hartford Springs Park Area, MRZ-3a(h-4): This area includes the historic Gavilan mine (appendix no. 135, map no. 131), first worked by Mexican settlers and worked intermittently in the late 1800's and into the 1900's, and the Ida Leona mine (appendix no. 141, map no. 132). The Ida Leona mine was most active in the 1930's and finally closed in 1942. Mineralization appears to be confined to quartz veins, mostly striking northwest, in deeply weathered quartz diorite. Along with the producing veins many pegmatitic quartz-feldspar veins crop out in the district. Many old prospect pits and adits seem to have been in these old pegmatites. One sample from this study assayed at .011 ounces per ton gold. Because of the location of historic producers in the area, there is a possibility for gold resources in this area.

Santa Rosa Mine Area, MRZ-3a(h-5): Located five miles west of Perris in the Pinacate mining district, this area has been the target of much mining and prospecting from the time of the Mexican settlements in the 1700's through the late 1800's. The most famous producer of the area is the Santa Rosa mine (appendix no. 161, map no. 139) last mined about 1896. Other producers of the district were the Santa Fe (appendix no. 160, map no. 138), the Colorado-Justice claims (appendix no. 131, map no. 151), Golden Chariot (appendix no. 136, map no. 140) and the Little Maggie (appendix no. 147, map no. 143). All prospecting has been on quartz veins in country rock of diorite, quartz diorite and gabbro. Samples collected for this study from the vicinity of old producers assayed in a wide range: 0.004 ounces per ton gold to 0.746 ounces per ton gold. The highest assay, 0.746 ounces per ton gold, was from a selected sample from the vein on the Little Maggie (appendix no. 147, map no. 143). This area is judged to have possible gold resources at depth.

Good Hope Mine Area, MRZ-3a(h-6): Located five miles northeast of the City of Lake Elsinore in the Pinacate mining district, the Good Hope mine was the largest producer of gold in western Riverside County (appendix no. 139, map no. 183). A total production of about one million dollars in gold-silver bullion appears reasonable although 1.5 and 2 million dollars have been reported.

The gold mineralization was discovered in 1874 but the mine's period of greatest activity was from 1889 to 1894. It was intermittently active until its closing in 1936.

The system of quartz veins at the Good Hope mine strikes N 12° E and dips about 60° NW in quartz monzonite host rock. At the surface the vein system is about 100 feet wide and is discontinuously exposed along strike for more than 3,300 feet. At a depth of about 200 feet the veins unite to form a mineralized zone that ranges in width from 3 to 10 feet. The ore is predominantly native gold in quartz, but the proportion of gold that occurs in sulphide minerals (mostly pyrite) increases with depth.

The grade of ore was consistent over the 3,300-foot length of the vein sampled or mined. In the period 1890-1892 ore mined along 1875 linear feet of the vein averaged 24 inches in width and returned $15 to $20 per ton from the mill ($20.67 per ounce gold). A comprehensive assay survey throughout the mine, made in 1895, showed an average assay value of $22.51 per ton (1.09 ounces per ton) in gold for 209 samples. Ore shoots sampled were rarely wider than 30 inches, and most commonly were 18 inches or less.

Future mineral development at the Good Hope mine area would be dependent on establishment of remaining economic ore reserves at depth and along strike. Establishment of reserves, if any, within the quartz monzonite host rock would be necessary for open-pit mining (rather than underground methods) to be a viable alternative.

The area surrounding the mine is undergoing steady development, primarily widely-spaced, single family residences, making future mine development a difficult venture.

Alice Mine Area, MRZ-3a[(h-7)]: The Alice mine is located about six miles southeast of Sun City in the Menifee mining district (appendix no. 124, map no. 233). Gold was discovered in the early 1890's in outcroppings of quartz veins in deeply weathered gabbroic country rock. Development (shaft sinking) was reported underway in 1894. A 5-stamp mill was installed in 1895 when the shaft was reported to be down 85 feet, and 500 tons of ore were said to be ready for milling. The ore reportedly yielded about $30.00 per ton (1.45 ounces per ton) in gold. Operations were suspended in 1896; subsequent reports indicate no further activity.

Both gold and silver occur in open-space fillings in the quartz veins. The open spaces contain abundant limonite and boxworks of secondary iron oxides after primary sulphide minerals. Oxide ore samples from surface outcrops fire assayed from 0.04-0.21 ounces per ton silver and 0.019-0.367 ounces per ton gold (this study).

The system of quartz veins exposed at the surface varies in thickness from 1 1/2 to 2 feet (single vein) to as much as 15

feet (multiple parallel veins). The quartz veins were developed over a distance of 500 feet or less. Field work (this study) indicates that the quartz vein system can be traced about 1/2 mile on the basis of discontinuous surface exposures and fragments of vein quartz and fragments of associated massive tourmaline in colluvium and in soil developed from the deeply weathered gabbroic country rock.

Future mineral development in the Alice mine area would be dependent on establishment of remaining economic ore reserves at depth and laterally along strike of the vein system. Favorable economics for underground mining would also be necessary if the gabbroic country rock does not contain economic reserves.

Although the area around the Alice mine is sparsely developed at present, residential development is likely in the near future. Residential development (mainly from the west) is presently to within 1/2 mile northwest of the Alice mine workings.

Elsinore Peak Area, MRZ-3a$^{(h-8)}$: Located in the Santa Ana Mountains just west of Elsinore Peak 3 1/2 miles west of Wildomar, this area is underlain by three rock units (appendix no. 134, map no. 240). The Woodson Mountain granodiorite is overlain unconformably by friable, white, clayey sandstone assigned to the Silverado Formation. The sandstone and granodiorite are unconformably overlain by fine-grained olivine basalt flows of Miocene age (24 to 5.3 million years ago).

The rocks in the contact zone between the sandstone and basalt are highly altered, but whether this resulted from hydrothermal activity or from pre-basalt weathering is undetermined. However, an anomalously high gold content associated with the contact zone suggests that hydrothermal activity has occurred.

Gold and silver values for ten samples (fire assay) ranged from trace to 0.030 ounces per ton gold and 0.010 to 0.283 ounces per ton silver (based on the work of P.K. Morton, unpublished and personal communication).

Future mineral development of this area would be dependent on identification of the source of the gold-silver mineralization, establishment of economic reserves, and determination of favorable recovery by bulk mining methods. Compatible and alternative land use considerations would have to be resolved. Elsinore Peak is the site of a communications repeating station. A ranch-style residential development is located about 1/2 mile northwest of the area.

Area Classified MRZ-3b$^{(h)}$:

Gavilan Area, MRZ-3b$^{(h-1)}$: Prospects (appendix nos. 178, 179, and 180, map nos. 115, 117, & 118) in this area are on quartz veins in metasedimentary and metavolcanic host rocks. The veins are usually shattered and show abundant iron oxides and extensive development of boxwork textures, apparently of a variety of minerals. Boxworks are spectacularly developed in the southernmost part of the area (see appendix no. 180, map no. 118). Veins in the area strike northeast to east-west and range from inches to feet in width. The observed veins are heavily leached and oxidized and assays in the area are low: 1.94 to 0.04 ounces per ton silver and 0.002 to 0.001 ounces per ton gold. The leached nature of the veins and the abundant boxworks indicates that there is a possibility for precious metal values at depth.

AREA CLASSIFIED FOR DEPOSITS FORMED BY SEDIMENTARY PROCESSES

A variety of mineral deposits are formed by sedimentary processes. They include: (1) volcanogenic deposits from underwater springs associated with volcanism (massive sulphide deposits of the Cyprus-type, and manganese-nickel-copper nodules); (2) volcanogenic deposits from underwater springs associated with sediments (black-shale-hosted deposits); (3) deposits formed by interaction of solutions (includes deposits involving inorganic chemical reactions and deposits involving organic chemical reactions); (4) deposits formed by evaporation of solvents (evaporite deposits); and (5) deposits formed by chemical sedimentation (sedimentary base metal deposits, sedimentary iron deposits, phosphate deposits, and sedimentary manganese deposits).

Some sedimentary deposits can be included in more than one of the categories. For example, stratiform (bedded) manganese deposits have been divided into two broad groups, non-volcanogenic and volcanogenic-sedimentary, according to the source of the manganese.

The manganese deposits located northeast of the City of Lake Elsinore are the only deposits in the Temescal Valley area that have been classified as formed by sedimentary processes.

Area Classified MRZ-3a$^{(s)}$:

Beal-McClellan Mine Area, MRZ-3a$^{(s-1)}$: Located about 5 1/2 miles northeast of the City of Lake Elsinore, the Beal-McClellan area comprises several manganese prospects (appendix no. 221, map no.

192). Manganese mineralization here and elsewhere within the primarily metasedimentary but in part metavolcanic rocks of the Bedford Canyon Formation, appears to be stratiform (conformable with the bedding in these rocks). At the Beal-McClellan deposit, manganese mineralization occurs in a siliceous layer resembling somewhat recrystallized banded chert. This layer appears to be conformable with the bedding in the argillites, schists, and quartzites that comprise the country rocks.

Although the Beal-McClellan deposit has been considered to be of sedimentary origin, other alternative origins are possible pending additional evidence. For example, this deposit could be of hydrothermal origin with mineralization occurring in a vein, with the geometry controlled by bedding in the host rock. This deposit might also be of volcanogenic-sedimentary origin where manganiferous hot spring waters of subaerial or submarine affinity transport manganese as well as other metals to a lake or ocean floor where a portion of the metals precipitates out of the water and becomes part of the sediments. Volcanic rocks resembling andesitic flows and rhyolitic tuffs are interbedded with the metasedimentary rocks of the Bedford Canyon Formation in the area northeast and east of Lake Elsinore. Oxide ore from the Beal-McClellan mine was analyzed by ICP (Inductively Coupled Plasma - Atomic Emission Spectroscopy) and found to contain metals commonly of volcanogenic affinity, including molybdenum, zinc, silver, nickel, cobalt, arsenic, strontium, cadmium, antimony, vanadium, barium, and tungsten.

The manganese-bearing zone at the Beal-McClellan deposit is 3 to 4 feet wide as exposed in workings near the surface, and can be traced for about 900 feet in surface exposures. Oxide ore formed by partial to complete oxidation of rhodonite appears to be restricted to shallow depths.

Development of this deposit was reported as early as 1900, but no ore was removed on a commercial basis until the Second World War. Thirty to fifty tons of ore reportedly were produced prior to 1950. Prior to 1945, several rail cars of ore reportedly containing 30 to 35 percent manganese were shipped to Kaiser Steel Company at Fontana.

Future development of manganese from this area is dependent upon establishing reserves laterally and with depth, a significant change in alternative market availability of manganese, and, possibly, economic recovery of various other metals associated with this deposit.

AREAS CLASSIFIED FOR INDUSTRIAL MINERALS

Industrial minerals are those naturally occurring earth materials exclusive of metallic ores, fuels or gemstones. These materials have economic value because of the physical and/or chemical characteristics which they possess. Bates (1960) classified the industrial minerals into two groups: Industrial Rocks and Industrial Minerals (Table 3). This classification was based on criteria such as tonnage produced, price per unit, proximity to markets, geologic occurrence and distribution and processing. Bates' industrial rocks are usually economic in large tonnages, low price per unit, close proximity to markets and require only minor processing. Industrial minerals, however, are opposite in all of these considerations and are produced in low tonnages with moderate to high unit price, can be distant from markets, and require extensive processing. This study, for simplicity, uses the term "industrial minerals" as a collective term for all the industrial rocks and minerals.

Areas classified for industrial minerals are shown on Plates 3A and 3B. In the Temescal Valley Area, the industrial minerals of economic importance are clays, limestone, specialty sands, gypsite and feldspar. Aggregate resources, which are very important in this region, are discussed in a subsequent section. The clays and sands occur in the Temescal Valley area, while the limestone resources are located in the Jurupa Mountains in the northern part of the study area. Feldspar resources are restricted to one location in the Perris Block area.

AREAS CLASSIFIED FOR CLAY RESOURCES

Areas classified for clay resources in the Temescal Valley area are shown on Plates 3A and 3B. The classified areas are identified by the following superscripts; $^{CK(i)}$ for kaolinite clay, and $^{CC(i)}$ for common clay (miscellaneous clay and shale). The superscript numbers are used to identify specific MRZ-2a, MRZ-2b, MRZ-3a, and MRZ-3b deposits discussed in this section.

Clay is one of the leading industrial minerals both in terms of tonnage and value. A variety of substantial industries that are important in local and regional economies are supported by clay production. The term "clay" generally means a natural, earthy, fine-grained material. The term commonly is used either in referring to a definite group of hydrous aluminum-silicate minerals, or to indicate detrital rock particles of the smallest grain size regardless of composition.

Because clays have been utilized for so many purposes over a long period of time and are such a diverse group of materials, many classification systems have been used in their description. Clays may be classified on the basis of their origin, as residual

Table 3. Classification of industrial rocks and minerals from Bates (1960)

Industrial Rocks	Industrial Minerals
Igneous Rocks	Igneous Minerals
Granite	Nepheline syenite
Basalt and diabase	Feldspar
Pumice and pumicite	Lithium minerals
Perlite	Beryl
Metamorphic Rocks	Vein and Replacement Minerals
Slate	Quartz crystal
Marble	Fluorspar
Sedimentary Deposits	Barite
Sand and gravel	Magnesite
Sandstone	Metamorphic Minerals
Clay	Graphite
Limestone and dolomite	Asbestos
Phosphate rock	Talc
Gypsum	Vermiculite
Salt	Sedimentary Minerals and Sulfur
	Diamond
	Diatomite
	Potash minerals
	Sodium minerals
	Borates
	Nitrates
	Sulfur

(formed in place) and sedimentary (transported from their place of origin). The terms "high-alumina" clay and "ferruginous" clay refer to chemical properties; "brick" clay and "bleaching" clay refer to use. For gathering statistical information, the U.S. Bureau of Mines employs a classification system based on industrial use, as follows:

kaolin clay
ball clay
fire clay
bentonite
fuller's earth
common clay

In the Temescal Valley area the clays mined include kaolin, ball clay, fire clay, and common clay. Kaolin clay is composed largely of the mineral kaolinite, but may have much quartz, mica, feldspar, or other minerals present. White kaolin is used in whiteware bodies and other high-grade ceramic uses, as a filler, and as coating in papermaking. Some uses of kaolin, such as a filler, require rigid specifications, whereas other uses, such as in cement manufacture, require practically no specifications. Ball clay is important due to its high plasticity and bonding power. Ball clay is composed largely of kaolinite, sericite micas, and organic matter. It is used in blending with other clays to enhance their workability in manufacturing ceramic products. Fire clay is made up primarily of kaolinite-group minerals, but varies widely in composition. Its most important property is high heat resistance, and it is subdivided into several classes based on a test known as the pyrometric cone equivalent. Fire clay is used in a variety of ceramic products, from common brick to art pottery, sewer pipe, and ornamental tile. Common clays include mixtures of clay minerals with other minerals, impure varieties of clays, or clay-sized particles of any mineral. For specific purposes they are blended with higher-quality clays to develop certain properties. Large quantities of common clays go into the manufacture of heavy clay products, such as common brick, tile, and sewer pipe. Common clay is also used as liner material for solid waste dumps.

Clay was first mined at Alberhill in the Temescal Valley area in the early 1880's. The discovery of coal in the area led to the discovery of clay because of its close geologic proximity. In the early days clay was mined by underground methods with hand tools and mule power. Since about 1940, clay has been mined almost entirely by open pit methods with modern equipment. From 1885 to the present the total yield of clay has been mined mostly from the Alberhill area - for use in refractory and heavy clay products, and from the Corona area - for use in heavy clay products and cement. The reserves of high-quality refractory clays have been substantially depleted, but relatively large reserves of fire clay and low-grade kaolinite clay still exist.

Clays, including shales, in the Temescal Valley area consist of a variety of types, each with its own characteristics. Several clay types may be necessary in order to blend a composite product having the requisite characteristics. In general, the clays of the area have been used to produce two main types of clay products. Residual clay (the red and white mottled facies of the clay beds) and some of the clay shales are used to make heavy clay products such as sewer pipe, face brick, and tile. White "bone" clay and fire clay are used to make refractory clay products such as fire brick, flue lining, and some pottery. Both types of clay are also used in making cement.

Except for the marine clay shales of the Late Cretaceous-age Ladd Formation (98 to 66 million years ago), all of the clays in the Temescal Valley area are found in a zone within the Silverado Formation. This zone contains both residual and sedimentary clays. The residual clay was formed in place during Paleocene time (66 to 58 million years ago) by the deep weathering of the Mesozoic (245 to 66 million years ago) bedrock. The sedimentary clays were transported and deposited as part of the Silverado Formation, and laid on top of the residual clay. The residual clays are as thick as 130 feet at Alberhill, and the sedimentary clays may be as thick as 150 feet. The thick beds of residual and sedimentary clays generally are found on the eastern side of the Temescal Valley and in the central part of the valley from about 3 miles south of Corona to Lake Elsinore. Along the northwestern side of the valley, in the Elsinore fault zone at the base of the Santa Ana Mountains, the clay beds within the Silverado Formation are sedimentary only. In this area the rocks of the Silverado Formation were laid on top of Cretaceous marine rocks which had not been exposed to the weathering that the older crystalline and metamorphic bedrock had in the other areas, and had not developed residual clays. The clays of the Silverado Formation in the central part of the valley were often found underneath a cover of younger sediments. There remain large areas that may have clays buried beneath the alluvial sediments of the valley.

The Temescal Valley area has been classified for two types of clay; they are termed kaolinite clay and common clay. The clays within the Silverado Formation, both the residual clays and the sedimentary clays are referred to as kaolinite clays. These clays are characterized by a generally high kaolinite content. The clay shales of the Ladd Formation and, at one location, metasediments of the Bedford Canyon Formation, are referred to as common clays. These common clays are a mixture of different clay minerals or are clay-size particles. The area was classified for both kaolinite clay resources and common clay resources based on published geologic mapping, three previous classification reports by the Division of Mines and Geology, company maps, interviews with knowledgeable people in the area, and limited field work.

The previous classification reports were done in response to petitions for classification submitted to the State Mining and Geology Board. The three reports classified specific clay properties; the Pacific Clay Products, Inc. clay deposits in the Alberhill area (California Department of Conservation, Division of Mines and Geology, 1982), the Thomas clay deposit near Corona (Joseph, 1982), and the Dominguez clay/shale deposit (Joseph, 1985).

AREAS IDENTIFIED $^{CK(i)}$ (Kaolinite Clay):

Areas classified as $^{CK(i)}$ contain deposits of kaolinite clay resources. These deposits are generally associated with the Silverado Formation, either as sedimentary clay beds or as residual clays in a zone of weathering that caps a basement rock composed of metamorphic or granitic rocks.

Areas Classified MRZ-2a$^{CK(i)}$ (Kaolinite Clay):

Corona Clay Deposit, MRZ-2a$^{CK(i-1)}$: The Corona clay deposit (appendix nos. 7 and 224, map no. 82) is located about four miles southeast of Corona, between Freeway I-15 and Temescal Wash. The deposit is also called the Bedford Canyon clay deposit. The deposit was discovered in 1954 by drilling by the Gladding, McBean Company. The property is now owned by Pacific Clay Products, Inc. The Corona Industrial Sand Company is mining industrial sand from the deposit and leaving the clay fraction for use by Pacific Clay Products, Inc. The deposit is also classified as a specialty sand resource (see section "AREAS CLASSIFIED FOR SPECIALTY SAND RESOURCES" - MRZ-2a$^{SS(i-1)}$) The deposit consists of a series of sedimentary and residual clays overlain by a gray sand and capped by old alluvium. The alluvial cap is from 20 to 50 feet thick in the present pit area and thickens to the west. The gray sand, which is being mined for industrial sand, ranges from 10 to 100 feet thick. The clay beds range from 40 to 150 feet thick. A typical section of the clay beds consists of, from top to bottom, a red-gray "mottle" clay, a red-brown pisolitic "bone" clay, a buff-colored sand, a second pisolitic "bone" clay, a second red-gray "mottle" clay, and a variegated residual clay. This residual clay grades into the underlying granodiorite basement rock by degrees of weathering of the granodiorite. Both the sedimentary "mottle" and "bone" clays and the residual clays have a high alumina content, with the clay fraction consisting almost entirely of kaolinite. The sedimentary clays contain quartz sand and some iron oxides. The residual clays are generally free of sand. The entire clay section is considered to be Paleocene Silverado Formation. The overlying gray sands may be either Silverado Formation or an equivalent of the Eocene (58 to 37 million years ago) Santiago Formation. The clay has been used to manufacture various clay

products such as sewer pipe and is usually blended with other common clays for this purpose. The "bone" clays have been sold to cement companies because of their high alumina content and low alkali content.

Cajalco Clay Deposit, MRZ-2a$^{CK(i-2)}$: The Cajalco clay deposit (appendix no. 4, map no. 95) is about four miles southeast of Corona. The deposit is bordered on the north by Cajalco Road and on the west by Temescal Wash. Pacific Clay Products, Inc. developed and operated a mine here for a short time in the early 1930's. The deposit is presently being mined by Paul J. Hubbs Construction Company and sold to the Davidson Brick Company in Perris for making bricks. The deposit is a residual clay formed by the weathering of the underlying Bedford Canyon metasediments. Thin sedimentary beds of the Paleocene Silverado Formation overlie the residual clays. In places the Silverado Formation is overlain by old alluvium. The clays were described by Gray (1961) as red mottled clay, bright brick-red clays, mottled grayish green clays, and gray clays. Buck (1977) identified paleosol horizons within the clay beds. A notable feature of the paleosol section is the increase in kaolinite content of the clay fraction from the lower to the upper horizon. In the lower horizon the clays are from 50 to 70 percent kaolinite, and in the upper horizon the clays are from 90 to 99 percent kaolinite.

Liston and Corona Clay Pits Area, MRZ-2a$^{CK(i-3)}$: This area is located about one mile east of Temescal Wash, about 8 miles southeast of Corona. It is one of a group of three clay deposits that also includes the Harrington clay deposit (appendix no. 17, map no. 104) to the east and the Murphy clay deposit (appendix no. 26, map no. 105) to the south. All three deposits are erosional remnants of a once more continuous deposit of clay and younger capping material which covered the metamorphic and granitic rocks of the Perris Block. There are two large active clay quarries in the area. The Liston pit (appendix no. 21, map no. 102) and Corona clay pit (appendix no. 8, map no. 103) area was first prospected for kaolinite clay in the early 1900's. The Riverside Cement Company acquired the Corona clay pit property at the southern edge of the deposit sometime before 1925. The Riverside Cement Company began large scale mining of the clays for use in cement in 1960 and continues now to mine the deposit intermittently. The Atlas pit, which is adjacent to the Corona pit on the southeast, is also included in their quarry area. The California Portland Cement Company acquired the Liston pit at the northern end of the deposit from the Liston Brick Company in 1971 and has continued to mine clay for making cement since. Pacific Clay Products Company held two parts of the deposit in reserve - The El Sobrante and Quintet properties. The El Sobrante property, on the east side of the Liston pit, is being used as a sanitary landfill by Riverside County. The Quintet property, on the west side of the Liston pit, has never been mined. The deposit consists of clay beds of the Paleocene-age Silverado

Formation which lie unconformably on metamorphic rocks of the Bedford Canyon Formation. The clay beds are, in turn, capped by Pliocene (5.3 to 1.6 million years ago) alluvium of the Lake Mathews Formation. The clay beds include both the residual clays, at the base of the clay sequence, and the sedimentary clays which form the upper part of the sequence. The residual clays are red-mottled clays up to 130 feet thick, capped by a pisolitic "bone" clay. They were formed by the intense weathering of the underlying metamorphic rocks during a period when they were exposed to surface conditions for a long time. These residual clays were preserved when the sedimentary clays were laid over them. The sedimentary clays are a soft, green clay shale. Up to 80 feet of Pliocene-age sands and gravels overlie the Silverado Formation clays. The clays are valued for use in making cement due to their moderately high alumina content and their generally low alkali content.

Harrington Clay Pit Area, MRZ-2a$^{CK(i-4)}$: The Harrington clay pit area (appendix no. 17, map no. 104) is located about 8 1/2 miles southeast of Corona, about 1/2 mile north of the mouth of Dawson Canyon. United States Tile Company is presently mining clay for roofing tile. As early as 1905 clay was being mined from the Harrington clay pit by the Independent Sewer Pipe Company. Mining of the deposit has been nearly continuous since that time. The clay has been used by many companies in the Los Angeles and Corona areas. The clays have a high kaolinite content. The clay beds, considered to be the Paleocene Silverado Formation, are overlain by Pliocene alluvial deposits of the Lake Mathews Formation, and are underlain by metasediments of the Bedford Canyon Formation. There are both residual and sedimentary clays in the deposit. The residual clays immediately overlie the metasediments and are considered to have been derived from them by extensive weathering. The sedimentary clays are above the residual clays. The sedimentary clays have a kaolinite percentage in the high 80's and 90's. The residual clays generally have a lower kaolinite content. The total clay sequence is more than 100 feet thick in places. The clay sequence is complex due to lateral changes of character and perhaps faulting. The sedimentary clays consist typically of red and pink mottled clays, pisolitic carbonaceous clays ("bone clays"), and clay breccias, with lignite layers near the base. The residual clays are generally red mottled clays. To make their product, U.S. Tile Company is mining red clay and shale clay from this deposit and blending them with clays from other sources.

Temescal Clay Mine Area, MRZ-2a$^{CK(i-5)}$: This deposit (appendix no. 37, map no. 106) is located about 9 miles southeast of Corona on the southwest side of Temescal Wash. The Mission Clay Products Company presently mines clay from pits on the north end of the deposit. Clay mining by the Pacific Clay Products Company started here at least before 1945 (Stauffer, 1945). The Mission

Clay Products Company has been mining clay for sewer pipe here since 1965. The clay beds are residual clays of the Paleocene Silverado Formation which originated by the intense weathering of the underlying metasedimentary rocks. A red or pink mottled clay is mined. The Silverado Formation is capped by old alluvium in much of the area.

Pacific Clay Products Property, Alberhill Area, MRZ-2a$^{CK(i-6)}$: This property (appendix no. 29, map no. 164) is three miles northwest of Lake Elsinore at Alberhill. The deposit classified MRZ-2a consists of a group of four open pits, west of Lake Street (old Highway 71), that have exposed kaolinite-rich clay beds. The pits are presently operated by Pacific Clay Products Company, Inc. The remainder of the property leased by Pacific Clay Products Company is classified MRZ-2b and is described in the next section. The deposit was previously classified MRZ-2 by the Division of Mines and Geology by petition (California Department of Conservation, Division of Mines and Geology, 1982) and this classification has not been changed in this report. This deposit was previously mined by the Gladding McBean and Los Angeles Brick and Clay Products Companies, both of which began here in about 1925. Clay was first discovered here in the 1880's. A variety of clay products have been manufactured from the clays in the Alberhill area. Sewer pipe, tile, flue lining, fire brick, and face brick are some of the more common products. Some of the clay has also been sold for cement use. The clay deposit consists of both residual clays, formed by intense weathering of the underlying bedrock, and sedimentary clays, which are part of the overlying Paleocene Silverado Formation. The residual clays include a pink and white mottled plastic clay and an overlying white, yellow, and red pisolitic "bone" clay. The sedimentary clays generally consist of a white to dark-gray carbonaceous clay overlain by a red and gray mottled, sandy clay. The combined clays are as much as 100 feet thick. Underlying the clay beds are metasedimentary rocks of the Bedford Canyon Formation. The clays are overlain by an old fanglomerate deposit that averages about 15 feet thick.

Alberhill Area East of Lake Street (Old Highway 71), MRZ-2a$^{CK(i-7)}$: This deposit (appendix no. 2, map no. 169) is located about 3 1/2 miles northwest of Lake Elsinore between Freeway I-15 and Lake Street (old Highway 71). This area has been previously classified MRZ-2 for clay by the Division of Mines and Geology by petition (California Department of Conservation, Division of Mines and Geology, 1982) and this classification has not been changed in this report. The clay pits are on the southwest slope of an elongate, northwest-trending hill. The Alberhill Coal and Clay Company began mining this deposit in about 1890. Most recently the Pacific Clay Products Company leased the land and extracted clay. The land is now being developed for housing. Although clay has been mined from this deposit for almost 100 years, there are still significant quantities of high alumina

clay remaining. Both residual and sedimentary clays of the Paleocene Silverado Formation occur in the deposit. The residual red and pink mottle clays, were formed by the weathering of the underlying slates and metavolcanic rocks. The sedimentary clays which are white, sandy, carbonaceous, high alumina clays with lignite, overlie the residual clays. The maximum thickness of the commercial clays is about 130 feet. The residual clays have been used primarily for sewer pipe and face brick. The sedimentary clays have been used mostly for refractory clay products such as fire brick, furnace lining, and pottery. A large percentage of the clay mined in Riverside County in the last 100 years has come from this deposit.

Area Classified MRZ-2b$^{CK(i)}$ (Kaolinite Clay):

Pacific Clay Products Property, Alberhill Area, MRZ-2b$^{CK(i-1)}$: This area is located about four miles northwest of Lake Elsinore on the lease property of Pacific Clay Products Company, Inc. (appendix no. 29, map no. 167). Clay mining on the property over the last 100 years has exposed the Silverado Formation kaolinite clays in several pits. These areas are classified as MRZ-2a. Much of the remainder of the property is covered by alluvial deposits of differing ages and origins which are underlain by the Silverado Formation which likely contains beds of kaolinite clay. The exact thicknesses and qualities of these covered kaolinite clay deposits are not known. Therefore, they are classified MRZ-2b. This area has been previously classified MRZ-2 by the Division of Mines and Geology by petition (California Department of Conservation, Division of Mines and Geology, 1982) and that classification is not changed in this report.

Areas Classified MRZ-3a$^{CK(i)}$ (Kaolinite Clay):

Silverado Formation along Northeastern Flank of the Santa Ana Mountains, MRZ-3a$^{CK(i-1)}$: The kaolinite clay deposits in the Temescal Valley area are all associated with the Paleocene Silverado Formation. Within the Temescal Valley area exposures of the Silverado Formation are found along both sides of the Temescal Valley from Corona to Lake Elsinore, and in isolated areas in the Santa Ana Mountains. The occurrences of clay in the Silverado Formation in the exposures along the northeastern flank of the Santa Ana Mountains (within the Elsinore fault zone), differ in character from the clay occurrences on the eastern margin of the valley and those farther south. The kaolinite clay beds within the Silverado Formation along the northeastern flank of the Santa Ana Mountains are all sedimentary in origin. There are no residual clay beds underlying the sedimentary clays in this area. The reason for this lack of residual clays probably is that the underlying rocks are of Late Cretaceous age. This area of Silverado Formation exposures generally lies between

Wardlow Wash in the northwest and Brown Canyon in the southeast. In the other areas of the Temescal Valley the Silverado Formation is underlain by older rocks which were exposed to subaerial weathering for a prolonged period of time before the sedimentary clays were deposited. Also, the clay deposits along the northeastern flank of the Santa Ana Mountains generally are not as thick as those found in the areas with residual clays. Records of clay deposits in this area indicate that clay beds are generally from 5 to 15 feet thick and rarely up to 30 feet thick. The clays found here are red to yellow mottled clay, greenish-brown and red pisolitic clay, and sandy white, red, greenish, and blue-gray clay. There was limited kaolinite clay mining from the Silverado Formation in this area in the past, and there is little possibility that large resources remain here. Although there were as many as 16 kaolinite clay mines and prospects in this area, none were of large size. The largest mine was probably the McKnight clay mine (appendix no. 23, map no. 54), which reportedly produced 200 tons of clay per month during the late 1800's (Gray, 1961).

Silverado Formation on East Side of Temescal Valley and the Alberhill-Lake Elsinore Area, MRZ-3a$^{CK(i-2)}$: Kaolinite clay deposits in the Temescal Valley area are restricted to the Silverado Formation. Exposures of the Silverado Formation occur across a large area in the northern part of the Temescal Valley from Corona to Lake Elsinore. As mentioned in the previous entry, where the Silverado Formation overlies Late Cretaceous-age rocks there are no residual clays. This classification zone includes areas where the Silverado Formation overlies weathered bedrock surfaces. The bedrock can consist of metasedimentary rocks of the Bedford Canyon Formation or equivalent rocks, metavolcanic rocks of Mesozoic or Cretaceous age, or Cretaceous granitic rocks. All of these bedrock types were exposed to intense subaerial weathering before the Silverado Formations was deposited on them. The deposition of these rocks preserved the residual clays developed by the weathering. There are six areas that have been included in this classification zone. The first is at the north end of the hills to the west of Temescal Wash, about two miles southeast of Corona. The second area is just south of the intersection of the Corona Freeway (I-15) and Cajalco Road and includes the abandoned Owens-Illinois Glass Company sand quarry (appendix no. 28, map no. 86). This second area is also classified as a specialty sand resource (see section "AREAS CLASSIFIED FOR SPECIALTY SAND RESOURCES" - MRZ-3a$^{SS(i-3)}$). The third is an area of low hills located about one mile northwest of Glen Ivy. The fourth area is about 1 1/2 miles southeast of Glen Ivy. The fifth area includes a southeastern part of the Pacific Clay Products Company property at Alberhill and a low hill one mile north of Lake Elsinore. The sixth area is 1/4 mile north of the intersection of the Corona Freeway (I-15) and Highway 74 and is known as the Morton clay deposit (appendix no. 25, map no. 195). The sixth area was mined in the

1950's by the Elsinore Clay Company. Little clay is left exposed in the pit walls and the extent of the deposit beyond the pit area is not known.

Silverado Formation in the Santa Ana Mountains, MRZ-3a$^{CK(i-3)}$: There are two occurrences of the Silverado Formation in the high parts of the Santa Ana Mountains south of Lake Elsinore. The northern exposure at Elsinore Peak has been prospected for clay (Sievert prospect - appendix no. 31, map no. 239). In both areas the Silverado Formation is capped by Santa Rosa Basalt which has been dated at about 10 million years old (Kennedy, 1977). The southern occurrence is on the sides of Redonda Mesa near the San Diego County border. In both deposits the Silverado Formation may contain sedimentary clays and residual clays weathered from the underlying granitic rocks.

Areas Classified MRZ-3b$^{CK(i)}$ (Kaolinite Clay):

Northern Temescal Valley Area, MRZ-3b$^{CK(i-1)}$: Residual and sedimentary kaolinite clay deposits may occur within buried strata of the Silverado Formation. A large area of the Temescal Valley, between Lake Elsinore and Corona may be underlain by the Paleocene Silverado Formation. This area is covered by younger deposits which mask its presence. Drilling would have to be done to determine if there are clay beds shallow enough to be economically mined. The extent of the classified area was determined by mapped exposures of the Silverado Formation and an estimation of its extent by F.H. Weber, Jr. (1977, plate 4, map 3).

Mesas in the Santa Ana Mountains, MRZ-3b$^{CK(i-2)}$: Kaolinite clay beds of the Silverado Formation may be preserved beneath mesas in the Santa Ana Mountains by coverings of Santa Rosa Basalt. There are two areas where the Silverado Formation can be seen underlying basalt cappings, at Elsinore Peak and Redonda Mesa. Both of these areas have been classified MRZ-3a for kaolinite clay (see preceding section). The other mesas with basalt cappings in the Santa Ana Mountains within the Temescal Valley Area have been classified MRZ-3b to indicate that there is the possibility of clay beds underlying the basalts. The mesas are Mesa de Burro, Mesa de la Punta, Mesa De Colorado, and Avenaloca Mesa.

AREAS IDENTIFIED $^{CC(i)}$ (Common Clay):

Areas classified as $^{CC(i)}$ contain deposits of common clay resources. Common clay can be either a mixture of clay minerals such as illite or montmorillonite or a material with clay-size particles of any mineral. The resources of common clay minerals

are generally found in the shales of the Ladd Formation of Cretaceous age.

Areas Classified MRZ-2a$^{CC(i)}$ (Common Clay):

Dominguez Clay/Shale Deposit, MRZ-2a$^{CC(i-1)}$: The Dominguez clay/shale deposit (appendix no. 11, map no. 39) is located at the north end of the Santa Ana Mountains about four miles west of Corona. The deposit has been previously classified MRZ-2 for clay by the Division of Mines and Geology by petition (Joseph, 1985) and that classification has not been changed in this report. The deposit was discovered in 1975 and mined from 1980 to 1990 by United States Tile Company. The deposit consists of buff to greenish-gray shale of the Ladd Formation. The shale, as it was used, is composed of montmorillonite, kaolinite, feldspar, iron oxides, mica, and quartz. The clay was used to make roofing tile and patio tile. The mine is no longer active.

Thomas Clay Deposit, MRZ-2a$^{CC(i-2)}$: The Thomas clay deposit (appendix no. 38, map no. 42) is located at the north end of the Santa Ana Mountains about three miles west of Corona. The deposit is on both sides of an unnamed canyon west of Wardlow Wash. The deposit has been previously classified MRZ-2 for clay by the Division of Mines and Geology by petition (Joseph, 1982) and that classification has not been changed in this report. The Thomas clay deposit was discovered in 1951 and mining was begun by Gladding McBean and Company shortly thereafter. Pacific Clay Products operated the mine from 1980 until a few years ago. The property is now developed into housing. The clay was mined from a massive calcareous shale of the Silverado Formation. The clay shale was blended with other clays to make sewer pipes, roofing tile, and thin brick veneer.

Alberhill Shale/Clay Mine, MRZ-2a$^{CC(i-3)}$: MCA Company (Maruhachi Ceramics of America, Inc.) has plans to open a clay mine (appendix no. 3, map no. 174) in 1991 on 60 acres of property located in the hills about three miles north of Lake Elsinore and about one mile east of Alberhill. Metamorphic rock, probably equivalent to the Bedford Canyon Formation, will be crushed and used for its clay-size particles. The MCA Company has made tests on the material to verify that its properties are suitable for use in making roofing tile.

Area Classified MRZ-3a$^{CC(i)}$ (Common Clay):

Shale at North End of Santa Ana Mountains, MRZ-3a$^{CC(i-1)}$: Resources of common clay are contained in shale deposits at the north end of the Santa Ana Mountains. In this area shale beds are found within rock units mapped as Undifferentiated Cretaceous formations and Silverado Formation, and may be found in rocks

mapped as Santiago Formation. Except where detailed mapping has allowed non-shale rocks to be excluded, areas underlain by these formations have been included in this classification zone. Several common clay mines and prospects are located in this area including the Conduit clay placer (appendix no. 6, map no. 40) and the Sky Ranch east (appendix no. 32, map no. 46) and west pits (appendix no. 33 map no. 45). The two most recently active common clay mines in this area, the Dominguez clay/shale deposit (appendix no. 11, map no. 39) and the Thomas clay deposit (appendix no. 38, map no. 42) have been classified MRZ-2a (see preceding section). The shales in this area are generally dark blue-gray to black and buff with limy concretions. The shales contain a mixture of clay minerals and can be used in making heavy clay products such as sewer pipe and tile.

AREAS CLASSIFIED FOR SPECIALTY STONE RESOURCES

Areas classified for specialty stone resources in the Temescal Valley area are shown on Plate 3A. The classified areas are identified by the following superscripts; $^{SR(i)}$ for riprap and $^{SG(i)}$ for roofing granules. The superscript numbers are used to identify specific MRZ-2a and MRZ-3a deposits discussed in this section.

Specialty stone includes stone used for specialized purposes that require certain physical characteristics. These characteristics can be hardness, cleavage, chemical inertness, or a combination of characteristics that lend themselves to a specified use. Included under this heading are stone materials that are used as riprap, roofing granules, cut or dimension stone, and slate. Excluded from this category are construction aggregates which are covered in a separate section.

AREAS IDENTIFIED $^{SR(i)}$ (Specialty Stone - Riprap):

Areas classified as $^{SR(i)}$ contain deposits of stone resources suitable for use as riprap. These deposits are within the granitic rocks of the northern part of the southern California batholith.

Large blocks of rough-hewn or broken granite or other stone have long been used in such structures as seawalls and jetties, and as facing for levees and dams. Requirements for such stone are that it resist erosion and weathering and that it break naturally into large sizes that set easily. Granitic rocks meet these requirements well and are the most commonly used stone for this purpose. Most of the riprap in the Temescal Valley area has been mined from granodiorite bodies or related granitics of the southern California batholith.

Historically, limited amounts of stone were quarried for riprap in the Temescal Valley area around the turn of the century at the Casa Blanca quarries (appendix no. 244, map no. 34) and at what is now known as the Stringfellow quarry (appendix no. 251, map no. 4). It was in the 1920's, however, that large tonnages of riprap began being supplied by quarries in the area for breakwaters and sea walls along the coast (Long Beach breakwater 1925-1929, Seal Beach 1944-1949, and Redondo Beach 1953-1956). The quarries in the area have also filled the needs of various flood control and dam construction projects.

There are three active riprap quarries in the Temescal Valley area. Two, in the Jurupa Mountains, the Stringfellow (appendix no. 251, map no. 4) and Atkinson (appendix no. 243, map no. 9) quarries, produce stone from granitic rocks of the southern California batholith. The third, the Harlow quarry (appendix no. 245, map no. 97), about 5 miles southeast of Corona, quarries riprap from older metavolcanic rocks. All three of the quarries are producing construction aggregates as a by-product.

Areas in the Temescal Valley area were classified for riprap resources based on published geologic mapping, company data, and limited field work. Generally, only the existence of a producing quarry provided sufficient information for classifying a deposit for riprap.

Areas Classified MRZ-2a$^{SR(i)}$ (Specialty Stone - Riprap):

Stringfellow Quarry Area, MRZ-2a$^{SR(i-1)}$: This area is wholly within the Stringfellow quarry property. The Stringfellow quarry (appendix no. 251, map no. 4) is located in the central part of the Jurupa Mountains at the north end of Pyrite Street. The quarry was first operated by the West Riverside Granite Company in about 1900. In 1905 the Bly Brothers shipped the rock to Los Angeles for use as building stone. In 1928 the stone was crushed and used as roofing material and chicken grit. Since the 1920's the principal use of the material has been as riprap. The quarry supplied riprap for breakwaters along the southern California coast from 1925 to 1963. The Paul J. Hubbs Construction Company now operates the quarry. Recently the quarry has been producing construction aggregate (see section "AREAS CLASSIFIED FOR CRUSHED STONE RESOURCES" - MRZ-2a$^{CS(c-1)}$). The deposit is a roughly rectangular-shaped mass of granodiorite of the southern California batholith. Two sets of joints, one trending east, spaced about 8 to 10 feet apart, and the other trending north assist the quarrying of the stone. Testing in about 1939 by the U.S. Army Corp of Engineers yielded the following results: specific gravity = 2.68; absorption = 0.4; L.A. Rattler, average percent loss at 500 revolutions = 38.6%.

Atkinson Quarry Area, MRZ-2a$^{SR(i-2)}$: This area is located about 3 1/2 miles northwest of Riverside, on the southern side of the Crestmore Hills. Most of the deposit is within the Atkinson quarry property (appendix no. 243, map no. 9). The deposit was opened in 1925 by the Hauser Construction Company to provide riprap for the Long Beach Harbor breakwater. From 1929 to 1944 the quarry was intermittently used to supply riprap for aqueduct projects. The quarry was acquired by the Guy F. Atkinson Company in about 1944 to supply riprap for the Seal Beach breakwater. The Paul J. Hubbs Construction Company now operates the quarry. The deposit is also classified as a construction aggregate resource (see section "AREAS CLASSIFIED FOR CRUSHED STONE RESOURCES" - MRZ-2b$^{CS(c-1)}$). The deposit consists of a large mass of granodiorite of the southern California batholith. The granodiorite is light gray to gray and ranges from fine- to coarse-grained. The rock is dense, but is jointed and breaks into large blocks. Testing of the rock done in about 1939 by the U.S. Army Corp of Engineers showed the following: specific gravity = 2.78; L.A. Rattler, average percent loss at 500 revolutions = 38.4%.

Harlow Quarry Area, MRZ-2a$^{SR(i-3)}$: This area is wholly within the Harlow quarry property (appendix no. 245, map no. 97). It is located about 6 miles southeast of Corona along the east side of Temescal Wash, 1/2-mile south of Cajalco Road. The deposit was opened about 1935 to 1939 by Pantages Construction Company for use probably as track ballast for the Atchison, Topeka, and Santa Fe Railroad. Large scale quarrying began in 1953 by the Stringfellow Company and Livingston Rock and Gravel Company, Inc. The stone was quarried for use as riprap for a number of flood control projects from 1953 to 1962. The Paul J. Hubbs Construction Company now produces riprap and construction aggregates as a by-product (see section "AREAS CLASSIFIED FOR CRUSHED STONE RESOURCES" - MRZ-2a$^{CS(c-3)}$). The dominant rock type in the deposit is metamorphosed volcanics of the Santiago Peak Volcanics (meta-andesite porphyry). It is a medium gray, dense rock with closely to moderately spaced joints. Because of the joint pattern, large-sized rock is not generally produced. Testing of the rock in about 1939 by the U.S. Army Corps of Engineers resulted in the following: specific gravity = 2.71; absorption = 0.3; L.A. Rattler, average percent loss at 500 revolutions = 13.4%.

AREAS IDENTIFIED $^{SX(i)}$ (Specialty Stone - Roofing Granules):

Areas classified as $^{SX(i)}$ contain deposits of stone resources suitable for use as roofing granules. These deposits are within the igneous rock body known as the Temescal Wash quartz latite porphyry (Gray, 1961) at the northwestern end of the Temescal Hills.

Artificially colored roofing granules provide protection for asphalt roofing from solar radiation and add desired colors to the product. The development of roofing granules has gone on for nearly 100 years, and today the specifications for a rock deposit are so restrictive that only a few can be processed acceptably and economically. A deposit must be large, uniform in composition, and provide equidimensional granules upon crushing. The resultant granules must be tough, resistant to weathering, completely opaque to ultraviolet light, adaptable to the coloring process, and have low porosity. (Jewett and Collins, 1975)

Such a rock deposit has been quarried for roofing granules in the Temescal Valley area since 1948. The Minnesota Mining and Manufacturing Company is producing roofing granules from the Temescal rock quarry (appendix no. 253, map no. 80), about 4 miles southeast of Corona. The rock being mined is dark-colored intrusive named the Temescal Wash quartz latite porphyry. This plant is one of the largest producers of roofing granules in California.

The area was classified for roofing granule resources based on published geologic mapping, company data, and limited field work. Only the area in and near the Minnesota Mining and Manufacturing Company property was well enough known to classify for roofing granules.

Area Classified MRZ-2a$^{SX(i)}$ (Specialty Stone - Roofing Granules):

Temescal Rock Quarry Area, MRZ-2a$^{SX(i-1)}$: A quarry was opened in this deposit in about 1888 for use as road material in Los Angeles. Crushed rock for construction aggregate was produced from the deposit until 1927. Beginning in 1947, the Minnesota Mining and Manufacturing Company produced roofing granules from the deposit. Their quarry has been in continuous operation since (appendix no. 253, map no. 80). The deposit consists of a dark-colored quartz latite - part of an igneous body named the Temescal Wash quartz latite porphyry. The rock is fine-grained and blue-black to gray on fresh surfaces. It has good breakage qualities and is very hard. The stone is crushed and screened into suitable sizes and coated with colored epoxy resins. The granules are used primarily for coating asphalt roofing. This plant is a major source of roofing granules on the west coast. The deposit is also classified as a construction aggregate resource (see section "AREAS CLASSIFIED FOR CRUSHED STONE RESOURCES" - MRZ-2a$^{CS(c-2)}$).

Area Classified MRZ-3a$^{SX(i)}$ (Specialty Stone - Roofing Granules):

Area near Temescal Rock Quarry, MRZ-3a$^{SX(i-1)}$: The igneous body of quartz latite porphyry mined by the Minnesota Mining and

Manufacturing Company for roofing granules extends beyond the area of the Temescal rock quarry (appendix no. 253, map no. 80). The quartz latite porphyry to the north and to the east appears to be unweathered and likely is suitable for use as roofing granules. Part of the eastern area is being mined for construction aggregate (Santa Ana River Rock Company, Eagle Valley quarry - appendix no. 109, map no. 91) and much of the northern area is planned for mining as construction aggregates by CalMat Corporation. To the northeast of the classified area the quartz latite appears to be sheared and, in places, hydrothermally altered and may not be suitable for use as roofing granules.

AREAS CLASSIFIED FOR SPECIALTY SAND RESOURCES

Areas classified for specialty sand resources in the Temescal Valley area are shown on Plate 3A. The designation superscript for Specialty Sand is $^{SS(i)}$. A superscript number (e.g. MRZ-2a$^{SS(i-1)}$) is used to identify specific MRZ areas discussed in this section.

Specialty sands in the Temescal Valley Project area are used as foundry sands, molding sands or silica sands (glass sands). Foundry or molding sands must be able to withstand high heat, be non-reactive, and have sufficient cohesiveness to hold together when wet. Bonding material (such as 5% to 10% clay) can be naturally occurring with the sand or added. These sands are used to make kiln brick or molds for the steel, electrical and ceramic industries. Foundry or molding sands are quartz or quartzo-feldspathic sands used in the casting of iron or other metallic machine parts. Glass silica sands are medium grained sands used in the production of glass. Silica content is 95% to 99.8%.

Most specialty sand resources in the Temescal Valley are associated with the Paleocene Silverado Formation. A marginal resource is associated with the undifferentiated Vaqueros and Sespe formations. Current production of specialty sands in the area is from the Corona clay deposit (appendix no. 224, map no. 82), mined by the Corona Industrial Sand Company.

Area Classified MRZ 2a$^{SS(i)}$ (Specialty Sand):

Corona Clay Deposit, MRZ-2a$^{SS(i-1)}$: The Corona clay deposit is located about 4 miles southeast of Corona between Freeway I-15 and Temescal Wash. The property is owned by Pacific Clay Products, Inc. The Corona Industrial Sand Company is mining industrial sand from what is either the upper Paleocene Silverado Formation or an equivalent of the Eocene-age Santiago Formation. After extracting the sand, the clay fraction is stockpiled for use by Pacific Clay Products, Inc. The arkosic sand layer is 10

to 100 feet thick and ranges in color from a dull white to lead gray with some pink and brownish staining. The sand is sold for industrial uses including golf course sand, play sand, sand blasting and glass manufacture. (This property is also classified for clay resources as discussed in the section "Areas Classified MRZ-2a$^{CK(i-1)}$).

Areas Classified MRZ-3a$^{SS(i)}$ (Specialty Sand):

Area between Hagador and Main Street Canyons, MRZ-3a$^{SS(i-1)}$: White to gray sand crops out along the northeastern margins of the Santa Ana Mountains. The sand is within the upper Paleocene Silverado Formation and is overlain by 2 to 5 feet of Quaternary (less than 1.6 million years ago) terrace material. The sands were mined in the early 1900's as silica sands, with unknown but probably small production. The sands are 30 to 50 feet thick and dip gently to the west. Elsewhere in the area the sands of the upper Silverado have been exploited with great success, even when the beds contain as much as 30% clay. The Jackson and Havens property (appendix no. 226, map no. 62) is located within this area. An MRZ-3a classification of this area is warranted by the uniformity of the Silverado Formation and the occurrences of commercial sands in other local areas.

Smith Silica Sand Pit Area, MRZ-3a$^{SS(i-2)}$: The Smith silica pit (also known as the Hoag and the Jones property, appendix no. 228, map no. 84) is located west of the Corona Freeway (I-15), south of Corona, on the western edge of the Bedford Canyon Wash. The area was developed as a source of foundry sand in the 1920's. In 1958, the Riverside Cement Company developed the property as a source of white silica sand for use in the production of white portland cement. The deposit occurs within a Pliocene-age formation with 5 to 10 feet of terrace material as overburden. The deposit is a massive, poorly consolidated white sand which is locally conglomeratic. The sand was reported to be 97.54% silica (Tucker and Sampson, 1929). The beds in the abandoned quarry are 40 feet thick on the maximum face. The sand crops out along the wash which cuts through the deposit from the southwest.

Corona Silica Sand Area, MRZ-3a$^{SS(i-3)}$: The Corona silica sand MRZ-3a area includes the Owens-Illinois Property (appendix no. 227, map no. 86) which lies on either side of old highway 71, and the Coronita Ranch prospect (appendix no. 225, map no. 85) which is adjacent to the west. This area is also classified as a clay resource (see section "AREAS CLASSIFIED FOR CLAY RESOURCES" - MRZ-3a$^{CK(i-2)}$). This deposit is within the lower Silverado Formation and is 120 feet thick. The Corona deposit was the principle source of silica sand for southern California and was operated nearly continuously until its closure in 1974. The sand is 30% clay which was stockpiled. The dumps were worked as recently as 1988 for fine sand for abrasive grit. The adjacent

Coronita Ranch prospect was drilled in the late 1950's. The sand is the northwest extension of the Corona silica deposit. The formation dips 8° to 10° to the southwest and the deposit is from 66 to 88 feet thick. There is a good possibility that additional resources of silica sand are contained within the MRZ zone boundaries.

Temescal Canyon Prospect Area, MRZ-3a$^{SS(i-4)}$: The Temescal Canyon prospect area is located on the ridge just north of McBride Canyon on the eastern edge of the Santa Ana Mountains. The sand of the Eocene- to Miocene-age undifferentiated Vaqueros and Sespe formations, has been prospected for silica sand in the 1920's, and in 1958 by the Ottawa Silica Company. This sand is a white to buff colored arkosic sand which could be as much as 200 feet thick. A sliver of Silverado Formation which crops out along the Elsinore fault is included within the MRZ boundary.

AREA CLASSIFIED FOR LIMESTONE RESOURCES

The area classified for limestone resources in the Temescal Valley area is shown on Plate 3A. The classified area is identified by the superscript: $^{L(i-1)}$.

Limestone is a resource that can be used as aggregate or as a chemical commodity: calcium carbonate ($CaCO_3$). In the Temescal Valley area, limestone has been mined for aggregate, poultry grit, asphalt tile filler, for sugar beet manufacture, flux in iron foundries, and as roofing granules. The most important end use of limestone, however, has been its use in cement production. Limestone is the major ingredient in the production of cement.

Limestone is classed by brightness, or whiteness, for use as dimension stone, roofing granules, extenders and in "white" cement. For cement production, the chemical composition is important. Cement grade limestone must have a high calcium carbonate content and a low magnesium (Mg) content- no more than 3%. Alkalies (sodium, Na, and potassium, K) also must be low, usually less than 1.5%.

Most limestone in the project area occurs in small lensoid bodies. Limestone resources of sufficient size and acceptable grade to be classed as economic occur only in the eastern Jurupa Mountains. The Crestmore (appendix no. 218, map no. 10) and the Jensen quarries (appendix no. 220, map no. 8) are the largest limestone quarries in the area. The Crestmore quarry, a continuous producer since the late 1890's and still has large resources of cement grade limestone.

Area Classified MRZ-2b$^{L(i)}$ (Limestone):

Crestmore Quarry Area, MRZ 2b$^{L(i-1)}$: The Crestmore quarry area (appendix no. 218, map no. 10) is classified MRZ-2b for limestone. The quarry is located at the extreme eastern end of the Jurupa Mountains, north of Rubidoux. Originally developed in the 1890's, the limestone has been mined as building stone and for the production of lime. Production of cement-grade limestone commenced in 1909. Although the mine is currently inactive, underground reserves are estimated at more than 136 million tons of limestone. Of the total reserves, 90% is of grade greater than 90% $CaCO_3$. The reserves are primarily in the upper limestone body. Engineering problems prevent extraction at this time. Parts of the deposit are also classified as construction aggregate resources (see section "AREAS CLASSIFIED FOR CRUSHED STONE RESOURCES" - MRZ-2b$^{CS(c-2)}$).

INDUSTRIAL MINERALS FOUND IN THE AREA BUT NOT CLASSIFIED

Coal

Coal was produced from mines in the Temescal Valley area between 1894 and 1902. Virtually all of the coal came from a single deposit in the Silverado Formation at Alberhill (Alberhill Coal and Clay Company coal deposit - appendix no. 43, map no. 169). A coal bed ranging in thickness from 4 to 10 feet was found in the clay-rich part of the formation. The coal was mined by the Elsinore Coal and Clay Company. The property, for many years mined for clay, is now planned for urban development. Two other mines in the area produced small amounts of coal - the McKnight clay deposit (appendix no. 46, map no. 54) and the Jones clay deposit (appendix no. 45, map no. 87), both located along the northeastern flank of the Santa Ana Mountains, a few miles southwest of Corona. Coal was also found at two prospects in this same area, at Castillo's prospect (appendix no. 44, map no. 88) and an unknown name coal prospect (appendix no. 47, map no. 60). The coal in the two mines and two prospects was also found in the clay-rich section of the Silverado Formation. The coal in all three areas was lignite, a low-grade, low-BTU product, used for heating. The quality of the coal was too poor for locomotive boiler use. With the advent of petroleum the coal became unmarketable.

No areas in the Temescal Valley area were classified for coal resources.

Dimension Stone

Dimension stone is generally blocks of natural stone that are cut or broken to definite shapes or sizes. The principal uses of dimension stone are in building construction and monuments. Other uses include curbstones and paving blocks. In the United States, dimension stone commands an ever decreasing share of the building market. Around the year 1900 dimension stone accounted for more than half the stone produced in the United States, but by the 1970's it accounted for about 0.2 percent. Although there was a small increase in production in the later half of the 1980's, during the last two decades the output of dimension stone in the United States has fallen by about 1/4. Competition from cheaper materials and the demand for uniform products accounts in part for the decrease. Foreign imports and high domestic labor costs have also contributed to the decrease in local production. (Power, 1975)

More than a dozen quarries have produced dimension stone within the Temescal Valley area. Most of the quarries were active around the turn of the century. Since the 1930's very few quarries have recorded production. The last dimension stone production in the area was in the early 1960's from the Royal Black Granite quarry (appendix no. 234, map no. 156) located about four miles west of Perris. The Delano Black Granite quarry (appendix no. 231, map no. 149) was adjacent to the Royal Black Granite quarry. The Blue-Gray Granite quarry was located about three miles northwest of Perris. In the northern part of the Temescal Valley area there were several dimension stone quarries. Three dimension stone quarries were located near Corona; the Hole Ranch quarries (appendix no. 232, map no. 19), and Sierra Grande quarry (appendix no. 236, map no. 22) east of Corona and the Mt. Hole quarries (appendix no. 233, map no. 17) northeast of Corona. There was a small quarry at the west end of the Jurupa Mountains (unknown name quarry - appendix no. 238, map no. 2), a small quarry on a hilltop in the western part of the City of Riverside (unknown name quarry - appendix no. 239, map no. 32), and a small quarry reported at the north end of Rubidoux Hill (Rubidoux Hill quarry - appendix no. 235, map no. 26). There were three small dimension stone quarries located about four miles north of Lake Elsinore (unknown name quarries - appendix nos. 240, 241, and 242; map nos. 175, 181, and 182, respectively). A group of small dimension stone quarries were worked around the turn of the century in the southern part of the Temescal Valley area south of Temecula (Temecula quarries - (appendix no. 237, map no. 253).

The lack of a local stone cutting industry and the difficulty in finding large tonnages of fresh rock with the desired characteristics (color and pattern) may have contributed to the demise of dimension stone production within the Temescal Valley area. In most areas underlain by granitic rocks, the surface has undergone deep weathering, often to depths of several

hundred feet. The weathering has developed along joints and fractures that extend well beneath the surface. The only hard, fresh rock material to be found near the surface is in residual unweathered boulders surrounded by extensively weathered material.

No areas in the Temescal Valley area were classified for dimension stone resources.

Gypsum (Gypsite)

Gypsite is an impure earthy form of gypsum, a calcium sulfate ($CaSO_4$ $2H_2O$), usually mixed with clay or sand. In the Temescal Valley area, the gypsite deposits are small and are scattered along the northeast flank of the Santa Ana Mountains. The deposits are aligned along faults or shears within the Santiago Peak Volcanics of Cretaceous age. Within the shear zones, the volcanics have been hydrothermally altered producing clays (kaolin), iron oxides, calcite and pyrite. Gypsum occurs as small crystals within the highly altered rocks and as veinlets.

Commercial gypsite for local agricultural use was produced from locations in Tin Mine Canyon (Big Chief and White Gypsum group - appendix nos. 206 and 211, map nos. 58 and 59), Hagador Canyon (Hagador Canyon gypsum deposit - appendix no. 209, map no. 61), Main Street Canyon (Main Street Canyon gypsum deposit and Capitol deposit - appendix nos. 210 and 207, map nos. 65 and 66) and Eagle Canyon (Eagle Canyon gypsum - appendix no. 208, map no. 69). Thin gypsum beds occur within the Cretaceous and Paleocene rocks along the eastern flank of the Santa Ana Mountains, but these have never been economic. Gypsite was shipped as early as 1900 with most mining activity occurring between 1909 and 1919 and again between 1924 to 1934. Material has been occasionally produced for local consumption.

No areas in the Temescal Valley area were classified for gypsite resources.

Slate

Slate is a microgranular metamorphic rock derived from argillaceous sediments and is characterized by perfect cleavage entirely independent of the original bedding. The Bedford Canyon Formation contains some slate in the area west of Railroad Canyon Reservoir, about 4 1/2 miles northeast of Lake Elsinore. Three slate quarries (unknown names - appendix nos. 254, 255, and 256; map nos. 186, 193, and 194) and the Wrench slate prospect (appendix no. 257, map no. 200) were located in that area. The slate found there does not have perfect enough cleavage to be

split into roofing tiles and the close spacing of the cross fractures prevent its use for blackboards. Prior to 1954, several hundred tons were mined for use as building foundation and fence material, and ground for use as roofing granules (Engel and others, 1959).

No areas in the Temescal Valley area were classified for slate resources.

AREAS CLASSIFIED FOR CONSTRUCTION AGGREGATE

This section of the report deals with the classification of construction aggregate resources in the Temescal Valley area. Sand, gravel and crushed stone are "construction materials." These commodities, collectively referred to as "aggregate" or "construction aggregate", provide bulk and strength to portland cement concrete (PCC), asphaltic concrete (AC), plaster, and stucco. Aggregate is also used as road base, subbase, railroad ballast and fill. Aggregate normally provides 80 to 100 percent of the material volume in these uses.

Construction aggregate can be produced from either crushed stone or from natural sand and gravel sources. A full range of aggregate products, from fill through PCC-grade aggregate, can be produced from either source, though, in general it is more costly to produce aggregate from a crushed rock source, particularly in the production of sand-sized particles. The use preference of the construction industry in the Los Angeles Basin generally favors sand and gravel, which has been relatively plentiful, for use in PCC applications. Because of obvious geologic differences between sand and gravel and crushed stone aggregate deposits, the two types have been classified separately in this report.

Large quantities of aggregate are consumed by the building and paving industries and future demand for this commodity is expected to increase throughout California. Aggregate materials are essential to the needs of modern society both to maintain the existing infrastructure and to provide for new construction. Therefore, aggregate materials are a resource of great importance to the economy of any urban area. Because aggregate is a low unit-value, high bulk-weight commodity, it must be obtained from nearby sources in order to minimize costs to the aggregate consumer. If nearby sources do not exist, then transportation costs can quickly exceed the value of the aggregate. In addition to increasing the cost of aggregate to the consumer, transporting aggregate from distant sources also results in increased fuel consumption, air pollution, traffic congestion, and road maintenance. Transportation cost is the principal constraint defining the market area for an aggregate operation. These factors set construction aggregate apart from many other mineral

commodities such as gold or copper which may reach markets far removed from the areas in which they are mined.

CONSTRUCTION AGGREGATE TRANSPORTATION RATES

All aggregate mined in the Temescal Valley area is transported by truck. Minimum rates for independent aggregate truckers are set by the Public Utilities Commission of the State of California (PUC). Rates for Riverside County are published in "Minimum Rate Tariff 7-A" (Public Utilities Commission of the State of California, 1987). Charges are calculated based on either an hourly rate (Table 4) or a distance rate (Table 5). The minimum hourly rate or the minimum distance rate, whichever is larger, may be charged to the consumer. If the hourly rate is used, the carrier and debtor must enter into a written agreement prior to transport.

Table 5 illustrates how the PUC rates increase with distance as specified in Minimum Rate Tariff 7-A.

CONSTRUCTION AGGREGATE CLASSIFICATION PROCEDURES

Classification procedures and categories for construction aggregate are identical to those previously described for other mineral commodities. The Temescal Valley area has been classified for the presence or likely occurrence of construction aggregate resources, which can be either crushed stone resources or sand and gravel resources. Each of these commodities has been further subdivided on the basis of their highest end use. Two categories are considered for both crushed stone and sand and gravel:

1. Concrete aggregate (portland cement concrete and/or asphaltic concrete aggregates).

2. Base aggregates (base and/or subbase aggregates).

It is hoped that these divisions will assist both the local government in making planning decisions, and the aggregate industry in seeking additional sources of aggregate materials suitable to their needs. Active mines that produce only fill material have not been classified MRZ-2.

SMARA guidelines set forth two requirements to be used to determine the significance of a construction aggregate deposit and to determine whether or not the land containing that deposit should be classified MRZ-2:

1. The deposit must be composed of material of suitable quality to be considered a marketable commodity.

Table 4. Minimum hourly rates for transport of aggregate in the Temescal Valley area. From Public Utilities Commission of the State of California, 1987, Minimum Rate Tariff 7-A (current rates as of October 1, 1990).

TYPICAL TONS PER LOAD	NO. OF AXLES PER UNIT OF EQUIPMENT	HOURLY RATES* ($)	$/TON/HR
10	2	47.27	4.73
15	3	53.61	3.57
24	4	56.49	2.35
26	5+	59.69	2.30

*Rates are higher for work done on holidays and weekends.

Table 5. Minimum distance rates for transport of aggregate in the Temescal Valley area. From Public Utilities Commission of the State of California, 1987, Minimum Rate Tariff 7-A (current rates as of October 1, 1990. Includes surcharge as specified in Supplement 30).

MILES		RATES*	MILES		RATES*
OVER	BUT NOT OVER	$/TON	OVER	BUT NOT OVER	$/TON
0	1	0.81	35	36	5.29
1	2	0.94	36	37	5.39
2	3	1.08	37	38	5.52
3	4	1.22	38	39	5.64
4	5	1.36	39	40	5.76
5	6	1.50	40	41	5.89
6	7	1.65	41	42	6.00
7	8	1.79	42	43	6.12
8	9	1.92	43	44	6.23
9	10	2.06	44	45	6.35
10	11	2.19	45	46	6.47
11	12	2.33	46	47	6.59
12	13	2.45	47	48	6.70
13	14	2.59	48	49	6.82
14	15	2.71	49	50	6.95
15	16	2.83			
16	17	2.96	50	52	7.15
17	18	3.09	52	54	7.37
18	19	3.23	54	56	7.60
19	20	3.35	56	58	7.82
20	21	3.47	58	60	8.04
21	22	3.59			
22	23	3.73	60	63	8.36
23	24	3.86	63	66	8.71
24	25	3.99	66	69	9.03
25	26	4.10	69	72	9.38
26	27	4.22	72	75	9.70
27	28	4.34	75	80	10.23
28	29	4.45	80	85	10.77
29	30	4.57	85	90	11.30
30	31	4.70	90	95	11.83
31	32	4.80	95	100	12.37
32	33	4.93			
33	34	5.03			
34	35	5.16			

* Rates are higher for holidays and weekends and if equipment other than "a tractor with bottom dump doubles in train" are required at the destination.

2. The deposit must meet threshold value. The projected value (gross selling price) of the deposit, based upon the value of the first marketable product, must be at least 5,000,000 1978 dollars (approximately 9,700,000 1988 dollars).

Suitability as a marketable commodity is demonstrated by current or past commercial or government production of construction aggregate from a deposit, or by the existence of aggregate quality tests which indicate that the material in the deposit is likely to meet California Department of Transportation specifications for a specified class of construction aggregate.

Rarely is in-place aggregate (raw material) physically or chemically suited for every type of aggregate use. Every potential deposit must be tested to determine how much material can meet specifications for a particular use, and what processing is required. Specifications for aggregate have been established by Federal, State and local agencies to ensure the manufacture of strong, durable structures capable of withstanding the physical and chemical effects of weathering and use. These agencies, and other major consumers of aggregate, test aggregate by standard test procedures defined by such organizations as the American Society for Testing Materials (ASTM), the American Association of State Highway Officials (AASHO) and the California Department of Transportation (1988). These tests determine the physical and chemical properties of the materials and also aggregate size and shape. In general, aggregate for high end uses such as PCC or AC must meet more stringent specifications than aggregate for low end uses such as base or subbase.

In the Temescal Valley area, construction aggregate sells in bulk for an average price of about $5.50 per ton at the production site. At this average price of $5.50 per ton a deposit must contain a minimum of approximately 1.76 million tons of aggregate to meet the threshold value established by the State Mining and Geology Board.

AREAS CLASSIFIED FOR CRUSHED STONE RESOURCES

Areas classified for crushed stone resources in the Temescal Valley area are shown on Plates 4A and 4B. The classified areas are identified by the following superscripts; $^{CS(c)}$ (crushed stone - concrete aggregate) and $^{CS(b)}$ (crushed stone - base aggregate). Additionally, superscript reference numbers are used to identify specific MRZ-2a, MRZ-2b, MRZ-3a, and MRZ-3b deposits discussed in this section. Deposits of any classification type, for example MRZ-2a$^{CS(c)}$, are generally numbered west to east and from north to south.

AREAS IDENTIFIED $^{CS(c)}$ (Crushed Stone - Concrete Aggregate):

Areas identified $^{CS(c)}$ contain crushed stone resources that are or are potentially of concrete aggregate quality. The types of rocks that occur in the Temescal Valley area that are classified in this category are granitic rocks of the southern California batholith, shallow igneous intrusive rocks (porphyries), metamorphic rocks of the Bedford Canyon Formation and Santiago Peak Volcanics in the Santa Ana Mountains and related metamorphic rocks east of Temescal Wash, metamorphic rocks in the Jurupa Mountains, and volcanic rocks of the Santa Rosa Basalt. In the Temescal Valley area concrete aggregates are being produced from shallow igneous intrusive rocks near Corona. Nearly all of the crushed stone produced in the area is used as asphaltic concrete aggregate. Crushed stone is seldom used as portland cement concrete aggregate because of the reluctance of the construction industry in southern California to use it in place of sand and gravel. This is because portland cement concrete made with crushed stone is more difficult to finish because of the broken, angular pieces than is concrete made with rounded gravel.

Although no concrete aggregate has been produced from the metamorphic rocks in the area, testing by various companies now interested in using it as concrete aggregate has shown that some of it is suitable for the purpose. The basaltic rock exposed in the Temescal Valley area has neither been used as construction aggregate nor tested for that use; however, the use of basalt as construction aggregate in other areas of the United States provides evidence for its probable suitability.

Areas Classified MRZ-2a$^{CS(c)}$ (Crushed Stone - Concrete Aggregate):

Stringfellow Quarry, MRZ-2a$^{CS(c-1)}$**:** The Stringfellow quarry (appendix no. 111 and 251, map no. 4) has been in operation for 85 years producing riprap. The material has recently been tested for PCC-grade aggregate by Paul J. Hubbs Construction Company, the present operator of the quarry, and found to be suitable. This deposit is also classified MRZ-2a for riprap (see section "AREAS CLASSIFIED FOR SPECIALTY STONE RESOURCES" - MRZ-2a$^{SR(i-1)}$) The material here is medium- to coarse-grained, porphyritic, gray granodiorite with septa of schist. This property was previously classified as MRZ-3 for PCC-grade aggregate by the Division of Mines and Geology (Miller, 1987). This classification has been changed to reflect new data on this deposit.

All American Asphalt and Aggregates, Inc., Corona Pit - CalMat Corporation, Corona Pit - Temescal Rock Quarry - Santa Ana River Rock Company, Eagle Valley Quarry Area, MRZ-2a$^{CS(c-2)}$**:** This area is about two miles southeast of Corona, on the east side of

Temescal Wash. The rocks here are shallow igneous intrusives described as quartz latite porphyry, granodiorite porphyry, and quartz monzonite porphyry. The property is mostly owned or controlled by four companies, All American Asphalt and Aggregates, Inc. (appendix no. 92, map no. 74), CalMat Corporation (appendix no. 96, map no. 75), Santa Ana River Rock Company (appendix no. 109, map no. 91), and Minnesota Mining and Manufacturing Company (appendix no. 253, map no. 80), the first three of which produce construction aggregates, including asphaltic concrete aggregate, as their major products from the deposit. The Minnesota Mining and Manufacturing Company produces primarily roofing granules from their property. The entire area was previously classified as MRZ-2 for PCC-grade aggregate by the Division of Mines and Geology (Miller and Corbaley, 1981) and this classification has not been altered in this report. Part of the area in and around the Minnesota Mining and Manufacturing Company property (also called the Temescal Rock quarry) is also classified as a roofing granule resource area (see section "AREAS CLASSIFIED FOR SPECIALTY STONE RESOURCES" - MRZ-2a$^{SG(i-1)}$).

Harlow Quarry, MRZ-2a$^{CS(c-3)}$: This quarry area lies just east of the Temescal Wash and south of Cajalco Road. The Harlow quarry (appendix nos. 104 and 245, map no. 97), which is operated by the Paul J. Hubbs Construction Company, has produced riprap for several years and has lately been producing construction aggregates, including asphaltic aggregate (see section "AREAS CLASSIFIED FOR SPECIALTY STONE RESOURCES" - MRZ-2a$^{SR(i-3)}$). The quarry rock is mapped as quartz latite porphyry by Morton (unpublished geologic mapping of the Lake Elsinore quadrangle).

Areas Classified MRZ-2b$^{CS(c)}$ (Crushed Stone - Concrete Aggregate):

Atkinson Quarry, MRZ-2b$^{CS(c-1)}$: The Atkinson quarry (appendix nos. 93 and 243, map no. 9), also known as the Ormond quarry, has been in intermittent operation since 1925 producing riprap (see section "AREAS CLASSIFIED FOR SPECIALTY STONE RESOURCES" - MRZ-2a$^{SR(i-2)}$). The material has recently been tested by Paul J. Hubbs Construction Company, the quarry operator, for asphaltic concrete-grade aggregate and found to be suitable. The rock is a medium- to coarse-grained porphyritic gray granodiorite. Testing of the quality of the material east of the quarry would be necessary to classify this area as MRZ-2a. This property was previously classified as MRZ-3 for PCC-grade aggregate by the Division of Mines and Geology (Miller, 1987). This classification has been changed to reflect the new test data on the deposit.

Crestmore Quarry, MRZ-2b$^{CS(c-2)}$: The Crestmore quarry (appendix nos. 100 and 218, map no. 10) has produced limestone since the late 1890's. Beginning in 1909 and ending in 1986 the Riverside

Cement Company mined and processed the limestone for cement (see section "AREA CLASSIFIED FOR LIMESTONE RESOURCES" - MRZ-2b$^{L(i-1)}$). The company now proposes to mine the remaining two hills on the property for construction aggregate including both asphaltic and portland cement concrete. The rock is quartz diorite and limestone. Testing of the quality of the remaining material would be necessary to classify this area as MRZ-2a. This property was previously classified as MRZ-3 for PCC-grade aggregate by the Division of Mines and Geology (Miller, 1987). This classification of the two hills has been changed to reflect new data on the deposit.

Temescal Wash Area, MRZ-2b$^{CS(c-3)}$: This deposit is east and south of the Santa Ana River Rock Company Eagle Valley quarry (appendix no. 109, map no. 91) about four miles southeast of Corona. The area is underlain by quartz latite porphyry which has been geologically mapped as part of the same unit which is being mined for construction aggregates, including asphaltic concrete aggregate, at the Santa Ana River Rock quarry. Testing of the quality of the material would be necessary to classify this area as MRZ-2a. The area was previously classified MRZ-2 for PCC-grade aggregate by the Division of Mines and Geology (Miller and Corbaley, 1981) and this classification has not been altered in this report. This deposit is also classified as a roofing granule resource (see section "AREAS CLASSIFIED FOR SPECIALTY STONE RESOURCES" - MRZ-3a$^{SG(i-1)}$).

Areas Classified MRZ-3a$^{CS(c)}$ (Crushed Stone - Concrete Aggregate)**:**

Jurupa Mountains Complex, MRZ-3a$^{CS(c-1)}$: This area lies north of the City of Riverside at the north edge of the Riverside County line. The area is underlain by granitic and metasedimentary rocks. The granitic rocks are some of the northernmost exposures of the southern California batholith which have intruded a series of metasedimentary rocks consisting mostly of schists, marbles, and amphibolites. These metamorphic rocks are probably older than the metasedimentary rocks in the Santa Ana Mountains and in the Perris Block. Construction aggregates are being mined in granitic rocks in the Jurupa Mountains at the Stringfellow quarry, which is classified as MRZ-2a. Testing and evaluation would be required to assess the suitability of the granitic and metamorphic rocks for use as construction aggregates. The metamorphic rocks are expected to be generally less suitable for use as concrete aggregate than the granitic rocks. The area was previously classified MRZ-3 for PCC-grade aggregate by the Division of Mines and Geology (Miller, 1987) and this classification has not been altered in this report.

Santa Ana Mountains and Perris Block Rocks, MRZ-3a$^{CS(c-2)}$: Areas classified MRZ-3a$^{CS(c-2)}$ include large tracts of land underlain by

possible crushed stone resources of granitic rocks associated with the southern California batholith, metamorphic rocks of the Bedford Canyon Formation and the Santiago Peak Volcanics and similar metamorphic rocks of the Perris Block, hypabyssal intrusive rocks, and extrusive basalts. Asphaltic concrete aggregates are being mined from hypabyssal intrusive rocks near Corona and those areas have been classified as MRZ-2a. Granitic rocks associated with the southern California batholith have been and are being used for base aggregate material, and some limited areas of granitic rock (now classified MRZ-2a) have been tested and found suitable for asphaltic and portland cement concrete aggregate. Metamorphic rocks have been tested in a few areas (now classified as MRZ-2a for base aggregate) and found to be suitable for base material. Although, neither the metasedimentary rocks nor the Santiago Peak Volcanics have produced concrete aggregates in the area, sand and gravel eroded from those units have produced both asphaltic and portland cement concrete aggregates. The basalt unit in the area, the Santa Rosa Basalt, has never produced nor been tested for suitability as concrete aggregate. However, the apparent hardness of the basalt along with the demonstrated suitability of basalts in other areas of the country for use as concrete aggregate, are evidence of its possibilities as a concrete aggregate resource. A large part of these areas were previously classified MRZ-3 for PCC-grade aggregate by the Division of Mines and Geology in two reports (Miller and Corbaley, 1981 and Miller, 1987) and this classification has not been altered in this report. Testing and evaluation would be required to assess the suitability of any of the rocks in this area.

AREAS IDENTIFIED $^{CS(b)}$ (Crushed Stone - Base Aggregate):

Areas identified $^{CS(b)}$ contain crushed stone resources that are or are potentially of base and/or subbase aggregate quality. The types of rocks that occur in the Temescal Valley area that are classified in this category are granitic rocks of the southern California batholith and metasedimentary and metavolcanic rocks. Because the granitic and metamorphic rocks in the area also have a potential to produce concrete aggregate, the only areas that are classified for base aggregate material are those areas that are producing base material at present or have been tested and found to be suitable for use as base aggregate.

Areas Classified MRZ-2a$^{CS(b)}$ (Crushed Stone - Base Aggregate):

Markham Road Pit, MRZ-2a$^{CS(b-1)}$**:** The Markham Road pit (appendix no. 77, map no. 124) is a ten-acre site, owned by the Riverside County Road Department, located just south of Markham Road about four miles northwest of Perris. Road base is intermittently

mined from the decomposed surface material of the granodiorite which underlies the area. The area was previously classified MRZ-3 for PCC-grade aggregate by the Division of Mines and Geology (Miller, 1987). This classification has been changed to reflect new information on the deposit.

Railroad Canyon Road Pit, MRZ-2a$^{CS(b-2)}$: The Railroad Canyon Road pit (appendix no. 79, map no. 216) is a 14-acre site, owned in part by the Riverside County Road Department and in part by a private party (Christensen pit - appendix no. 74, map no. 215), located on the south side of Railroad Canyon Road about three miles east of Lake Elsinore. Road base is made from the decomposed surface material of the underlying granodiorite. The area was previously classified MRZ-3 for PCC-grade aggregate by the Division of Mines and Geology (Miller, 1987). This classification has been changed to reflect new information on the deposit.

Bundy Canyon Road Pit, MRZ-2a$^{CS(b-3)}$: The Bundy Canyon Road pit (appendix no. 73, map no. 221) is an 85-acre site, owned by the Riverside County Road Department, located on the north side of Bundy Canyon Road about four miles southeast of Lake Elsinore. Road base is produced from decomposed surface material of the underlying granodiorite. The area was previously classified MRZ-3 for PCC-grade aggregate by the Division of Mines and Geology (Miller, 1987). This classification has been changed to reflect new information on the deposit.

Areas Classified MRZ-2b$^{CS(b)}$ (Crushed Stone - Base Aggregate):

Mobil Sand Company Property East of Temescal Wash, MRZ-2b$^{CS(b-1)}$: This is a 450-acre area that has been tested for suitability as base material by Mobil Sand Company which operates an aggregate pit in Temescal Wash, adjacent to this property (appendix no. 106, map no. 101). The area is underlain by granitic, metasedimentary, and metavolcanic rocks. Testing indicates that both the granitic and metamorphic rocks may be suitable for use as base aggregate. A permit to mine this area has not yet been obtained.

Properties South of Mayhew Fan, MRZ-2b$^{CS(b-2)}$: This area has been tested by two companies - Werner Corporation and R.J. Noble Company - both of which produce construction aggregates from a sand and gravel resource area on adjacent properties on the Mayhew fan (Foster Sand and Gravel pit - appendix no. 103, map no. 165 and Coldwater Canyon pit - appendix no. 108, map no. 110, respectively). The area is underlain by both granitic rocks and metasedimentary rocks of the Bedford Canyon Formation. Both rock types have been shown by limited testing to be possibly suitable for use as base aggregate. Permits to mine in this area have not yet been obtained.

AREAS CLASSIFIED FOR SAND AND GRAVEL RESOURCES

Areas classified for sand and gravel resources in the Temescal Valley area are shown on Plates 4A and 4B. The classified areas are identified by the following superscript: $^{SG(c)}$ (sand and gravel - concrete aggregate). Superscript reference numbers are used to identify specific MRZ-2a, MRZ-2b, and MRZ-3a deposits discussed in this section. Deposits of a given classification type are numbered from west to east and north to south across the area.

AREAS IDENTIFIED $^{SG(c)}$ (Sand and Gravel - Concrete Aggregate):

Areas identified as $^{SG(c)}$ contain sand and gravel resources that are or are potentially of concrete aggregate quality. The types of alluvial deposits that occur in the Temescal Valley area that are classified in this category are recent stream beds, recent and older flood plain deposits (terrace deposits), recent and older alluvial fan deposits, and Tertiary (66 to 1.6 million years ago) sedimentary deposits that have little or no cementation (unlithified). Currently most of the PCC-grade aggregate produced in the Temescal Valley area is mined from sand and gravel deposits.

Areas Classified MRZ-2a$^{SG(c)}$ (Sand and Gravel - Concrete Aggregate):

Owl Rock Products Company, Prado Pit Area, MRZ-2a$^{SG(c-1)}$: The Prado pit area was previously classified MRZ-2 for PCC-grade aggregate by the Division of Mines and Geology (Miller and Corbaley, 1981) and this classification has not been changed in this report. Most of this property is owned and permitted for mining by the Owl Rock Products Company (appendix no. 107, map no. 14) which has produced construction aggregates here since 1966. The company presently produces asphaltic concrete and base aggregates from the deposit. The deposit consists of a sequence of pebbly sandstones that belong to the Sycamore Canyon member of the Puente Formation of Miocene age. The deposit is about 95% fine material with the balance composed of pebbles and a few cobbles. The fine fraction is estimated to be about 75% sand and 25% silt and clay.

Fontana Paving, Inc., Corona Plant Area, MRZ-2a$^{SG(c-2)}$: This property was previously classified MRZ-2 for PCC-grade aggregate by the Division of Mines and Geology (Miller and Corbaley, 1981) and this classification has not been changed in this report. The property is mined by Fontana Paving, Inc. - a subsidiary of Boral Resources, Inc. The mine (appendix no. 102, map no. 78) has produced asphaltic concrete aggregate since 1962 from the recent alluvium in Temescal Wash.

Upper Temescal Wash and Mayhew-Coldwater Fan, MRZ-2a$^{SG(c-3)}$: This area was previously classified as MRZ-2 for PCC-grade aggregate by the Division of Mines and Geology (Miller and Corbaley, 1981) and this classification has not been changed in this report. This area includes the alluvial fans at the mouths of Mayhew and Coldwater canyons and the alluvium in a section of Temescal Wash. Six sand and gravel companies produce construction aggregates, including asphaltic and portland cement concrete and base aggregates, in this area. On the Mayhew and Coldwater fans, aggregate is mined by Chandler's Palos Verdes Sand and Gravel, Inc. (Glen Ivy pit - appendix no. 98, map no. 109), Werner Corporation (Foster Sand and Gravel pit - appendix no. 103, map no. 165), R.J. Noble Company (Coldwater Canyon pit - appendix no. 108, map no. 110), C.L. Pharris Sand and Gravel, Inc. (Maitri pit - appendix no. 95, map no. 112), and West Coast Sand and Gravel Company (J.F. and T. Sand pit - appendix no. 105, map no. 111). In Temescal Wash, aggregate is mined by Mobil Sand Company (appendix no. 106, map no. 101) and C.L. Pharris Sand and Gravel, Inc. (Dawson Canyon pit - appendix no. 94, map no. 108).

McVicker Canyon, MRZ-2a$^{SG(c-4)}$: This property was previously classified MRZ-2 for PCC-grade aggregate by the Division of Mines and Geology (Miller, 1987) and this classification has not been changed in this report. The property is underlain by recent alluvium in McVicker Canyon and the proximal part of the alluvial fan at the mouth of the canyon. The deposit is being mined by Elsinore Ready Mix, Inc. (appendix no. 101, map no. 171) which has been producing portland cement concrete and base aggregates here since 1958.

Areas Classified MRZ-2b$^{SG(c)}$ (Sand and Gravel - Concrete Aggregate):

Mira Loma Area, MRZ-2b$^{SG(c-1)}$: This area is underlain by alluvial fan material originating from canyons on the southeastern side of the San Gabriel Mountains. The area was previously classified MRZ-2 for PCC-grade aggregate by the Division of Mines and Geology (Miller, 1987) and that classification has not been changed in this report. Triangle Rock Products, Inc. (appendix no. 113, map no. 1), produced concrete aggregate from a part of this deposit until 1969. The deposit mined by Triangle Rock Products, Inc. consisted of a 30-foot thick layer of sand and gravel overlain by a 20-foot thick layer of silt. The sand and gravel layer was depleted in the Triangle Rock Products, Inc. pit and that area is classified MRZ-3a to reflect the possibility of resources in the underlying material. The extension of the buried sand and gravel layer into the surrounding area classified MRZ-2b is supported by seven water-well drill-logs.

Santa Ana River and Lytle Creek, MRZ-2b$^{SG(c-2)}$: This area was previously classified MRZ-2 for PCC-grade aggregate by the

Division of Mines and Geology (Miller, 1987) and that classification has not been changed in this report. The deposit consists of recent alluvium in the channel of the Santa Ana River and alluvial material deposited in a gap through the eastern Jurupa Mountains in what may be an abandoned channel of Lytle Creek. Aggregate was mined from the Lytle Creek deposit in this area by the Service Rock Company (appendix no. 110, map no. 11) in the early 1950's. Limited subsurface information from water-well drill-logs in this area support an MRZ-2b classification. More subsurface data, including testing, would be necessary for an MRZ-2a classification.

Lower Santa Ana River, MRZ-2b$^{SG(c-3)}$: This area was previously classified MRZ-2 for PCC-grade aggregate by the Division of Mines and Geology (Miller, 1987) and this classification has not been changed in this report. The deposit consists of recent alluvium in the Santa Ana River channel immediately downstream of Prado Dam. The past mining of concrete aggregate material several miles upstream and downstream of this area and limited water-well drill-log data within the area support the MRZ-2b classification of this deposit. More subsurface data, including testing, would be necessary for an MRZ-2a classification.

Lower Temescal Wash near Corona, MRZ-2b$^{SG(c-4)}$: This area was previously classified MRZ-2 for PCC-grade aggregate by the Division of Mines and Geology (Miller and Corbaley, 1981) and this classification has not been changed in this report. The deposit consists of recent alluvium in the channel of Temescal Wash downstream of Cajalco Road. Mining for construction aggregate took place as early as 1937 within this area. Presently the Fontana Paving, Inc. (appendix no. 102, map no. 78) mines aggregate in a section of lower Temescal Wash which has been classified MRZ-2a. The information from two water-well drill-logs in the area and the Fontana Paving, Inc., Corona pit support the MRZ-2b classification. More subsurface data would be necessary to classify the deposit MRZ-2a.

Rice Canyon, MRZ-2b$^{SG(c-5)}$: This area was previously classified MRZ-2 for PCC-grade aggregate by the Division of Mines and Geology (Miller, 1987) and this classification has not been changed in this report. The deposit consists of recent alluvium in the stream channel within Rice Canyon. Elsinore Ready Mix, Inc., which now mines aggregate in McVicker Canyon one mile south of Rice Canyon, once mined concrete aggregate from this section of Rice Canyon. More data concerning the quality of the remaining alluvial material in the channel would be necessary to classify the deposit MRZ-2a.

Areas Classified MRZ-3a$^{SG(c)}$ (Sand and Gravel - Concrete Aggregate):

Sedimentary Deposits, MRZ-3a$^{SG(c-1)}$: Areas classified MRZ-3a$^{SG(c-1)}$ include large tracts of land in the Temescal Valley area underlain by possible sand and gravel resources of sedimentary units, including recent stream alluvium, floodplain deposits, alluvial fan deposits, and unconsolidated (unlithified) Tertiary sediments. Concrete aggregates are being mined from recent stream deposits and alluvial fan deposits in the Temescal Valley area. Those areas are classified MRZ-2a. A large part of the area here classified MRZ-3a has been previously classified MRZ-3 for PCC-grade aggregate by the Division of Mines and Geology (Miller and Corbaley, 1981 and Miller, 1987) and that classification has not been changed in this report except where described under other aggregate classification sections. Testing and evaluation would be required to assess the suitability of any of the rocks in this area for use as concrete aggregates.

PART IV - AGGREGATE RESOURCE AREAS IN THE TEMESCAL VALLEY AREA

Recognizing that there are lands within areas that have been classified MRZ-2 for aggregate resources that have already been urbanized and therefore have a limited opportunity for mineral resource conservation and extraction, the State Geologist has limited the quantification of aggregate resources to areas classified as MRZ-2 for aggregate that have not been urbanized. The non-urbanized portions of MRZ-2a and MRZ-2b areas are, in this report, called "Aggregate Resource Areas" and are shown on Plates 5A and 5B. The delineation of Aggregate Resource Areas is to provide local government with more detailed information with which to make land-use decisions and to provide the State Mining and Geology Board with information necessary for the designation process.

OVERVIEW OF THE DESIGNATION PROCESS

This report is the classification phase of the two-step process mandated by SMARA. The classification phase results in a complete product in and of itself. However, at the discretion of the State Mining and Geology Board, a second phase, termed designation, may follow. The designation phase follows receipt and approval of this classification report by the State Mining and Geology Board. Designation is the formal recognition by the State Mining and Geology Board of areas containing mineral deposits of regional or statewide significance that should be given special consideration by lead agencies for protection from land uses incompatible with mineral extraction. Recognition is achieved by the adoption of regulations which designate certain deposits to be of prime importance in meeting the future needs of the region or the state. Designation is based upon this report and consultation with lead agencies and other interested parties. Procedures for the designation of lands containing significant mineral deposits are specified in Section II.2 of the California State Mining and Geology Board's Guidelines for Classification and Designation of Mineral Lands (1983, p. 23).

Parts of the Temescal Valley area have been classified for aggregate resources by the State Geologist in two previous studies and lands within those study areas were designated by the State Mining and Geology Board. The two previous classification studies were: Classification of Sand and Gravel Resource Areas, Orange County-Temescal Valley Production-Consumption Region (Miller and Corbaley, 1981) which covered the Temescal Valley from Alberhill north to the county line and included the cities of Norco, Corona, and part of Riverside; and Classification of Sand and Gravel Resource Areas, San Bernardino Production-Consumption Region (Miller, 1987) which covered the northeastern part of the area, the Lake Elsinore area, and the eastern edge of the area. The State Mining and Geology Board designated land

within those areas as described in two reports: **Designation of Regionally Significant Construction Aggregate Resource Areas in the Orange County-Temescal Valley and San Gabriel Valley Production-Consumption Regions (California Department of Conservation, 1984); and Designation of Regionally Significant Construction Aggregate Resource Areas in the Claremont-Upland and San Bernardino Production-Consumption Regions (California Department of Conservation, 1986).** The areas designated by the State Mining and Geology Board are shown on Plates 5A and 5B.

But, regardless of whether the State Mining and Geology Board pursues additional designation of mineral deposits in the Temescal Valley area, local governments are still required under SMARA to recognize the information provided in this report, and to emphasize the conservation and development of identified mineral deposits. To assist local governments in this role, some relative quantification of aggregate resources (both available tonnages and projected demand) provides essential information in evaluating proposed land-uses for specific sites. Only with this perspective can sound local decisions regarding the long-term availability of mineral resources be made.

CONCEPTS USED IN IDENTIFYING AGGREGATE RESOURCE AREAS

An Aggregate Resource Area (ARA) is an area that has been classified as MRZ-2a or MRZ-2b for construction aggregate by the State Geologist and is deemed to be available for mining based upon criteria for compatibility provided by the State Mining and Geology Board and outlined below.

For purposes of identifying available aggregate resource areas, incompatible uses of land are defined as improvements of high-cost (such as high-density residential developments) intensive industrial developments, commercial developments, developed public parks, and major public facilities. In addition, lands for which the lead agency has approved a tract map or issued an approved Specific Plan are treated as having uses that are incompatible with mining. Lands that have compatible uses are defined as those that are non-urbanized or that have very low density residential development (one unit or less per ten acres), land that does not have high-cost improvements, and lands used for agriculture, silviculture, grazing, or open space.

For this report, determination of use of lands classified as MRZ-2a or MRZ-2b for construction aggregate was based upon conditions of the lands at the time of the study (1990). The use of the lands was determined after review of data from lead agencies, reference to aerial photographs and photo-revised topographic maps, and limited field reconnaissance. The Aggregate Resource Areas Maps (Plates 5A and 5B) show the

portions of those areas classified MRZ-2a or MRZ-2b considered to have current land uses compatible with mining.

Each Aggregate Resource Area meets or exceeds the State Mining and Geology Board's threshold value for deposits of significant size. The State Mining and Geology Board has defined threshold value as "...the projected value (gross selling price) of the first marketable product from an individual mineral deposit or from a group of deposits that can be operated as a unit...", and has set a minimum value for construction materials at 5,000,000 1978 dollars (approximately 9,700,000 1988 dollars) (California State Mining and Geology Board, 1983, p. 26). The State Geologist has divided the Aggregate Resource Areas into three categories as follows: IS (Immediately Significant), HS (Highly Significant), and S (Significant). These categories are based on a semi-quantitative evaluation of suitable aggregate resources classified as MRZ-2a or MRZ-2b. The criteria for these categories follows:

IS - All lands within Aggregate Resource Areas which are currently permitted for aggregate mining.

HS - Aggregate Resource Areas that contain in excess of 10 times threshold value of material (approximately 1.76 million tons at 1990 prices in the Temescal Valley area), or that are adjacent to permitted property.*

S - All remaining Aggregate Resource Areas containing at least 1.76 million tons of material.*

* If conditions warrant, an Aggregate Resource Area category can be changed from HS to S or from S to HS. These conditions may include, but are not limited to, local scarcity of commodity, proximity to an operating aggregate mine, and distance from market areas.

Aggregate Resource Areas have been employed to focus the attention of land-use planners and local governments on areas that remain accessible for mineral extraction. Mineral land classification, which is done without regard for current land uses, by itself, does very little to put into perspective the resource base that is available to meet the future needs of a region.

AGGREGATE RESOURCE AREAS

Aggregate Resource Areas in the Temescal Valley area are shown on Plates 5A and 5B. The relationship between areas classified MRZ-2a or MRZ-2b in this report and the resulting Aggregate Resource Areas are described below. Highest use

indicates the highest potential use of the material in a deposit based on current or past production or tests from that deposit or similar deposits in the region. Further testing and evaluation could either upgrade or downgrade the potential highest use of a deposit. The Aggregate Resource Areas have been numbered generally from west to east and from north to south in the area.

The Aggregate Resource Areas and their respective category of significance are summarized in Table 6.

ARA-1: That part of MRZ-2b$^{SG(c-1)}$ east of Milliken Avenue, south of Mission Boulevard, and northwest of the powerlines (see Plate 5A). This area is designated as a regionally significant construction aggregate resource area by the State Mining and Geology Board as part of Sector D-6 in the San Bernardino Production-Consumption Region (California Department of Conservation, 1986; California Administrative Code, Section 3550.8 of Title 14, Division 2, Chapter 8, Subchapter 1). ARA-1 is rated as Significant. The highest probable use of material from this deposit is concrete aggregate.

ARA-2: That part of MRZ-2b$^{SG(c-1)}$ north of Freeway I-60, west of Freeway I-15, and southeast of the powerlines (see Plate 5A). This area is designated as a regionally significant construction aggregate resource area by the State Mining and Geology Board as part of Sector D-6 in the San Bernardino Production-Consumption Region (California Department of Conservation, 1986; California Administrative Code, Section 3550.8 of Title 14, Division 2, Chapter 8, Subchapter 1). ARA-2 is rated as Significant. The highest probable use of material from this deposit is concrete aggregate.

ARA-3: That part of MRZ-2b$^{SG(c-1)}$ east of Etiwanda Avenue and south of Patton Road (see Plate 5A). This area is designated as a regionally significant construction aggregate resource area by the State Mining and Geology Board as Sector D-4 in the San Bernardino Production-Consumption Region (California Department of Conservation, 1986; California Administrative Code, Section 3550.8 of Title 14, Division 2, Chapter 8, Subchapter 1). ARA-3 is rated as Significant. The highest probable use of material from this deposit is concrete aggregate.

ARA-4: MRZ-2a$^{CS(c-1)}$ is included in its entirety in ARA-4 (see Plate 5A). This ARA is presently permitted for aggregate mining and contains the Stringfellow quarry which is operated by Paul J. Hubbs Construction Company (appendix no. 111 and 251, map no. 4). ARA-4 is rated as Immediately Significant. Based on test data, the highest probable use for material from this deposit is concrete aggregate.

ARA-5: MRZ-2b$^{CS(c-1)}$ is included in its entirety in ARA-5 (see Plate 5A). The western part of this ARA contains the Atkinson

quarry which is operated by Paul J. Hubbs Construction Company (appendix no. 93 and 243, map no. 9). ARA-5 is rated as Significant. Based on test data, the highest probable use for material from this deposit is concrete aggregate.

ARA-6a and ARA-6b: MRZ-2b$^{CS(c-2)}$ is included in its entirety in ARA-6a, known as Beckett Hill, and ARA-6b, known as Sky Blue Hill, which are parts of the Crestmore quarry (see Plate 5A). ARA's 6a and 6b are proposed for aggregate mining by the Riverside Cement Company (appendix no. 100 and 218, map no. 10). ARA-6a and ARA-6b are rated as Significant. Based on test data, the highest probable use for material from this deposit is concrete aggregate.

ARA-7: That part of MRZ-2b$^{SG(c-2)}$ that is east of Crestmore Road and within the Santa Ana River channel (see Plate 5A). This area is designated as a regionally significant construction aggregate resource area by the State Mining and Geology Board as Sector E-14 in the San Bernardino Production-Consumption Region (California Department of Conservation, 1986; California Administrative Code, Section 3550.8 of Title 14, Division 2, Chapter 8, Subchapter 1). ARA-7 is rated as Highly Significant. Based on similar deposits upstream, the highest probable use for material from this deposit is concrete aggregate.

ARA-8: That part of MRZ-2b$^{SG(c-2)}$ that is between Crestmore Road and Freeway I-60 and within the Santa Ana River channel (see Plate 5A). This area is designated as a regionally significant construction aggregate resource area by the State Mining and Geology Board as Sector E-17 in the San Bernardino Production-Consumption Region (California Department of Conservation, 1986; California Administrative Code, Section 3550.8 of Title Division 2, Chapter 8, Subchapter 1). ARA-8 is rated as Significant. Based on similar deposits upstream, the highest probable use of material from this deposit is concrete aggregate.

ARA-9: That part of MRZ-2b$^{SG(c-2)}$ that is within the triangular area bordered by Wallace Road, 34th Street and a Santa Ana River levee (see Plate 5A). This area is designated as a regionally significant construction aggregate resource area by the State Mining and Geology Board as Sector E-22 in the San Bernardino Production-Consumption Region (California Department of Conservation, 1986; California Administrative Code, Section 3550.8 of Title Division 2, Chapter 8, Subchapter 1). ARA-9 is rated as Significant. Based on similar deposits upstream, the highest probable use of material from this deposit is concrete aggregate.

ARA-10: That part of MRZ-2b$^{SG(c-2)}$ that is south of Freeway I-60, northwest of the Santa Ana River channel, and east of a branch levee (see Plate 5A). This area is designated as a regionally significant construction aggregate resource area by the State

Mining and Geology Board as Sector E-20 in the San Bernardino Production-Consumption Region (California Department of Conservation, 1986; California Administrative Code, Section 3550.8 of Title Division 2, Chapter 8, Subchapter 1). ARA-10 is rated as Significant. Based on similar deposits upstream, the highest probable use of material from this deposit is concrete aggregate.

ARA-11: That part of MRZ-2b$^{SG(c-2)}$ that is within the Santa Ana River channel and between Freeway I-60 and Mission Boulevard (see Plate 5A). This area is designated as a regionally significant construction aggregate resource area by the State Mining and Geology Board as Sector E-19 in the San Bernardino Production-Consumption Region (California Department of Conservation, 1986; California Administrative Code, Section 3550.8 of Title Division 2, Chapter 8, Subchapter 1). ARA-11 is rated as Significant. Based on similar deposits upstream, the highest probable use of material from this deposit is concrete aggregate.

ARA-12: That part of MRZ-2b$^{SG(c-2)}$ that is southeast of the Flabob Airport, southwest of Capary Road, and north of Crestmore Road (see Plate 5A). This area is designated as a regionally significant construction aggregate resource area by the State Mining and Geology Board as part of Sector E-24 in the San Bernardino Production-Consumption Region (California Department of Conservation, 1986; California Administrative Code, Section 3550.8 of Title Division 2, Chapter 8, Subchapter 1). ARA-12 is rated as Highly Significant. Based on similar deposits upstream, the highest probable use of material from this deposit is concrete aggregate.

ARA-13: That part of MRZ-2b$^{SG(c-2)}$ that is south of Mission Boulevard and in the streambed of the Santa Ana River (see Plate 5A). This area is designated as a regionally significant construction aggregate resource area by the State Mining and Geology Board as part of Sector E-24 in the San Bernardino Production-Consumption Region (California Department of Conservation, 1986; California Administrative Code, Section 3550.8 of Title Division 2, Chapter 8, Subchapter 1). ARA-13 is rated as Significant. Based on similar deposits upstream, the highest probable use of material from this deposit is concrete aggregate.

ARA-14: That part of MRZ-2b$^{SG(c-2)}$ that is east of the Santa Ana River bed, north of Mission Boulevard, and southwest of Lake Evans (see Plate 5A). This area is designated as a regionally significant construction aggregate resource area by the State Mining and Geology Board as part of Sector E-23 in the San Bernardino Production-Consumption Region (California Department of Conservation, 1986; California Administrative Code, Section 3550.8 of Title Division 2, Chapter 8, Subchapter 1). ARA-14 is

rated as Significant. Based on similar deposits upstream, the highest use of material from this deposit is concrete aggregate.

ARA-15: MRZ-2a$^{SG(c-1)}$ is included in its entirety in ARA-15 (see Plate 5A). Most of this ARA is permitted for mining by the Owl Rock Products Company as the Prado pit (appendix no. 107, map no. 14). This area is designated as a regionally significant construction aggregate resource area by the State Mining and Geology Board as Sector H in the Orange County-Temescal Valley Production-Consumption Region (California Department of Conservation, 1984; California Administrative Code, Section 3550.4 of Title Division 2, Chapter 8, Subchapter 1). ARA-15 is rated as Immediately Significant. Based on production from this deposit, the highest use for this material is concrete aggregate.

ARA-16: That part of MRZ-2b$^{SG(c-3)}$ that extends from the Greenriver Golf Course to within one-half mile of Prado Dam (see Plate 5A). This area is designated as a regionally significant construction aggregate resource area by the State Mining and Geology Board as part of Sector A in the Orange County-Temescal Valley Production-Consumption Region (California Department of Conservation, 1984; California Administrative Code, Section 3550.4 of Title Division 2, Chapter 8, Subchapter 1). ARA-16 is rated as Significant. Based on similar deposits downstream from this deposit, the highest use for this material is concrete aggregate.

ARA-17: That part of MRZ-2b$^{SG(c-3)}$ that is immediately downstream from Prado Dam and extends for one-quarter mile below it (see Plate 5A). This area is designated as a regionally significant construction aggregate resource area by the State Mining and Geology Board as part of Sector A in the Orange County-Temescal Valley Production-Consumption Region (California Department of Conservation, 1984; California Administrative Code, Section 3550.4 of Title Division 2, Chapter 8, Subchapter 1). ARA-17 is rated as Significant. Based on similar deposits downstream from this deposit, the highest use for this material is concrete aggregate.

ARA-18: That part of MRZ-2b$^{SG(c-4)}$ that is between Quarry Street and the Atchison, Topeka, and Santa Fe Railroad (see Plate 5A). Part of this area is designated as a regionally significant construction aggregate resource area by the State Mining and Geology Board as part of Sector P in the Orange County-Temescal Valley Production-Consumption Region (California Department of Conservation, 1984; California Administrative Code, Section 3550.4 of Title Division 2, Chapter 8, Subchapter 1). ARA-18 is rated as Significant. Based on production from other areas in this deposit, the highest use for this material is concrete aggregate.

ARA-19: That part of MRZ-2b$^{SG(c-4)}$ that is southeast of Magnolia Avenue and southwest of Dudley Way, on both sides of Cajalco Street (see Plate 5A). This area is designated as a regionally significant construction aggregate resource area by the State Mining and Geology Board as part of Sector Q in the Orange County-Temescal Valley Production-Consumption Region (California Department of Conservation, 1984; California Administrative Code, Section 3550.4 of Title Division 2, Chapter 8, Subchapter 1). ARA-19 is rated as Significant. Based on production from other areas in this deposit, the highest use for this material is concrete aggregate.

ARA-20: That part of MRZ-2b$^{SG(c-4)}$ that is southeast of Magnolia Avenue and northwest of Dudley Way (see Plate 5A). This area is designated as a regionally significant construction aggregate resource area by the State Mining and Geology Board as part of Sector Q in the Orange County-Temescal Valley Production-Consumption Region (California Department of Conservation, 1984; California Administrative Code, Section 3550.4 of Title Division 2, Chapter 8, Subchapter 1). ARA-19 is rated as Significant. Based on production from other areas in this deposit, the highest use for this material as concrete aggregate.

ARA-21: All of MRZ-2a$^{SG(c-2)}$ and that part of MRZ-2b$^{SG(c-4)}$ that is north of Cajalco Road, extending downstream to within one mile of Magnolia Avenue (see Plate 5A). This ARA contains the Fontana Paving, Inc. (Boral Resources, Inc.) Corona Plant (appendix no. 102, map no. 78). This area is designated as a regionally significant construction aggregate resource area by the State Mining and Geology Board as part of Sector Q in the Orange County-Temescal Valley Production-Consumption Region (California Department of Conservation, 1984; California Administrative Code, Section 3550.4 of Title Division 2, Chapter 8, Subchapter 1). ARA-19 is rated as Immediately Significant. Based on production from within this ARA, the highest use for this material is concrete aggregate.

ARA-22: MRZ-2a$^{CS(c-2)}$ and MRZ-2b$^{CS(c-3)}$ are included in their entirety in ARA-22 (see Plate 5A). Nearly half of this ARA is permitted for mining by three aggregate producing companies - All American Asphalt and Aggregates, Inc. (Corona pit - appendix no. 92, map no. 74); CalMat Corporation (Corona pit - appendix no. 96, map no. 75); and Santa Ana River Rock Company (Boral Resources, Inc.) (Eagle Valley quarry - appendix no. 109, map no. 91). ARA-22 is rated as Immediately Significant. Based on production from this deposit, the highest use for this material is concrete aggregate.

ARA-23: MRZ-2a$^{CS(c-3)}$ is included in its entirety in ARA-23 (see Plate 5A). All of this area is permitted for mining by the Paul J. Hubbs Construction Company as the Harlow quarry (appendix no. 104 and 245, map no. 97). ARA-23 is rated as Immediately

Significant. Based on production from this deposit, the highest use of this material is for concrete aggregate.

ARA-24: MRZ-2a$^{CS(b-1)}$ is included in its entirety in ARA-24 (see Plate 5A). All of this area is owned by the County of Riverside Road Department and used for extraction of road material. The property is known as the Markham Road pit (appendix no. 77, map no. 124). ARA-24 is rated as Immediately Significant. Based on production from this site, the highest use of this material is for base aggregate.

ARA-25: That part of MRZ-2a$^{SG(c-3)}$ that is east of Freeway I-15 (see Plate 5A). Two aggregate producers control large parts of this ARA; they are Mobil Sand Company (appendix no. 106, map no. 101) and C.L. Pharris Sand and Gravel, Inc. (Dawson Canyon pit - appendix no. 94, map no. 108). Most of this area is designated as a regionally significant construction aggregate resource area by the State Mining and Geology Board as Sector R of the Orange County-Temescal Valley Production-Consumption Region (California Department of Conservation, 1984; California Administrative Code, Section 3550.4 of Title Division 2, Chapter 8, Subchapter 1). ARA-25 is rated as Immediately Significant. Based on production from this area, the highest use of this material is for concrete aggregate.

ARA-26: MRZ-2b$^{CS(b-1)}$ is included in its entirety in ARA-26 (see Plate 5A). This area is controlled by Mobil Sand Company (Temescal Canyon quarry) which is attempting to obtain a permit to mine aggregate on the property. ARA-26 is rated as Highly Significant. Based on test data from this area the highest use of this material is for base aggregate.

ARA-27: That part of MRZ-2a$^{SG(c-3)}$ that is west of Freeway I-15 (see Plates 5A and 5B). Five aggregate production companies control most of this area; they are Chandler's Palos Verdes Sand and Gravel, Inc. (Glen Ivy pit - appendix no. 98, map no. 109), C.L. Pharris Sand and Gravel, Inc. (Maitri pit - appendix no. 95, map no. 112), R.J. Noble Company (Coldwater Canyon pit - appendix no. 108, map no. 110), Werner Corporation (Foster Sand and Gravel pit - appendix no. 103, map no. 165), and West Coast Sand and Gravel, Inc. (J.F. and T. Sand pit - appendix no. 105, map no. 111). This area is designated as a regionally significant construction aggregate resource area by the State Mining and Geology Board as Sector S of the Orange County-Temescal Valley Production-Consumption Region (California Department of Conservation, 1984; California Administrative Code, Section 3550.4 of Title Division 2, Chapter 8, Subchapter 1). ARA-27 is rated as Immediately Significant. Based on production from this area, the highest use of this material is for concrete aggregate.

ARA-28: MRZ-2b$^{CS(b-2)}$ is included in its entirety in ARA-28 (see Plates 5A and 5B). Two aggregate companies control this area -

R.J. Noble Company and Werner Corporation, both of which operate aggregate production facilities on properties adjacent to this ARA (Coldwater Canyon and Foster Sand and Gravel pits, respectively). ARA-28 is rated as Highly Significant. Based on test data from this area, the highest use of material from this area is for base aggregate.

ARA-29: MRZ-2b$^{SG(c-5)}$ is included in its entirety in ARA-29 (see Plate 5B). This area is designated as a regionally significant construction aggregate resource area by the State Mining and Geology Board as part of Sector H. in the San Bernardino Production-Consumption Region (California Department of Conservation, 1986; California Administrative Code, Section 3550.8 of Title Division 2, Chapter 8, Subchapter 1). ARA-29 is rated as Significant. Based on past production from this area, the highest use for material from this ARA is for concrete aggregate.

ARA-30: That part of MRZ-2a$^{SG(c-4)}$ that is upstream or west of the mouth of McVicker Canyon (see Plate 5B). Most of the area is permitted for mining by the Elsinore Ready Mix, Inc. (McVicker Canyon pit - appendix no. 101, map no. 171). This area is designated as a regionally significant construction aggregate resource area by the State Mining and Geology Board as part of Sector I in the San Bernardino Production-Consumption Region (California Department of Conservation, 1986; California Administrative Code, Section 3550.8 of Title Division 2, Chapter 8, Subchapter 1). ARA-30 is rated as Immediately Significant. Based on production from this deposit, the highest use for material from this ARA is for concrete aggregate.

ARA-31: MRZ-2a$^{CS(b-2)}$ is included in its entirety in ARA-31 (see Plate 5B). Part of this area is owned by the County of Riverside Road Department (Railroad Canyon Road pit - appendix no. 79, map no. 216) and part is privately owned (Christensen pit - appendix no. 74, map no. 215) ARA-31 is rated as Immediately Significant. Based on production from this site, the highest use of this material is for base aggregate.

ARA-32: MRZ-2a$^{CS(b-3)}$ is included in its entirety in ARA-32 (see Plate 5B). All of this area is owned by the County of Riverside Road Department and used for extraction of road material (Bundy Canyon Road pit - appendix no. 73, map no. 221). ARA-31 is rated as Immediately Significant. Based on production from this site, the highest use of this material is for base aggregate.

Table 6. Aggregate Resource Areas in the Temescal Valley area.

ARA#	CATEGORY*	ROCK SOURCE**	HIGHEST USE***	QUARRY WITHIN ARA AND COMPANY NAME	PLATE
ARA-1	S	SG	concrete aggregate		5A
ARA-2	S	SG	concrete aggregate		5A
ARA-3	S	SG	concrete aggregate		5A
ARA-4	IS	CS	concrete aggregate (and riprap)	Stringfellow quarry - Paul J. Hubbs Construction Company	5A
ARA-5	S	CS	concrete aggregate (and riprap)	Atkinson quarry - Paul J. Hubbs Construction Company	5A
ARA-6a	S	CS	concrete aggregate (part used for cement)	Beckett Hill (Crestmore quarry) - Riverside Cement Company	5A
ARA-6b	S	CS	concrete aggregate (part used for cement)	Sky Blue Hill (Crestmore quarry) - Riverside Cement Company	5A
ARA-7	HS	SG	concrete aggregate		5A
ARA-8	S	SG	concrete aggregate		5A
ARA-9	S	SG	concrete aggregate		5A
ARA-10	S	SG	concrete aggregate		5A
ARA-11	S	SG	concrete aggregate		5A
ARA-12	HS	SG	concrete aggregate		5A
ARA-13	S	SG	concrete aggregate		5A
ARA-14	S	SG	concrete aggregate		5A
ARA-15	IS	SG	concrete aggregate	Prado pit - Owl Rock Products Company	5A
ARA-16	S	SG	concrete aggregate		5A
ARA-17	S	SG	concrete aggregate		5A
ARA-18	S	SG	concrete aggregate		5A
ARA-19	S	SG	concrete aggregate		5A
ARA-20	S	SG	concrete aggregate		5A
ARA-21	IS	SG	concrete aggregate	Corona Plant - Fontana Paving, Inc. (Boral Resources, Inc.)	5A
ARA-22	IS	CS	concrete aggregate (part used for roofing granules)	Corona Pit - All American Asphalt and Aggregates, Inc. Corona Pit - CalMat Corporation Eagle Valley quarry - Santa Ana River Rock Company (Boral Resources, Inc.)	5A

(Table 6 continued on next page)

Table 6. Aggregate Resource Areas in the Temescal Valley area. (continued from previous page)

ARA#	CATEGORY*	ROCK SOURCE**	HIGHEST USE***	QUARRY WITHIN ARA AND COMPANY NAME	PLATE
ARA-23	IS	CS	concrete aggregate (and riprap)	Harlow quarry - Paul J. Hubbs Construction Company	5A
ARA-24	IS	CS	base aggregate	Markham Road pit - Riverside County Road Department	5A
ARA-25	IS	SG	concrete aggregate	Mobil Sand Company pit Dawson Canyon pit - C.L. Pharris Sand and Gravel, Inc.	5A
ARA-26	HS	CS	base aggregate	Temescal Canyon quarry - Mobil Sand Company	5A
ARA-27	IS	SG	concrete aggregate	Glen Ivy pit - Chandler's Palos Verdes Sand and Gravel, Inc. Maitri pit - C.L. Pharris Sand and Gravel, Inc. Coldwater Canyon pit - R. J. Noble Company Foster Sand and Gravel pit - Werner Corporation J.F. and T. Sand pit - West Coast Sand and Gravel, Inc.	5A and 5B
ARA-28	HS	CS	base aggregate	R. J. Noble Company Werner Corporation	5A and 5B
ARA-29	S	SG	concrete aggregate		5B
ARA-30	IS	SG	concrete aggregate	McVicker Canyon pit - Elsinore Ready Mix, Inc.	5B
ARA-31	IS	CS	base aggregate	Railroad Canyon Road pit - Riverside County Road Department	5B
ARA-32	IS	CS	base aggregate	Bundy Canyon Road pit - Riverside County Road Department	5B

* IS = IMMEDIATELY SIGNIFICANT, HS = HIGHLY SIGNIFICANT, S = SIGNIFICANT

** CS = Crushed Stone, SG = Sand and Gravel

*** Highest Use indicates the highest potential use of material in a deposit based on current or past production or tests from that deposit or similar deposits in the region. Further testing and evaluation could either upgrade or downgrade the potential highest use of a deposit.

ANALYSIS OF AREAS DESIGNATED

As has been mentioned in a previous section "Overview of Designation Process," parts of the Temescal Valley area are designated by the State Mining and Geology Board (California Department of Conservation, 1984 and 1986). These areas are recognized by the State Mining and Geology Board as containing portland cement concrete-grade aggregate resources of regional or statewide significance. Special consideration is to be given these areas by lead agencies for protection from land uses incompatible with mineral extraction. These areas are shown on Plates 5A, 5B, and 7.

Some of these designated areas have undergone land-use changes since they were designated. Table 7 presents a summary of the land-use changes of the designated areas and Figure 3 shows, in a graph form, the loss of aggregate resources due to urban development, by year. About 18% (661 acres) of the original 3,664 acres of designated land within the Temescal Valley area now has land uses that preclude mineral extraction. Most of this loss (513 acres, or 14% of the original designated area) was due to urban development. The remaining losses were due to depletion of the resource (100 acres, or about 3% of the original area) and changes in criteria for defining available lands (48 acres, or about 1% of the original area).

The total loss of aggregate resources since the times of designation, within the designated areas, is 126,520,000 tons. However, as can be generally seen on Figure 3, a large percentage of the designated areas lost were committed to development before designation took place (note on Table 7 that most of the dates of land-use change reflect the lead agency approval of the project and not the actual construction). About 70 million tons have been lost to developments approved since the designation of areas in the two original production-consumption regions in 1983 and 1986. This can be compared to 38,820,000 tons of construction aggregate that have been produced from the designated areas since designation.

The loss of aggregate resource areas to urban development has not been curtailed by designation; in fact, the rate of loss has increased by a small amount since designation. However, the Temescal Valley area is under intense urban pressure, and the loss of aggregate resources may have been far greater without the protection of designation. Judging from the pattern of land-use changes, urban pressure is greatest in areas within the cities. Out of 455 acres of designated lands within cities in the area, over half - 237 acres - have been developed or approved for development. And, not all of the designated lands within cities can be considered available for development; 119 acres of these lands are within the channel of the Santa Ana River. Therefore, of the designated lands subject to urbanization pressures within

Table 7. Aggregate resource losses in designated areas in the Temescal Valley area. See Plate 7 for locations of Sectors.

DESIGNATED AREA	ORIGINAL AREA (acres)	REMAINING AREA (acres)	LEAD AGENCY JURISDICTION	LAND-USE CHANGE	YEAR OF CHANGE	RESOURCE LOSS (tons)
[1]Sector D-2	30	0	County of Riverside	industrial development	1989	2,590,000
[1]Sector D-4	71	71	County of Riverside	none		
[1]Sector D-6	78	78	County of Riverside	none		
[1]Sector E-14	55	55	County of Riverside	none		
[1]Sector E-17	19	19	City of Riverside	none		
[1]Sector E-19	96	96	City of Riverside	none		
[1]Sector E-20	44	[3]39	County of Riverside	none		
[1]Sector E-22	34	28	County of Riverside	single family homes	1980's	1,140,000
[1]Sector E-23	77	77	City of Riverside	none		
[1]Sector E-24	199	199	County of Riverside City of Riverside	none none		
[1]Sector H	142	142	County of Riverside	none		
[1]Sector I	324	117	County of Riverside City of Lake Elsinore	none housing tract approved but not yet built	[6]1989	41,320,000
[2]Sector A	226	[4]195	County of Riverside	housing tract	[6]1982	1,120,000
[2]Sector H	195	[3]173	County of Riverside	none		
[2]Sector O	29	0	City of Corona City of Corona	business development business development	[6]1980 [6]1985	10,300,000
[2]Sector P	108	17	City of Corona City of Corona	housing tract flood control channel	[6]1983 [6]1986	30,750,000
[2]Sector Q	471	[5]310	County of Riverside City of Corona	flood control channel none	1987	12,020,000
[2]Sector R	556	550	County of Riverside	waste treatment plant	[6]1989	510,000
[2]Sector S	910	837	County of Riverside	housing tract	[6]1979	26,500,000
TOTALS	3,664	3,003				126,520,000

[1] Sector designated in San Bernardino Production-Consumption Region (California Department of Conservation, 1986).

[2] Sector designated in Orange County-Temescal Valley Production-Consumption Region (California Department of Conservation, 1984)

[3] Original area included land that would not have been included under present land-use criteria.

[4] Original area included 21 acres of land that would not have been included under present land-use criteria. Resources in this area (2,350,000 tons) are not included in the "RESOURCE LOSS" column.

[5] Area was reduced by 100 acres due to depletion of aggregate pit. There are no resources in that area.

[6] Year lead agency approved development.

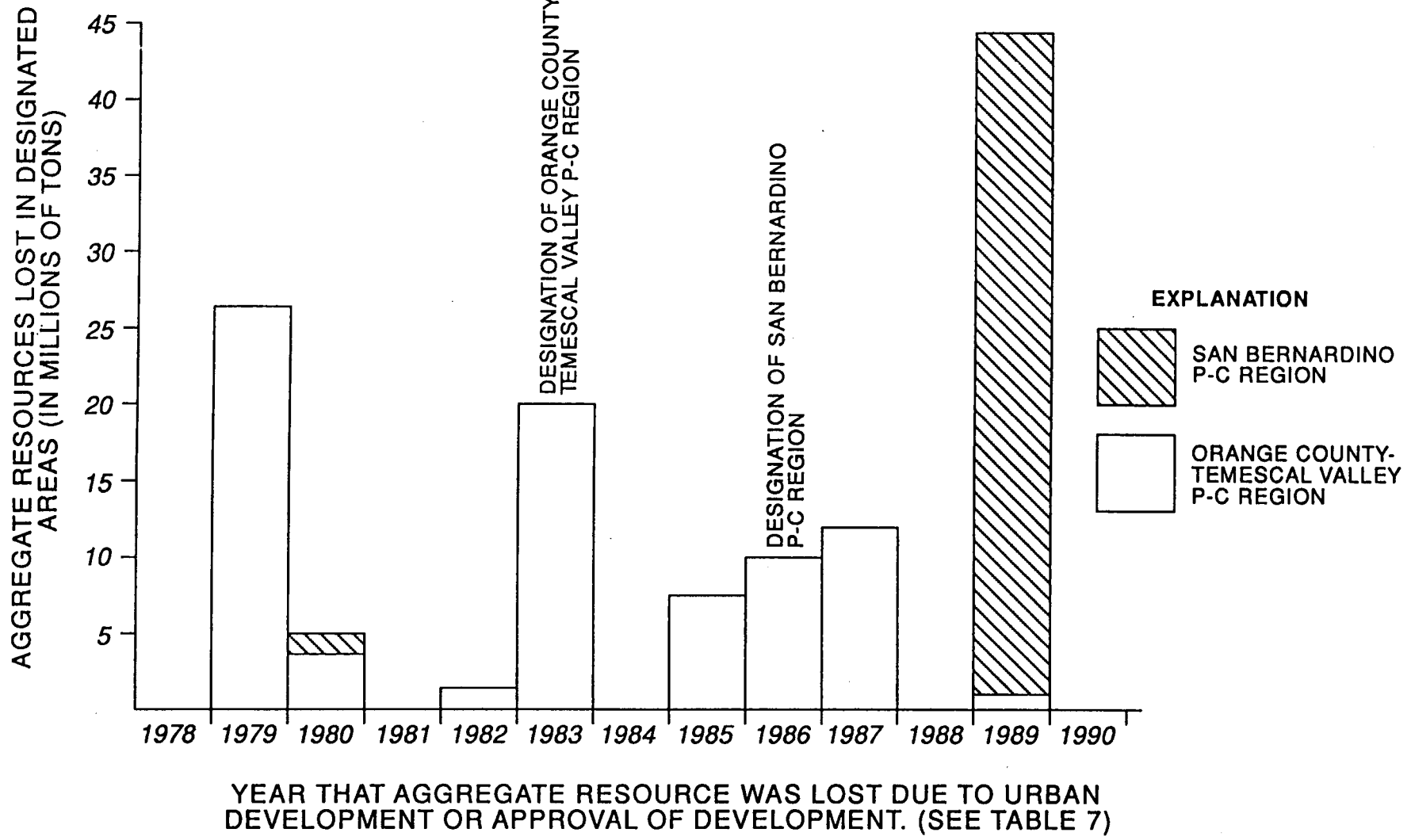


Figure 3. Loss of aggregate resources in designated areas in the Temescal Valley area.

cities, 71% have been developed. Approximately 148 acres, or 44%, of city lands have been approved for development since designation. In the remainder of the designated areas, outside of the city jurisdictions, less than one-tenth of the land has been developed. These patterns of land-use changes in designated areas is illustrated on Plate 7.

PART V - EVALUATION OF CONSTRUCTION AGGREGATE IN THE TEMESCAL VALLEY AREA

This section of the report contains an assessment of the total reserves of aggregate in the Temescal Valley area and addresses some of the factors which will effect the life span of those reserves.

AGGREGATE PRODUCTION IN THE TEMESCAL VALLEY AREA

At the time of this study the following thirteen companies had permitted mining operations producing aggregate in the Temescal Valley area:

All American Asphalt and Aggregates, Inc. - Corona pit
Santa Ana River Rock Company (Boral Resources, Inc.) - Eagle Valley quarry
CalMat Corporation - Corona pit
Chandler's Palos Verdes Sand and Gravel, Inc. - Glen Ivy pit
C.L. Pharris Sand and Gravel, Inc. - Dawson Canyon and Maitri pits
Elsinore Ready Mix, Inc. - McVicker Canyon pit
Fontana Paving, Inc. (Boral Resources, Inc.) - Corona plant
Mobil Sand Company - Mobil Sand pit
Owl Rock Products Company - Prado pit
Paul J. Hubbs Construction Company - Stringfellow and Harlow quarries
R.J. Noble Company - Coldwater Canyon pit
Werner Corporation - Foster Sand and Gravel pit
West Coast Sand and Gravel, Inc. - J.F.& T. Sand pit

In addition, the Riverside County Road Department operates four base aggregate pits - Markham Road, Christensen, Railroad Canyon Road, and Bundy Canyon Road pits.

All American Asphalt and Aggregates, Inc., Boral Resources, CalMat Corporation, and Paul J. Hubbs Construction Company produce crushed stone for use as construction aggregate. The other nine companies produce sand and gravel for use as construction aggregate. None of the companies have a market area that is restricted to the boundaries of the Temescal Valley area. All of the producers supply areas outside of the project area to a greater or lesser extent. The producers in this area have historically filled a large share of the Orange County construction aggregate demand. More recently there is a demand for construction aggregate in San Diego County that is being met in part by production from the Temescal Valley area. These demands outside of the area have and will continue to consume a large part of the total production in the area even though the growth of urban development within the area has been increasing.

Figure 4 shows the production of construction aggregate in the Temescal Valley area for the years 1960 to 1989. The historical aggregate production data for the study area was obtained from mining records of the U.S. Department of the Interior, U.S. Bureau of Mines and from the aggregate companies. The U.S. Bureau of Mines records are compiled from responses to voluntary questionnaires that are sent regularly to all known mining operators. Each producer is requested to divulge the production from each of his producing properties for the preceding year. The degree of accuracy of these statistics depends upon the completeness of the U.S. Bureau of Mines canvass and on the producer's response. The Division of Mines and Geology staff did not verify production data in the U.S. Bureau of Mines files.

The amount of aggregate produced in the Temescal Valley area has varied from just over 100,000 tons in 1960 to over 12,000,000 tons in 1989 (Figure 4). The tremendous increase in production in the area is due in large part to the demand of adjacent areas that have not been able to meet their own production needs. Orange County has been a large consumer of aggregate from the Temescal Valley area for nearly 20 years. The demand from Orange County has increased as the production within that area has fallen. The variations from year to year that interrupt the general increase in production may reflect changes in urban growth rates, the impact of major public works construction projects, or variations in the economy. For the years 1979 to 1989 the aggregate production rate for the Temescal Valley area averaged 7,530,000 tons per year.

AGGREGATE RESERVES IN THE TEMESCAL VALLEY AREA

Aggregate Resource Areas (see previous section) identified as Immediately Significant (IS) are important to the county because they contain resources which are presently permitted for mining and represent the current sources of construction aggregate in the Temescal Valley area as well as the most likely sources of construction aggregate in the near future. A more specific term for these permitted resources is reserves. In this report, reserves are resources of aggregate that have been determined to be acceptable for commercial use, that exist within properties owned or leased by aggregate producing companies, and for which permits have been granted to allow mining and processing of the material. Resources include reserves as well as all potentially usable aggregate materials that may be mined in the future, but for which no permit allowing mining has been granted, or for which marketability has not been established.

The reserves of construction aggregate in the Temescal Valley area have been determined based on the combined reserve

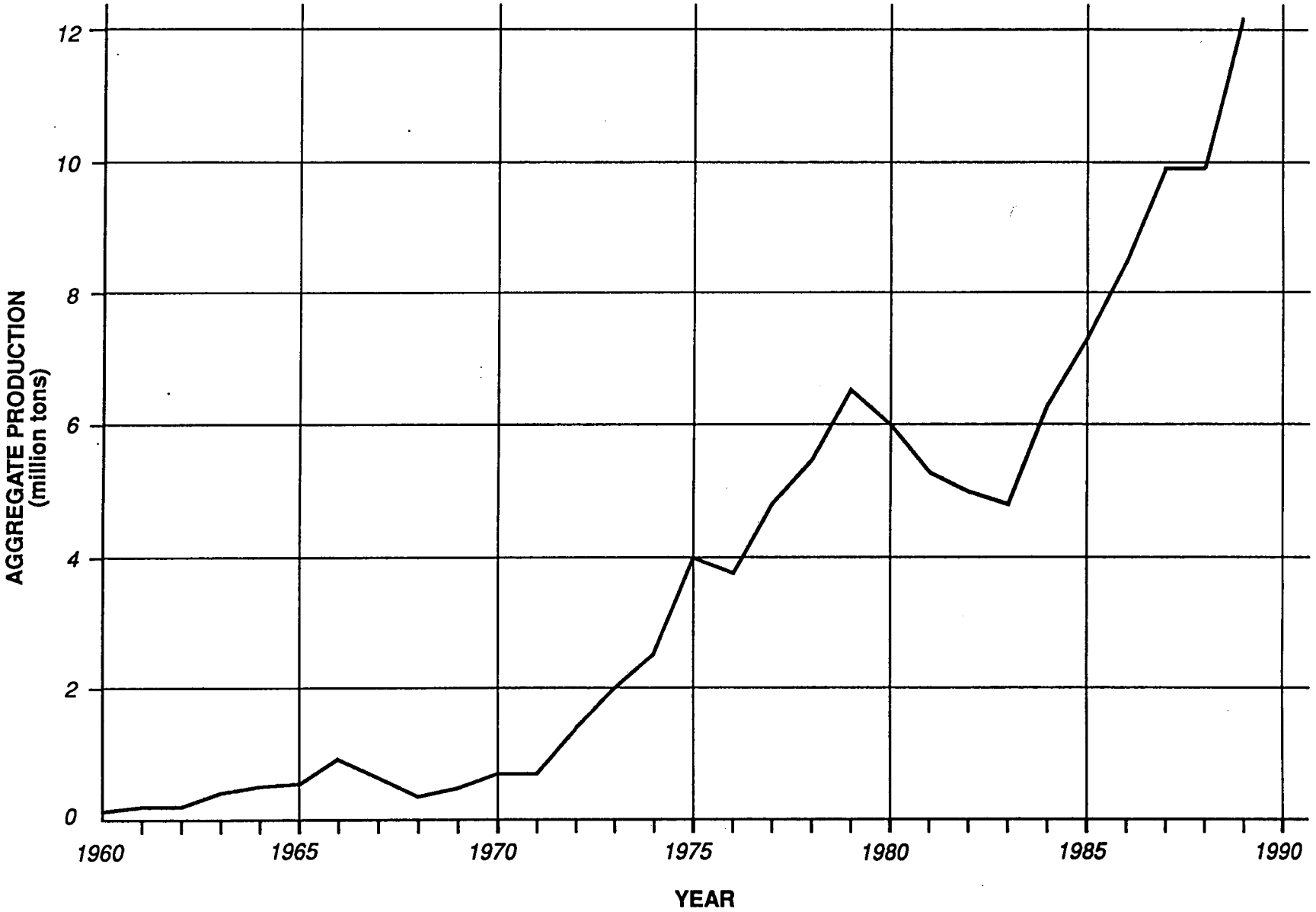


Figure 4. Aggregate production in the Temescal Valley area for the years 1960 to 1989. Includes both crushed stone and sand and gravel. Data from U.S. Bureau of Mines records and individual companies.

tonnages of the thirteen companies which currently have permitted aggregate mining operations in the area.

The construction aggregate reserves contained within the Temescal Valley area are 924,000,000 tons. Of this total, 623,000,000 tons are crushed stone reserves and 301,000,000 tons are sand and gravel reserves. This reserve base represents a starting point for planning purposes as of 1990. It is not a static number. The reserves will be progressively depleted by annual production from the operating mines within the area as they provide increasing tonnages of construction aggregate to meet the demand. If no new mining permits are granted the reserve base will ultimately be depleted. If aggregate exports increase, the reserve base will be depleted more quickly.

Minor additions to the reserve base may take place through natural geologic processes as sand and gravel is replenished at some of the instream operations. This may take place along Temescal Wash, Mayhew Canyon and Coldwater Canyon fans, and McVicker Canyon. The potential rate of material recharge at these sites is unknown, but will be minor compared to aggregate demand in the region.

To increase the reserve base significantly, the permitting of new mines should be given serious consideration by aggregate producers, local planners and decision makers. Advance planning for new mine sites can minimize incompatible adjacent land uses and environmental impacts can be more easily mitigated.

DEPLETION OF AGGREGATE RESERVES IN THE TEMESCAL VALLEY AREA

Figure 4 shows that the production of aggregate in the Temescal Valley area has greatly increased since 1960. During the decade from 1960 to 1970 there was more than a six-fold increase in aggregate production in the area. In the following two decades, from 1970 to 1989, there was more than a 17-fold increase. This tremendous increase in aggregate production in the Temescal Valley area may be attributed to the high urban growth rate of the Temescal Valley area and the increasing demand for aggregate in the adjacent areas of Orange County, San Diego County, and San Bernardino Valley. The increasing demand for aggregate in these adjacent, highly urbanized areas, has been difficult to meet with production in those areas. The supplies of aggregate in the production areas in Orange County and the San Bernardino Valley has been increasingly limited to the reserves on the properties of the producers. Resources that were once available on adjacent lands have often been covered by urban development. The expansion of production facilities and the permitting of more aggregate reserves to meet the increasing demand in Orange and San Diego counties and the San Bernardino Valley has instead taken place in the Temescal Valley area.

As demand for construction aggregate is largely dependent on the population of an area (Anderson and others, 1979), the increase in aggregate demand for the Temescal Valley area and the adjacent urban areas can be understood by looking at their population changes. During the last three decades, from 1960 to 1990 the population of the Temescal Valley area increased by 242% (Table 8). During the last decade alone the population increased by 76%, a total of almost 220,000 people. And in the adjacent counties of Orange and San Diego, the population increases during the 1980's were 20% and 34%, respectively. Although these percentages are less than for the Temescal Valley area, the total number of people added to those two counties was over 1,000,000.

Based on population projections made by the State of California (California Department of Finance, 1986) for Riverside, Orange, and San Diego counties, as shown on Table 9, the demand for construction aggregate will continue to grow. The projected population increase for Riverside County between the years 1990 and 2040 is 151%. It may be assumed from past population growth patterns that the Temescal Valley area will experience a similar increase. As Table 8 shows, the population growth rates of the Temescal Valley area and all of Riverside County have been similar since 1960, and were within a percentage point of each other over the last decade. The projected population growth rates for Orange and San Diego counties are 53% and 86%, respectively, over the same time period. Even though these population percentage increases for neighboring Orange and San Diego counties is less than that of Riverside County, the projected increase in number of people in the two adjacent counties is more than twice that for Riverside County.

The Temescal Valley area has became a major source area for construction aggregate for the eastern part of the Greater Los Angeles area. The amount of increase in construction aggregate production in the Temescal Valley area will depend both on the ability of the aggregate producers to increase plant outputs and on the increase of the reserve base by the opening of new production sites. Also, the continuing inability of adjacent market areas in Orange and San Diego counties to find new sources of aggregate other than the Temescal Valley area will increase the demand pressure on the area.

There are two options by which an increased demand for construction aggregate from the Temescal Valley area may be met. First, the existing aggregate operations can increase their production, if possible, to meet the increased demand (accelerating the depletion of presently permitted reserves). Second, new aggregate operations can be permitted to keep up with increasing demand. These options are not mutually exclusive and it is most likely that a combination of the two will occur over the long term.

Table 8. Population in the Temescal Valley area and Riverside County for the years 1960, 1970, 1980, and 1990.

AREA	YEARS			
	1960	1970	1980	1990
Temescal Valley Area	148,718*	219,168+	288,583**	508,542++
Riverside County Total	306,191*	456,916+	668,894**	1,170,413++

* From census tract counts compiled for 1960 by the Riverside County Planning Commission.

\+ From Riverside County 1970 Census Summary by Tract and City (Riverside County Department of Development, 1970).

** From Riverside County 1980 Planning News (Riverside County Planning Department, 1980).

++ From unpublished 1990 census tract data provided by the Riverside County Planning Department.

Table 9. Projected population increases, Riverside, Orange, and San Diego counties for the period 1990 to 2040.

COUNTY	YEAR			
	1990	2000	2020	2040
Riverside	1,170,413+	1,349,961++	1,941,125++	2,791,338**
Orange	2,326,200*	2,599,246++	3,043,973++	3,564,792**
San Diego	2,509,900*	2,852,513++	3,644,719++	4,656,938**

\+ Unpublished 1990 census tract data provided by Riverside County Planning Department.

* California Department of Finance, personal communication.

++ California Department of Finance, 1986.

** Estimated by continuing growth rates projected from the years 2000 to 2020.

For planning purposes, only the first option is predictable. It can be used to approximate the depletion date of the 1990 reserve base of 924,000,000 tons of construction aggregate, based on a starting depletion rate of 12,000,000 tons per year. If there is no increase in production over the next 50 years, the present reserves will last for 77 years (2066). If the increase in production continues as it has for the past 20 years, the present reserves will last for 39 years (2028). Figure 5 presents both of these depletion rate scenarios in graph form.

The expected longevity of aggregate reserves is based upon the assumption that the mining of the reserves will continue to be permitted until the reserves are depleted. The continued mining of the reserves is endangered in parts of the valley because of the encroachment of urban development. It is also possible that as urbanization continues to raise the value of undeveloped land in the area, some mining companies may choose to prematurely close and subdivide currently permitted properties.

AGGREGATE RESOURCES IN THE TEMESCAL VALLEY AREA

As stated previously, resources include reserves as well as all potentially usable aggregate materials that may be mined in the future, but for which no permit allowing mining has been granted, or for which marketability has not been established.

Aggregate resources in the Temescal Valley area have not been precisely quantified. However, an approximate minimum tonnage of resources can be calculated using Table 6. Table 6 identifies 17 Significant ARAs, 4 Highly Significant ARAs, and 11 Immediately Significant ARAs. The 18 Significant ARAs contain at least threshold value of aggregate (1.76 million tons) each. The 4 Highly Significant ARAs based on tonnage contain a minimum of ten times threshold value each. Thus the minimum tonnage within these ARAs is at least 58 times threshold value, or 102 million tons. This 102 million tons is in addition to the 924 million tons of reserves, for a total resource base of 1,026 million tons.

ALTERNATIVE SOURCES OF AGGREGATE

Other than the areas classified MRZ-2a or MRZ-2b for construction aggregate in the Temescal Valley many areas classified MRZ-3a exist. Many of the areas classified MRZ-3a might prove suitable as future sources of construction aggregate with further evaluation such as geologic mapping, drilling, and quality testing. The plutonic igneous rocks which occur throughout the area are all potential sources of crushed stone for use as construction aggregate. Large areas of these igneous rocks have a thick mantle of weathered material, often called

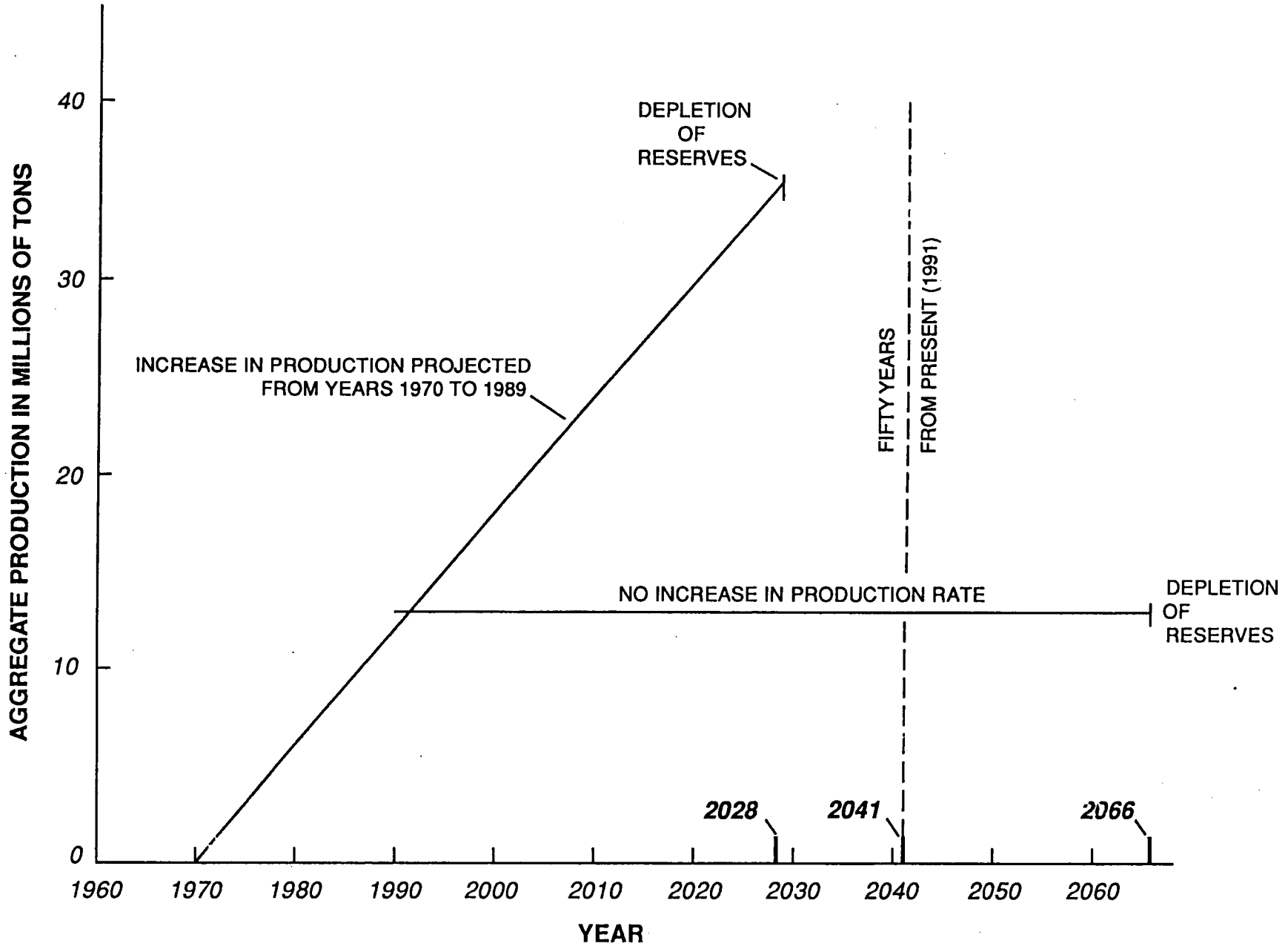


Figure 5. Projected depletion dates of aggregate reserves in the Temescal Valley area based on the increase in production from the years 1970 to 1989 and based on no increase in production.

"decomposed granite," which is a potential source of base aggregate. The alluvial deposits and unconsolidated sedimentary formations are potential sources of sand and gravel. These deposits would need to be evaluated on a site by site basis to establish material quality and quantity.

Alternative sources of construction aggregate for the Temescal Valley area also exist outside of the area. Aggregate production areas in the northern part of San Diego County and in the San Bernardino Valley could supply aggregate to the Temescal Valley area. But, since both of those areas now receive aggregate from the Temescal Valley area to make up deficits in their supply, it is unlikely that those areas would become sources for the Temescal Valley in the foreseeable future. Imports of construction aggregate from more distant sources by truck or rail is not yet economically feasible.

Another possible alternative source of construction aggregate is from recycling of used concrete material. In the southern part of Los Angeles County, far from aggregate production districts, concrete is recycled by mobil plants that produce base aggregates from demolition site material. Also, at large land fill sites in the Los Angeles area, selected waste material is recycled and used as base aggregate. It is estimated that less than 1% of the construction aggregate sold in the greater Los Angeles area is produced from recycled material (Walt Lukkarila, CalMat Corporation, personal communication). Recycled material cannot be used to make portland cement concrete aggregate; its highest use is for base aggregate, or, if the material is recycled from asphaltic concrete, as asphaltic aggregate. In the Temescal Valley area the potential of recycled aggregate is limited by the lack of source material. Recycling depends on the demolition of old structures for a source. Almost all construction in the Temescal Valley area is on open ground, with little removal of old structures. Even so, there is some recycling in the area. The All American Asphalt and Aggregates Company recycles asphaltic concrete for use as asphaltic aggregate. And, for a short time, a small plant known as Tru-Cast, located southeast of Corona, recycled concrete material for use as base aggregate.

CONCLUSIONS

Mineral resource evaluation of the Temescal Valley area indicates that two classes of mineral deposits are present, or likely to be present, in sufficient grade and tonnage to be of economic significance within the foreseeable future (50-year period). These are:

1. Construction aggregate deposits, including sand and gravel and crushed stone deposits.

2. Industrial minerals formed by diverse processes, including clay, specialty stone, specialty sand, and carbonate rock (limestone).

A total of 31 separate areas covering about 18-square miles of land in the Temescal Valley area are classified MRZ-2a or MRZ-2b (Areas of Identified Mineral Resource Significance) for construction aggregate and industrial mineral deposits (Plates 3A, 3B, 4A, and 4B). The measured area encompassed by each MRZ-2 is presented on Table 10. Note that some of these areas are a composite of more than one MRZ-2. Encompassed within these MRZ-2 areas are the 32 Aggregate Resource Areas (ARA's) listed on Table 6 and shown on Plates 5A and 5B.

A total of approximately 30-square miles of land in the Temescal Valley area is classified MRZ-3a or MRZ-3b for metallic and industrial mineral resources (Plates 2A, 2B, 3A, and 3B). This represents about 3% of the total land in the Temescal Valley area. Nearly the entire Temescal Valley area is classified MRZ-3a for construction aggregates.

In terms of immediate economic significance, both industrial minerals and construction aggregate are important mineral commodities in the Temescal Valley area.

METALLIC MINERAL RESOURCES

There are no areas in the Temescal Valley area classified MRZ-2a or MRZ-2b for metallic minerals. Nine areas covering about 5-square miles are classified MRZ-3a or MRZ-3b for metallic minerals. One area covering 0.04-square miles is classified MRZ-3a for manganese resources.

INDUSTRIAL MINERAL RESOURCES

Industrial mineral deposits present in economic or potentially economic concentrations in the Temescal Valley area

Table 10. Measured areas of land classified MRZ-2 in the Temescal Valley area.

Area	MRZ identification	Commodity	Sq. Mi.*
Corona clay deposit	$2a^{CK(1-1)}$ $2a^{SS(1-1)}$	Kaolinite clay Specialty sand	0.15 (0.15)**
Cajalco clay deposit	$2a^{CK(1-2)}$	Kaolinite clay	0.11
Liston and Corona clay pits area	$2a^{CK(1-3)}$	Kaolinite clay	0.15
Harrington clay pit	$2a^{CK(1-4)}$	Kaolinite clay	0.06
Temescal clay mine area	$2a^{CK(1-5)}$	Kaolinite clay	0.23
Pacific Clay Products property, Alberhill area	$2a^{CK(1-6)}$	Kaolinite clay	0.12
Alberhill area east of Lake Street	$2a^{CK(1-7)}$	Kaolinite clay	1.02
Pacific Clay Products property, Alberhill area	$2b^{CK(1-1)}$	Kaolinite clay	1.08
Dominguez clay/shale	$2a^{CC(1-1)}$	Common clay	0.02
Thomas clay deposit	$2a^{CC(1-2)}$	Common clay	0.02
Alberhill shale/clay	$2a^{CC(1-3)}$	Common clay	0.09
Stringfellow quarry area	$2a^{SR(1-1)}$ $2a^{CS(c-1)}$	Riprap Concrete aggregate	0.06 (0.06)**
Atkinson quarry area	$2a^{SR(1-2)}$ $2b^{CS(c-1)}$	Riprap Concrete aggregate	0.10 (0.10)**
Harlow quarry area	$2a^{SR(1-3)}$ $2a^{CS(c-3)}$	Riprap Concrete aggregate	0.11 (0.11)**
Crestmore quarry area	$2b^{L(1-1)}$ $2b^{CS(c-2)}$	Limestone Concrete aggregate	0.13 (0.05)**
All American Asphalt and Aggregates, Inc.- CalMat Corp. - Santa Ana River Rock Company area	$2a^{CS(c-2)}$	Concrete aggregate	1.87
Temescal rock quarry	$2a^{SG(1-1)}$	Roofing granules	(0.42)**
Temescal Wash area	$2b^{CS(c-3)}$	Concrete aggregate	0.34
Markham Road pit	$2a^{CS(b-1)}$	Base aggregate	0.02
Railroad Canyon Road pit	$2a^{CS(b-1)}$	Base aggregate	0.03
Bundy Canyon Road pit	$2a^{CS(b-1)}$	Base aggregate	0.08
Mobile Sand Company east of Temescal Wash	$2b^{CS(b-1)}$	Base aggregate	0.65
Properties south of Mayhew fan	$2b^{CS(b-2)}$	Base aggregate	0.43
Owl Rock Products Company, Prado pit area	$2a^{SG(c-1)}$	Concrete aggregate	0.30
Fontana Paving Company, Corona pit area	$2a^{SG(c-2)}$	Concrete aggregate	0.13
Upper Temescal Wash and Mayhew-Coldwater fan	$2a^{SG(c-3)}$	Concrete aggregate	2.32
McVicker Canyon	$2a^{SG(c-4)}$	Concrete aggregate	0.51
Mira Loma area	$2b^{SG(c-1)}$	Concrete aggregate	1.13
Santa Ana River and Lytle Creek	$2b^{SG(c-2)}$	Concrete aggregate	3.54
Lower Santa Ana River	$2b^{SG(c-3)}$	Concrete aggregate	0.90
Lower Temescal Wash near Corona	$2b^{SG(c-4)}$	Concrete aggregate	1.90
Rice Canyon	$2b^{SG(c-5)}$	Concrete aggregate	0.22
TOTAL AREA of Temescal Valley Area = 1,000 square miles.		TOTAL:	17.82***

* Areas are approximate.

** Area shown in parenthesis is included within the area shown immediately above, and is therefore not included in the column total.

*** Area classified MRZ-2 is approximately 1.8% of the total area of the Temescal Valley Area.

include: clay (kaolinite and common clay), specialty stone (riprap and roofing granules), specialty sand, and carbonate rock(limestone). At present, clay and specialty stone have the greatest economic importance among the industrial mineral resources known to occur within the county. Seven areas are classified MRZ-2a for kaolinite clay (1.84-square miles) and one area is classified MRZ-2b for kaolinite clay (1.08-square miles). Three areas are classified MRZ-2a for common clay (0.13-square miles). Four areas are classified MRZ-2a for specialty stone (three for riprap - 0.27-square miles - and one for roofing granules - 0.42-square miles). One area is classified MRZ-2a for specialty sand (0.15-square miles). One area is classified MRZ-2b for carbonate rock (0.13-square miles).

Within the areas classified as MRZ-2a for industrial minerals, there are eleven active mines - six clay mines, four specialty stone mines, and one specialty sand mine (which also produces clay):

1. Atkinson quarry (riprap and construction aggregate)
   Paul J. Hubbs Construction Company
2. Cajalco pit (kaolinite clay) -
   Paul J. Hubbs Construction Company
3. Corona clay deposit (specialty sand and kaolinite clay) -
   Corona Industrial Sand Company
4. Corona clay pit (kaolinite clay) -
   Riverside Cement Company
5. Harlow quarry (riprap and construction aggregate -
   Paul J. Hubbs Construction Company
6. Harrington pit (kaolinite clay) -
   United States Tile Company
7. Liston pit (kaolinite clay) -
   California Portland Cement Company
8. Pacific Clay Products, Inc. (kaolinite clay) -
   Pacific Clay Products, Inc.
9. Stringfellow quarry (riprap and construction aggregate)-
   Paul J. Hubbs Construction Company
10. Temescal clay mine (kaolinite clay) -
    Mission Clay Products Company
11. Temescal rock quarry (roofing granules) -
    Minnesota Mining and Manufacturing Company

CONSTRUCTION AGGREGATE RESOURCES

Twenty of the MRZ-2a and MRZ-2b areas listed on Table 10 are considered to be in the category of aggregate resources, as shown on Plates 4A and 4B. These twenty areas, classified MRZ-2a or MRZ-2b for construction aggregate resources, cover approximately 15-square miles of the Temescal Valley area. This represents approximately 1.5% percent of the study area. Of these areas classified MRZ-2a or MRZ-2b for construction aggregate,

approximately 8-square miles (0.8% of the study area) have been identified as Aggregate Resource Areas (ARA). An ARA is an area that has been classified MRZ-2a or MRZ-2b for construction aggregate by the State Geologist and is deemed to be available for mining based upon criteria for compatibility provided by the State Mining and Geology Board.

Eleven of the Aggregate Resource Areas contain active mines. There are nineteen active mines within those ARA's, fifteen of which are currently operated by thirteen different commercial companies, and four of which are operated by the Riverside County Road Department. All eleven deposits have been identified as Immediately Significant.

ARA-4 Stringfellow quarry (concrete aggregate)
Paul J. Hubbs Construction Company

ARA-15 Prado pit (concrete aggregate)
Owl Rock Products Company

ARA-21 Corona plant (concrete aggregate)
Fontana Paving, Inc.

ARA-22 Corona pit (concrete aggregate)
All American Asphalt and Aggregates, Inc.

Corona pit (concrete aggregate)
CalMat Corporation

Eagle Valley quarry (concrete aggregate)
Santa Ana River Rock Company - Boral Resources, Inc.

ARA-23 Harlow quarry (concrete aggregate)
Paul J. Hubbs Construction Company

ARA-24 Markham Road pit (base aggregate)
Riverside County Road Department

ARA-25 Mobil Sand pit (concrete aggregate)
Mobil Sand Company

Dawson Canyon pit (concrete aggregate)
C.L. Pharris Sand and Gravel, Inc.

ARA-27 Glen Ivy pit (concrete aggregate)
Chandler's Palos Verdes Sand and Gravel, Inc.

Maitri pit (concrete aggregate)
C.L. Pharris Sand and Gravel, Inc.

Coldwater Canyon pit (concrete aggregate)
R.J. Noble Company)

J.F. and T. Sand pit (concrete aggregate)
West Coast Sand and Gravel, Inc.

Foster Sand and Gravel pit (concrete aggregate) - Werner Corporation

ARA-30 McVicker Canyon pit (concrete aggregate)
Elsinore Ready Mix, Inc.

ARA-31 Railroad Canyon Road pit (base aggregate)
Riverside County Road Department
Christensen pit (base aggregate)
Riverside County Road Department
ARA-32 Bundy Canyon Road pit (base aggregate)
Riverside County Road Department

These eleven deposits total approximately 5-square miles or 0.5% of the Temescal Valley area.

Four Aggregate Resource Areas have been identified as Highly Significant because they each contain more than 17.6 million tons of construction aggregate resources. These areas total approximately 1-square mile or 0.1 percent of the Temescal Valley area. An additional seventeen Aggregate Resource Areas have been identified as Significant because they each contain between 1.76 million and 17.6 million tons of construction aggregate resources. These areas total approximately 1.5-square miles or 0.15 percent of the Temescal Valley area.

LIFE EXPECTANCY OF CONSTRUCTION AGGREGATE RESERVES

There are currently fifteen commercial and four noncommercial aggregate mining operations within the Temescal Valley area with combined reserves of 924,000,000 tons. Annual aggregate production in the Temescal Valley area has increased from approximately 100,000 tons to 12,200,000 tons from the years 1960 to 1989. The Temescal Valley area exports large amounts of construction aggregate to surrounding areas in Orange County, San Diego County, and other parts of Riverside County.

The State of California (California Department of Finance, 1986) has projected that the population for Riverside County by the year 2020 will be 166% of the 1990 population. A continued population growth at the same rate, from 2020 to the year 2040, would lead to a population of 238% of the 1990 population of the county. Past patterns of population growth indicate that the Temescal Valley area will experience very nearly the same growth rate as that of the county. This would mean an additional 700,000 people would be living in the area by the year 2040. If the adjacent areas of Orange and San Diego counties have population increases as projected, the rate of aggregate production within the Temescal Valley will probably be called upon to increase to meet part of the demands of these growing population centers. The Temescal Valley area has already tremendously increased its aggregate production to meet demands in these neighboring counties. Further increases in the reserve base of the area will be made more difficult if the pattern of urbanization of aggregate resources continues. The urban pressures in Temescal Valley have now become so great as to not

only make difficult any further expansion of production, but also to threaten the present producers. Unless the urban pressure in the Temescal Valley abates, some of the present aggregate mines may face premature closure. If this occurs, new, more distant resources will have to be utilized at greater cost - both environmental and economic.

The currently permitted reserves of construction aggregate in the Temescal Valley area may be depleted as early as the year 2028, thirty-nine years from the time of this study. The expected longevity of these reserves is based on the assumption that mining will continue to be permitted until the reserves are depleted. To increase the reserve base significantly, the permitting of new mines should be given serious consideration by aggregate producers, local planners and decision-makers. Planning for new mine sites can minimize incompatible adjacent land uses and environmental impacts can be more easily mitigated.

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APPENDIX A

MINE AND PROSPECT DESCRIPTIONS

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APPENDIX A - MINE AND PROSPECT DESCRIPTIONS

EXPLANATION

APPENDIX NO.	NAME/ U.S.B.M. NO.	LOCATION 7½' QUAD	COMMOD-ITY	MRZ ZONE	COMMENTS AND REFERENCES	MAP NO.

APPENDIX NO.: Numerical listing by commodity, of mines and prospects in the study area. Mines and prospects are listed by commodity in alphabetical order.

NAME/ U.S.B.M. NO.: Name or names of mines and prospects in the study area and the corresponding United States Bureau of Mines numbers.

LOCATION: United States Geological Survey 7 1/2' quadrangle sheet and the Township, Range and Section (all locations are in reference to the San Bernardino Base and Meridian).

COMMODITY: See commodity abbreviations on the following page.

MRZ ZONE: Mineral Resource Zone Classification of the area in which the mine or prospect is located. For an explanation of Mineral Resource Zone categories see page 16 of text. For an explanation of Mineral Resource Zone notation see Table 2, page 24 of text.

COMMENTS AND REFERENCES: Brief comments on location, history, production, development, geology, sample analyses and observations of the investigators. Most of the mines and prospects listed in this appendix have been visited by the investigators during this study. Observations of the investigators and information from references are often combined, and the references are not always cited within the text. All references used are listed at the conclusion of the text. Mines not visited are noted.

References are listed in this section by author and date. See APPENDIX C for full citation.

MAP NO.: Map number refers to the number assigned to the mine or prospect on the plates accompanying this study. Map numbers on the plates increase from north to south and from west to east.

APPENDIX A - COMMODITY ABBREVIATIONS

Construction Aggregates

Base Agg: Base Aggregate

Conc Agg: Concrete Aggregate

Industrial Minerals

Coal: Coal

Comm Clay: Common Clay

Dim Stn: Dimension Stone

Dumr: Dumortierite

Feld: Feldspar

Gyp: Gypsum (Gypsite)

Kaol Clay: Kaolinite Clay

Lmst: Limestone

Rip rap: Riprap

Roof Gran: Roofing Granules

Slt: Slate

SS: Specialty Sand

Si: Silica

Metals

Ag: Silver

As: Arsenic

Au: Gold

Cu: Copper

Fe: Iron

Mn: Manganese

Pb: Lead

Sb: Antimony

Sn: Tin

Zn: Zinc

Arsenic

APPENDIX NO.	NAME/ U.S.B.M. NO.	LOCATION 7½' QUAD	COMMOD-ITY	MRZ ZONE	COMMENTS AND REFERENCES	MAP NO.
1	Shining Star 0060650516	Lake Elsinore T6S R4W Center Sec 6	As Au	MRZ-4	Reportedly located on a town-lot on the north flank of a small flat-topped hill just north of Pottery Street at Lewis Street, in the northwest part of Elsinore. Surface workings have been destroyed and are no longer visible. Their exact location could not be determined for this investigation. The deposit is on a fault contact between slate and quartzite of the Bedford Canyon Formation, and the San Marcos gabbro. Aplitic dikes occur in the gabbro, and both rock types are weathered and decomposed near the surface, especially near the fault zone. The fault zone, about 3 feet wide, trends N20°W and dips about 68°SW as exposed in the shaft collar. Sugary siliceous material occupies the fault zone; parallel siliceous veins are reported in the adjacent rocks. The deposit contains gold and arsenopyrite, with traces of black manganese oxide. A sample representative of a 2-foot width of vein was reported to assay $4.80 in gold, 12 % arsenic, 7 % sulfur, and 18 % iron (Tucker and Sampson, 1929). In 1929 development consisted of two near-vertical shafts, 22 and 30 feet deep, and a 75-foot crosscut adit driven southward, its portal about 240 feet northwest of and 150 feet below the collar of the 30-foot shaft. The adit crossed five veins from 1 foot to 2 feet wide. In 1955 all workings were boarded but apparently uncaved. No production is reported; the property has been idle for many years. References: Engel and others, 1959, p. 61; Tucker and Sampson, 1929, p. 468-469; Tucker and Sampson, 1945, p. 123-124.	202

APPENDIX NO.	NAME/ U.S.B.M. NO.	LOCATION 7½' QUAD	COMMOD-ITY	MRZ ZONE	COMMENTS AND REFERENCES	MAP NO.
2	Alberhill Coal and Clay Company 0060650944	Lake Elsinore T5S R5W E 1/2 Sec 22 NW 1/4 and SW 1/4 Sec 23	Kaol Clay	MRZ-2a CK(i-7) p. 39	The Alberhill Coal and Clay Company mined coal and clay from pits on their property in the Alberhill area from about 1890 to 1956. From 1956 until recently Pacific Clay Products Company, Inc. operated the mine. The mine area is now being prepared for housing development. The clay pits are on the southwest slope of a northwest-trending hill that is bounded by Temescal Wash on the east and Lake Street on the west. A large area was underlain by kaolinite clays of the Silverado Formation. At the base of the formation was a residual clay formed by intense weathering of the underlying bedrock. The residual clays were used to make heavy clay products such as sewer pipe and face brick. The refractory clays lying above the residual clays were used to make fire brick, furnace lining, and pottery. The clay beds dip gently to the southwest and in places are capped by Quaternary alluvium. During the early years of operation, high-grade refractory clays were mined underground by hand methods. By 1955 all mining was by means of open pits. The several pits on the property were named for the dominant type of clay produced in each: the Douglas Pit West pit, Main Tunnel, Pink Mottle Nos. 1, 2, 3, and 4, Hill Blue Nos. 1 and 4, and No. 4 Plastic. References: Dietrich, 1928; Engel and others, 1959; California Department of Conservation, Division of Mines and Geology, 1982.	169
3	Alberhill Shale/Clay Mine	Lake Elsinore T5S R5W SW 1/4 Sec 13 SE 1/4 Sec 14	Comm Clay	MRZ-2a CC(i-3) p. 43	Located three miles north of Lake Elsinore in the hills east of Freeway I-15. Maruhachi Ceramics of America, Inc (MCA) has prospected this area and obtained a permit to mine clay from the metasedimentary rocks of the Bedford Canyon Formation. They plan to begin mining in 1991. The slate will be crushed and used for its clay-size particles in making roofing tile.	174

Clay

APPENDIX NO.	NAME/ U.S.B.M. NO.	LOCATION 7½' QUAD	COMMOD-ITY	MRZ ZONE	COMMENTS AND REFERENCES	MAP NO.
4	Cajalco Pit 0060650866	Corona South T4S R6W W 1/2 Sec 15	Kaol Clay	MRZ-2a CK(i-2) p. 37	Located south of Cajalco Road and east of Temescal Wash. The property was first developed and operated by Pacific Clay Products in the early 1930's. Hubbs Construction Company now mines clay for the manufacture of bricks. The clay beds consist of red mottled clay, bright brick-red clays, mottled grayish-green clays, and gray clays. The clays are at the base of the Paleocene Silverado Formation and were formed by the intense weathering of the underlying Bedford Canyon Formation. References: Buck, 1977, p. 15-22; Gray, 1961, p. 110.	95
5	Chocolate Drop 0060650869	Corona South T4S R6W SW 1/4 of NW 1/4 Sec 17	Comm Clay	MRZ-3b CK(i-1) p. 42	Located three miles southeast of Corona on the northwest corner of Boyd Avenue and Layton Street. The Liston Brick Company began mining diatomaceous clay shale of the Miocene Topanga Formation from this mine in 1948. The beds are dipping about 15° to the southwest in the mine area. The material was used in the manufacturing of common red brick. The mine has been abandoned for many years. References: Gray, 1961, p. 110.	81
6	Conduit Clay Placer 0060650893	Black Star Canyon Corona South T3S R7W SW 1/4 Sec 33 SE 1/4 Sec 32	Comm Clay	MRZ-3a CC(i-1) p. 43	Located about 3 1/2 miles west of Corona at the north end of the Santa Ana Mountains. Clay shales of the Upper Cretaceous Ladd Formation were prospected about 1900. Later prospecting by Riverside Cement Company revealed only sandy to very sandy clay shales. The property consists of two patented placer claims. The claims are idle. Reference: Gray, 1961, p. 110.	40
7	Corona Clay Deposit (Bedford Canyon Deposit) 0060650863	Corona South T4S R6W NW 1/4 Sec 16 NE 1/4 Sec 17	Kaol Clay	MRZ-2a CK(i-1) p. 36	Located five miles southeast of Corona north of the intersection of Freeway I-15 and Cajalco Road. Open pit measures about 700 feet by 400 feet, and is about 70 feet deep. Now being mined by Corona Industrial Sand Company for specialty sand. The clay fraction is separated and stockpiled for use by Pacific Clay Products, from whom the mine is leased.	82

APPENDIX NO.	NAME/ U.S.B.M. NO.	LOCATION 7½' QUAD	COMMOD-ITY	MRZ ZONE	COMMENTS AND REFERENCES	MAP NO.
8	Corona Clay Pit (includes Atlas Clay Pit)	Lake Mathews T4S R6W N 1/2 of SW 1/4 Sec 26	Kaol Clay	MRZ-2a CK(i-3) p. 37	Located about 8 miles southeast of Corona in the hills east of Temescal Wash. The Riverside Cement Company is intermittently mining kaolinite clay for use in making Type II Portland Cement at the Oro Grande facility. Some clay is sold to a brick company for making decorative brick. The property also includes the Atlas Clay Pit. The clay beds are part of the Paleocene Silverado Formation. The clay sequence, from bottom to top, is: a basal residual red mottled clay, as thick as 130 feet; a pisolitic "bone" clay, as thick as 30 feet; and a green clay shale and micaceous arkose. The clay beds are capped by about 80 feet of Pliocene-age alluvium of the Lake Mathews Formation. The clay beds dip 15° to 30° to the north in most exposures but are nearly flat-lying in others. References: Dietrich, 1928; Stauffer, 1946; Saul and others (1968), p. 83-85.	103
9	Corona Placer (Lord) 0060650923	Corona South T4S R7W NE 1/4 of NW 1/4 Sec 14	Kaol Clay	MRZ-3a CK(i-1) p. 40	Located about 3 1/2 miles southwest of Corona on the ridge northwest of Main Street Canyon. Property consists of one patented claim and six unpatented claims. Reported to have produced gray fire clay in 1905 (Gray, 1961). Thin discontinuous clay beds in the Paleocene Silverado Formation were mined by adits and open cuts. No workings could be found during a field visit. The Silverado Formation beds strike northwest and are vertical or dip steeply to the southwest. Mine has been idle probably since the early 1900's. Reference: Gray, 1961, p. 71.	64
10	De Guerre Mines 0060650815	Alberhill T5S R5W N 1/2 and SE 1/4 Sec 27	Kaol Clay	MRZ-2b CK(i-1) p. 40	Located about 1 1/4 miles southeast of Alberhill in low hills east of Lake Street (old Highway 71). Now part of the large holdings of Pacific Clay Products Company at Alberhill. In the 1960's the Pacific Clay Products Company exposed sandy clays of the upper part of the Silverado Formation. The material was used as a flux in making sewer pipe. Reference: Saul and others, (1968), p. 151.	170

Clay

APPENDIX NO.	NAME/ U.S.B.M. NO.	LOCATION 7½' QUAD	COMMOD-ITY	MRZ ZONE	COMMENTS AND REFERENCES	MAP NO.
11	Dominguez Clay/Shale Deposit 0060650945	Black Star Canyon T3S R7W N 1/2 Sec 32	Comm Clay	MRZ-2a CC(i-1) p. 43	Located at the north end of the Santa Ana Mountains, about 4 miles west of Corona. United States Tile Company mined common clay from shale of the Ladd Formation from 1980 until 1990. The mine is now closed. The clay, mined from a massive, calcareous shale bed, was blended with other materials to make clay roofing tile and patio tile. Reference: Joseph, 1985.	39
12	Eagle Canyon Clay Deposit 0060650920	Corona South T4S R7W SW 1/4 Sec 13	Kaol Clay	MRZ-3a CK(i-1) p. 40	Located about four miles south of Corona at the mouth of Eagle Canyon. Small test loads of clay were mined in 1944. No production since. Deposit consists of sandy clays and clay shales of the Paleocene Silverado Formation. Reference: Gray, 1961, p. 111.	68
13	Evans Shafts 0060650503	Lake Elsinore T5S R4W NE 1/4 Sec 31	Kaol Clay	MRZ-3a CK(i-2) p. 41	Located on the southeast side of Highway 71, 1/4 northeast of the Corona Freeway. Reportedly one or more incline shafts intersecting Paleocene Silverado clay beds beneath old alluvial cover. No evidence of workings can be seen. Reference: Stauffer, 1946.	196
14	Findley Feldspar Placer 0060650895	Corona South T3S R7W SE 1/4 Sec 33	Kaol Clay	MRZ-3a CK(i-1) p. 40	Located on west side of Wardlow Wash, about three miles west of Corona. Reported to be pods and stringers of mottled clays of the Silverado Formation striking N70°E and dipping 30°NW (Gray, 1961). Open cuts expose coarse sandstone with white clay matrix. Reportedly produced clay about 1920. Reference: Gray, 1961, p. 111.	43
15	Fire Clay Group 0060650908	Corona South T4S R7W SE 1/4 Sec 5	Comm Clay	MRZ-3a CC(i-1) p. 43	Located on north side of Mabey Canyon, about one mile from mouth, 3 1/2 miles southwest of Corona. Three patented placer claims. Shales of the Upper Cretaceous Ladd formation explored by adits and open cuts. One adit still visible. Sky Ranch Clay Company produced common clay from an open cut about 1950. Reference: Gray, 1961, p. 111.	47

APPENDIX NO.	NAME/ U.S.B.M. NO.	LOCATION 7½' QUAD	COMMOD-ITY	MRZ ZONE	COMMENTS AND REFERENCES	MAP NO.
16	Grapevine Clay Mine 0060650905	Corona South T4S R7W SW 1/4 Sec 4	Comm Clay	MRZ-3a CC(i-1) p. 43	Located on the south side of Mabey Canyon, about three miles southwest of Corona. Mining of clay shale began about 1900 and continued intermittently until 1956. The Sky Ranch Clay Company was the last to produce clay from this deposit. The mine is in a lens of clay shale in the Cretaceous Ladd Formation. The lens is about 3,500 feet long and as wide as 500 feet. The shale bed strikes N60°W and dips 65°NE. The clay was used to produce common clay products. Reference: Gray, 1961, p. 71-73 and 111.	50
17	Harrington Clay Pit (EMSCO) 0060650871	Lake Mathews T4S R6W NW 1/4 of SW 1/4 Sec 25	Kaol Clay	MRZ-2a CK(i-4) p. 38	Located about eight miles southeast of Corona on the east side of Temescal Wash. Residual and sedimentary clays of the Paleocene Silverado Formation have been mined here as early as 1905. The present operator, United States Tile Company, produces clay roofing tile from red clay and shale clay. The pit area covers more than 20 acres. References: Aubury, 1906, p. 223; Tucker and Sampson, 1925, p. 500; Dietrich, 1928, p. 169-171; Stauffer, 1946; Saul and others, (1968), p. 105-109; Buck, 1977, p. 38-53.	104
18	Hoist Pit 0060650812	Lake Elsinore T5S R5W NE 1/4 Sec 26	Kaol Clay	MRZ-2a CK(i-7) p. 39	Located 2 1/2 miles north of Lake Elsinore at the southeast end of a hill west of Walker Canyon. The residual clays of the Silverado Formation were mined from the Hoist Pit from 1887 to 1912. Sewer pipe and other heavy clay products were made from yellow and red and white mottled clay. The beds dip 5° to 15° to the SE. Pit is 600 feet by 200 feet and has a 60-foot back wall.	179
19	Jones Clay Deposit (Hoffman, Hoag Ranch) 0060650870	Corona South T4S R6W NW 1/4 Sec 19	Kaol Clay	MRZ-3a CK(i-1) p. 40	Located near the head of a small canyon between Joseph and Bedford Canyons, about four miles south of Corona. The greatest period of mining was reportedly about 1900 (Gray, 1961) when both coal and clay were taken from the Paleocene Silverado Formation. Kaolinite clay was mined from a gray clay bed about 6 to 8 feet thick. The coal occurred above and below the clay bed in seams up to 4 feet thick. Only dump material can be seen at the site. The property is now being developed for housing. References: Tucker and Sampson, 1929, p. 500-501; Gray, 1961, p. 73.	87

APPENDIX NO.	NAME/ U.S.B.M. NO.	LOCATION 7½' QUAD	COMMOD-ITY	MRZ ZONE	COMMENTS AND REFERENCES	MAP NO.
20	Kroonen Clay Deposit 0060650909	Corona South T4S R7W S 1/2 Sec 4 NE 1/4 Sec 9 NW 1/4 Sec 10	Kaol Clay	MRZ-3a CK(i-1) p. 40	Located along an unnamed canyon between Mabey and Tin Mine Canyons, about 3 miles southwest of Corona. Eight patented placer claims were active about 1900 to 1920. Kaolinite clay was mined from the Silverado Formation. Only small prospect cuts were noted in the field. Beds of the Silverado Formation striking N5°W and dipping 72°W on small ridge top. Beds generally contorted and faulted. Reference: Gray, 1961, p. 74.	53
21	Liston Clay Pit (Park Claim)	Lake Mathews T4S R6W E 1/2 of NW 1/4 Sec 26	Kaol Clay	MRZ-2a CK(i-3) p. 37	Located 8 miles southeast of Corona, in the hills east of Temescal Wash. California Portland Cement Company mines kaolinite clay from beds of the Silverado Formation for use in making cement at the Colton Cement Plant. The company bought the property from the Liston Brick Company in 1971. The clay beds are a maximum total thickness of 75 feet at the south end of the property and pinch to 0 feet at the center of the property. The clay beds are predominantly a red mottled residual clay that has formed by weathering of the underlying Bedford Canyon Formation. A 2- to 5-foot thick pisolitic clay bed overlying the residual clay has been mined out. The clay is also mined for use in mixing with waste sludge to make compost.	102
22	McClintock Clay Pit 0060650904	Corona South T4S R7W NW 1/4 of SE 1/4 Sec 4	Kaol Clay	MRZ-3a CK(i-1) p. 40	Located on north side of Mabey Canyon near the mouth. Silverado Formation prospected for kaolinite clay beds in the 1950's. Small production of red mottled clay for sewer pipe manufacture reported by Gray (1961). Idle since the 1950's. Property now planned for housing. Reference: Gray, 1961, p. 112.	49
23	McKnight Clay Deposit 0060650913	Corona South T4S R7W NE 1/4 Sec 9 SW 1/4 Sec 3 NW 1/4 Sec 10	Kaol Clay	MRZ-3a CK(i-1) p. 40	Three patented claims and one unpatented claim located between Mabey and Tin Mine Canyons. Mined for kaolinite clays beginning in the 1890's. The mine closed in the 1930's but produced small quantities of red-burning clay as recently as 1952 (Gray, 1961). The mine was worked principally by underground methods but some surface quarrying was done. Quarry is 60 to 80 feet deep and about 200 by 400 feet on the sides. Mining of clay beds in the Silverado Formation included an upper layer, 60 feet thick, of massive deep red beds, and a lower layer of pale gray pisolitic fire clay, 30 feet thick. The clay beds are within sandstone and conglomerate beds. Lignite beds also occur with the clays and were the first mined material here in the 1880's. References: Dietrich, 1928, p. 179; Sutherland, 1935, p. 75-79; Gray, 1961, p. 74-77.	54

APPENDIX NO.	NAME/ U.S.B.M. NO.	LOCATION 7½' QUAD	COMMOD-ITY	MRZ ZONE	COMMENTS AND REFERENCES	MAP NO.
24	Middlesworth Clay Deposit (Brown Star Claims) 0060650919	Corona South T4S R7W NW 1/4 Sec 14 SW 1/4 Sec 11 NE 1/4 Sec 15	Kaol Clay	MRZ-3a CK(i-1) p. 40	Located midway between Main Street and Hagador Canyons, about 3 1/2 miles south of Corona. Two types of clay beds in the Silverado Formation were exposed by cuts and adits in the early 1900's. A sandy red clay bed about 20 to 30 feet thick is overlain by greenish-brown pisolitic clay about 2 to 6 feet thick. There was intermittent production from these clays from 1918 to 1937. In 1943 Kaiser Steel Corporation prospected on the property for high-alumina clays for use in steel manufacture. Idle since. Some cuts still visible. References: Tucker and Sampson, 1945, p. 161; Gray, 1961, p. 77-78.	63
25	Morton Clay Deposit (Elsinore Clay Company) 0060650502	Lake Elsinore T5S R4W NE 1/4 Sec 31	Kaol Clay	MRZ-3a CK(i-2) p. 40	Located one mile north of Lake Elsinore. Kaolinite clays were exposed by open pits in the 1920's. Ten to twenty feet of soil (old alluvium) covers beds of carbonaceous claystone and gray to buff clay shale of the Paleocene Silverado Formation. The clay beds dip about 15° to the SW. From about 1930 to the 1960's or 1970's the Elsinore Clay Company mined clay from 5 pits on the property for use in making common brick. References: Tucker and Sampson, 1929, p.501; Sampson, 1935, p. 520; Tucker and Sampson, 1945, p. 161; Stauffer, 1946; Engel and others, 1959, p. 92 and 130; Saul and others (1968), p. 93-94.	195
26	Murphy Clay Pit (Tropico Pit) 0060650882	Lake Mathews T4S R6W NW 1/4 Sec 35 SW 1/4 Sec 26	Kaol Clay	MRZ-3a CK(i-2) p. 41	Located on the bluff east of Temescal Wash, about 8 miles southeast of Corona. The Pacific Clay Products Company reportedly mined clay from a side-hill cut here in 1945 (Tucker and Sampson, 1945). Thirty feet of red mottled residual kaolinite clays are overlain by about 20 feet of alluvium of Late Tertiary or Quaternary age. The clay bed is considered to be part of the Silverado Formation of Paleocene age. The clay was formed by intense weathering of the underlying altered argillites of the Bedford Canyon Formation, presumably during the Paleocene epoch. The mine has been idle for many years. References: Tucker and Sampson, 1945, p. 162; Buck, 1977, p. 27-38.	105

APPENDIX NO.	NAME/ U.S.B.M. NO.	LOCATION 7½' QUAD	COMMOD-ITY	MRZ ZONE	COMMENTS AND REFERENCES	MAP NO.
27	Oak Park Clay Prospect 0060650565	Alberhill T5S R5W NE 1/4 Sec 18	Kaol Clay	MRZ-3b CK(i-1) p. 42	Located about 7 miles northwest of Lake Elsinore on the southwest side of the Corona Freeway. Stauffer (1946) reported an abandoned adit in fossiliferous clays. Engel and others (1959) reported two 60- by 15-foot trenches 15 feet deep, exposing greenish-gray, waxy, clayey siltstone. The clay beds here are likely part of the Silverado Formation which is buried by alluvium. This prospect has been idle since 1945. References: Stauffer, 1946; Engel and others, 1959, p. 131; Saul and others, (1968), p. 143.	166
28	Owens-Illinois Glass Company (Corona Silica Sand Deposit) 0060650868	Corona South T4S R6W NE 1/4 Sec 21 SE 1/4 Sec 16	Comm Clay	MRZ-3a CK(i-2) p. 41	Located about 6 miles southeast of Corona on the east side of the Corona Freeway. Glass sand was mined here first by the P.J. Weisel Industrial Sand Company from the 1920's to 1945. The Owens-Illinois Glass Company operated the quarry from 1945 to (?). The waste material from the glass sand production contains a high clay percentage and has been used for making common bricks and sewer pipe. Presently, the Higgins Brick and Tile Company is using clay material from the old tailings pile to make brick. Reference: Gray, 1961, p. 97-101.	86
29	Pacific Clay Products, Inc., De Guerre Mines 0060650815	Alberhill T5S R5W parts of Secs 22, 26, 27, and 28 all of Sec 21	Kaol Clay	MRZ-2a CK(i-6) p. 39 MRZ-2b CK(i-1) p. 40	Located about three miles northwest of Lake Elsinore, west of Lake Street. Pacific Clay Products, Inc. mines kaolinite clays from residual and sedimentary clay beds of the Silverado Formation. The company uses the clay to make fire brick, face brick, and paving brick. The present property is an aggregation of several properties once owned and operated by different clay companies. Clay pits in northeastern part of the property were mined as early as 1885. Some companies that mined clay on this property were Los Angeles Pressed Brick Company, California Clay Manufacturing Company, Hoff Ganister Fire Brick Company, Los Angeles Brick and Clay Products Company, Gladding McBean Company, Interpace, and International Pipe and Ceramics Corporation. The general sequence of clays within the Silverado Formation clay beds, from bottom to top, is: a basal yellow to red mottled clay, 10 to 25 feet thick; a variegated pisolitic clay, 5 to 15 feet thick; a 4 to 15 foot-thick white to dark gray pisolitic "bone" clay; and a pink, red, and gray sandy sedimentary clay, 4 to 30 feet thick. This sequence of clays is overlain by 15 to 50 feet of clay shales and sandy clays of the Silverado Formation and a capping of Quaternary alluvium which is as thick as 50 feet. References: Aubury, 1906, p. 223; Merrill and Waring, 1919, p. 574; Boalich and others, 1920, p. 86-89; Dietrich, 1928, p. 171-174; Tucker and Sampson, 1929, p. 500; Sutherland, 1935, p. 70; Engel and others, 1959, p. 92-93.	167

APPENDIX NO.	NAME/ U.S.B.M. NO.	LOCATION 7½' QUAD	COMMOD-ITY	MRZ ZONE	COMMENTS AND REFERENCES	MAP NO.
30	Peterson's Claim 0060650879	Corona South T4S R6W N 1/2 Sec 29	Kaol Clay	MRZ-3a CK(i-1) p. 40	Reportedly located on the ridge between Bedford and McBride Canyons, about 5 1/2 miles south of Corona. Small amounts of kaolinite clay were mined by the Elsinore Clay Company in about 1930. There has been no clay mining on the property since. Red mottled clay and white to gray pisolitic clay of the Silverado Formation were reported by Gray (1961). The Silverado Formation beds here are faulted blocks within the Elsinore Fault Zone. Reference: Gray, 1961, p. 112.	90
31	Sievert Clay Prospect 0060650819	Wildomar T6S R5W SE 1/4 Sec 36	Kaol Clay	MRZ-3a CK(i-3) p. 42	Located at an elevation of 3,400 feet in the Santa Ana Mountains, at Elsinore Peak, about 5 miles southeast of Ortega Highway. Clay beds of the Paleocene Silverado Formation overlie granodiorite rocks, and are capped in places by Santa Rosa Basalt. Some of the clays may be residual clays formed by the weathering of the granodiorite (Engel and others, 1959). Prospect cuts are located on the north side of the hill. Reference: Engel and others, 1959, p. 131	239
32	Sky Ranch Clay Mine, East Pit 0060650903	Corona South T4S R7W NE 1/4 of SW 1/4 of NW 1/4 Sec 4	Comm Clay	MRZ-3a CC(i-1) p. 43	Quarry located on the north side of Wardlow Canyon, about 3 1/2 miles southwest of Corona. Gray shale of the Upper Cretaceous Ladd Formation was mined for common clay from a quarry about 200 feet by 50 feet with an 80-foot-high back wall. The floor of the quarry is 60 feet above the bottom of the wash. Several tens-of-thousands of tons of clay shale were mined by the Sky Ranch Clay Company from 1951 to 1956, for use in making heavy clay products at a plant in Corona. The clay shale beds strike generally east-west and dip about 30° north. Reference: Gray, 1961, p. 78-80.	46
33	Sky Ranch Clay Mine, West Pit	Corona South T4S R7W NW 1/4 of SW 1/4 of NW 1/4 Sec 4; S 1/2 of NE 1/4 Sec 5	Comm Clay	MRZ-3a CC(i-1) p. 43	Located on the north side of Wardlow Canyon, about 1/4-mile up-canyon from the Sky Ranch Clay Mine, east pit. Quarry in gray clay shale of the Upper Cretaceous Ladd Formation. First mined in 1956 by the Sky Ranch Clay Company for common clay for use in making heavy clay products. Quarry purchased in 1957 by Pacific Clay Products Company and mined until 1960. Ladd formation shale zone is about 500 feet wide and 1,500 feet long, trending north-south. Reference: Gray, 1961, p. 78-80; Saul and others, (1968), p. 180-181.	45

APPENDIX NO.	NAME/ U.S.B.M. NO.	LOCATION 7½' QUAD	COMMOD-ITY	MRZ ZONE	COMMENTS AND REFERENCES	MAP NO.
34	South Clay Pit (Corosil Mine) 0060651001	Lake Mathews T4S R6W SE 1/4 of SW 1/4 Sec 35	Kaol Clay	MRZ-2a CK(i-5) p. 38	Located about 8 1/2 miles southeast of Corona on a low hill on the east side of the Corona Freeway (I-15). About 1,000 feet south of the Temescal Clay Mine. Kaolinite clays of the Silverado Formation and underlying residual clays were mined here some years ago by Pacific Clay Product, Inc.. Pit about 300 feet by 300 feet and 30 to 40 feet in maximum depth. Reference: Tucker and Sampson, 1945, p. 162.	107
35	Susie Placer (McVicar Pit) 0060650907	Corona South T4S R7W NW 1/4 Sec 4	Kaol Clay	MRZ-3a CK(i-1) p. 40	One patented placer claim located on top of ridge, north of Mabey Canyon, about 3 1/2 miles southwest of Corona. Quarry area about 250 feet by 350 feet. Red mottled and white and gray pisolitic clays of the Paleocene Silverado Formation mined for use in manufacture of sewer pipe. Beds generally striking east-west and dipping south about 35°. First mined about 1900 for clay plant in Los Angeles. Mined in early 1950's for Mission Clay Products in Olive and from 1954 to 1957 by Sky Ranch Clay Company. References: Gray, 1961, p. 78-80; Saul and others, (1968), p. 166-167.	48
36	Switzer Clay Deposit 0060650910	Corona South T4S R7W NE 1/4 Sec 5	Comm Clay	MRZ-3a CC(i-1) p. 43	Located about 3 1/2 miles southwest of Corona, on the west side of a small ridge. A small amount of sandy, white clay was mined from an open cut in about 1945 by the Sky Ranch Clay Company. Clay bed, 2 to 5 feet thick, strikes N50°W and dips 40°NE. The clay bed has been mapped as part of the Upper Cretaceous Ladd Formation (Gray, 1961 and Weber, 1977), but could be part of the Silverado Formation. The sandy, white clay is much like the clays of the Silverado Formation in this area. References: Gray, 1961, p. 113	44
37	Temescal Clay Mine (Temescal Land and Water Company Clay Pit) 0060650881	Lake Mathews T4S R6W NE 1/4 of SW 1/4 Sec 35	Kaol Clay	MRZ-2a CK(i-5) p. 38	Located about 8 1/2 miles southeast of Corona on the north end of a hill between Temescal Wash and the Corona Freeway. The Mission Clay Products Company is mining kaolinite clay from beds of the Silverado Formation for use in making clay sewer pipe at their plant 3/4-mile to the west. The deposit was first prospected in 1926 (Dietrich, 1928). Samples taken at that time indicated that the red mottled clay would be suitable for making face brick and roofing tile. About 1965, Mission Clay Products acquired the property. The clays are reportedly only residual clays; there are no pisolitic clays. References: Dietrich, 1928, p. 181; Stauffer, 1946.	106

APPENDIX NO.	NAME/ U.S.B.M. NO.	LOCATION 7½' QUAD	COMMOD-ITY	MRZ ZONE	COMMENTS AND REFERENCES	MAP NO.
38	Thomas Clay Deposit 0060650894	Black Star Canyon Corona South T3S R7W W 1/2 Sec 33	Comm Clay	MRZ-2a CC(i-2) p. 43	The mine was located on both sides of an unnamed canyon west of Wardlow Wash, about 3 1/2 miles west of Corona. The area is now developed in housing. Gladding McBean and Company began mining clay shale here from massive calcareous shales of the Silverado Formation in 1953. Pacific Clay Products, Inc. took over the property in 1980 and extracted common clay until the mine closed. The shale beds trend N70°W and dipped steeply eastward or vertically. References: Gray, 1961, p. 80-81; Joseph, 1982.	42
39	Unknown Name Clay Prospect	Corona South T4S R6W NE 1/4 Sec 16	Kaol Clay	MRZ-3a CK(i-1) p. 40	Small prospect pit located on west side of Wardlow Wash, about 3 miles west of Corona. Exposure of gray-white and reddish-brown sandy clays of the Paleocene-age Silverado Formation. Beds strike N60°W and dip NE 45° to 60°. Reference: Gray, 1961, p. 113.	51
40	Unknown Name Clay Prospect	Corona South T4S R6W NE 1/4 Sec 16	Comm Clay	MRZ-4	Located on the northeast side of Temescal wash, about 4 1/2 miles southeast of Corona. Small borrow pits reported by Gray (1961) for the extraction of clayey soil for use in making bricks. Liston Brick Company mined the common clay here in the 1950's. References: Gray, 1961, p. 113; Saul and others, (1968), p. 176.	83
41	Unknown Name Clay Prospect	Lake Elsinore T5S R5W SE 1/4 Sec 14	Kaol Clay	MRZ-4	Prospect located on south side of hill about 3/4-mile northeast of the Corona Freeway. Red and white mottled residual clays exposed in 200-foot diameter area. Reported by Engel and others (1959) as prospected by an adit driven northward into hill. Reference: Engel and others, 1959, p. 130.	173
42	Wildomar Kaolin Deposit 0060650433	Murrieta T7S R3W SW 1/4 of NW 1/4 of NW 1/4 Sec 7	Kaol Clay	MRZ-4	Located two miles northwest of Murrieta, just east of Chaney Hill. A sliver of sandstone and conglomerate along the Wildomar Fault Zone contains a bed of ash which was mined for clay. The deposit was opened prior to 1925 and considerable amounts of clay were produced before 1935. Intermittent mining took place until 1961. Idle since 1961. A volcanic ash fall, correlated with 0.7 million-year-old Bishop Tuff (Kennedy 1977), was mined for its kaolin content and used as a filler in various	244

APPENDIX NO.	NAME/ U.S.B.M. NO.	LOCATION 7½' QUAD	COMMOD-ITY	MRZ ZONE	COMMENTS AND REFERENCES	MAP NO.
					clay product mixtures. Workings consist of a 200-foot-long cut 50 feet wide and as much as 25 feet deep and a reported shaft, now obscured. References: Aubury, 1906, p. 222; Dietrich, 1928, p. 180; Tucker and Sampson, 1929, p. 502; Sutherland, 1935, p. 72-75; Stauffer, 1946; Mann, 1955, p. 19; Kennedy, 1977, p. 5; Saul and others, (1968), p. 182-183.	
43	Alberhill Coal and Clay Company Coal Deposit (see also under Clay) 0060650944	Alberhill T5S R5W NE 1/4 Sec 22	Coal	(see Clay Section)	The Alberhill Coal and Clay Company property was located about 4 miles northwest of Lake Elsinore on a hill between Walker Canyon and old Highway 71 (Lake Street). A layer of coal as thick as 10 feet, interbedded with the clays, was mined from about 1885 to 1900 and sold locally. The coal was mined by the room and pillar method with hand tools. The coal was a soft lignite with about a 12% ash content. Coal was not mined for commercial use after about 1900. References: Hanks, 1884, p. 117; Goodyear, 1888a, p. 174-179; Engel and others, 1959, p.97, 133.	169
44	Castillo's Prospect 0060651103	Corona South T4S R6W NW 1/4 Sec 29	Coal	(area zoned for clay not coal)	Located on the east bank of Bedford Canyon, about 5 1/2 miles southeast of Corona. Coal was first noted at this location on a U.S. Bureau of Land Management survey map dated 1892 (Gray, 1961). Minor amounts of lignite are associated with clay beds of the Silverado Formation. Reference: Gray, 1961, p. 114	88
45	Jones Clay Deposit (Hoffman, Hoag Ranch) (see also under clay) 0060650870	Corona South T4S R6W NW 1/4 Sec 19	Coal	(area zoned for clay not coal)	The Jones clay deposit is located near the head of a small canyon, about one mile northwest of Bedford Canyon. Coal was mined underground from this deposit about 1900. As reported by Tucker and Sampson (1929), coal seams as thick as 4 feet occurred at the top and bottom of the clay beds. The beds are part of the Paleocene-age Silverado Formation. The area is now being developed for housing. References: Tucker and Sampson, 1929, p. 500-501; Gray, 1961, p. 73.	87

APPENDIX NO.	NAME/ U.S.B.M. NO.	LOCATION 7½' QUAD	COMMOD-ITY	MRZ ZONE	COMMENTS AND REFERENCES	MAP NO.
46	McKnight Clay Deposit (see also under Clay) 0060650913	Corona South T4S R7W NW 1/4 Sec 9 SW 1/4 Sec 3 NW 1/4 Sec 10	Coal	(area zoned for clay not coal)	The McKnight clay deposit is located on a ridge between Mabey and Tin mine Canyons, about 3 miles southwest of Corona. Coal was the first discovered commodity at the McKnight Mine in 1885 (Goodyear, 1888c). A bed of clean, soft coal as thick as 4 feet was reported to have been mined about 50 feet below the surface. The bed pinched out to a few inches farther down. The coal bed was associated with the clay beds of the Silverado Formation. References: Goodyear, 1888c, p. 505; Gray, 1961, p. 74-77, 114.	54
47	Unknown name Coal Prospect	Corona South T4S R7W SW 1/4 of NW 1/4 Sec 10	Coal	(area zoned for clay not coal)	Prospect located on the north side of Tin Mine Canyon, about 3 1/2 miles southwest of Corona. Reportedly lignite was mined from an adit here sometime before 1907 (Gray, 1961). The coal occurs as a one-foot thick bed in the Silverado Formation, trending NW and dipping about 80°NE. No workings were seen. Reference: Gray, 1961, p. 114.	60

Construction Aggregates

Base Aggregate

APPENDIX NO.	NAME/ U.S.B.M. NO.	LOCATION 7½' QUAD	COMMOD-ITY	MRZ ZONE	COMMENTS AND REFERENCES	MAP NO.
48	Borrow Pit	Prado Dam T3S R7W E 1/2 Sec 18	Base Agg	MRZ-3a SG(c-1) p. 67	A small borrow pit in sand of the Puente Formation. Probably used in road construction.	13
49	Borrow Pit	Corona North T3S R7W Sec 28	Base Agg	MRZ-3a SG(c-1) p. 67	Sand and gravel was mined here during 1939-40 for highway construction and for use in Prado Dam.	15
50	Borrow Pit	Corona North T3S R6W NW 1/4 Sec 21	Base Agg	MRZ-3a CS(c-2) p. 61	A small borrow pit in decomposed granite. Nothing known.	18
51	Borrow Pit	Riverside West T2S R6W NE 1/4 Sec 22	Base Agg	MRZ-3a CS(c-1) p. 61	A small pit in weathered gabbro. Northwest side of hill, east of Cedar Street. Nothing known.	23
52	Borrow Pit	Riverside West T2S R6W SW 1/4 Sec 14	Base Agg	MRZ-3a CS(c-1) p. 61	A small borrow pit in metamorphic rocks. Nothing known.	24
53	Borrow Pits	Riverside West T2S R5W NE 1/4 Sec 31 NW 1/4 Sec 32	Base Agg	MRZ-3a CS(c-2) p. 61	A group of borrow pits north of Riverside Municipal Airport. Used by E.L. Yeager Construction Company for Class III base. No longer active.	30
54	Borrow Pit	Riverside West T2S R5W SW 1/4 Sec 32	Base Agg	MRZ-3a CS(c-2) p. 61	Located on the south side of Central Avenue. Weathered granodiorite probably road material.	31
55	Borrow Pit	Riverside West T3S R6W NE 1/4 Sec 25	Base Agg	MRZ-3a CS(c-2) p. 61	Located on the southwest side of La Sierra Avenue. Weathered granodiorite probably used for road material.	35
56	Borrow Pit	Riverside West T3S R6W SE 1/4 Sec 25	Base Agg	MRZ-3a CS(c-2) p. 61	Located on the east side of La Sierra Avenue. Nothing known.	36

Construction Aggregates

Base Aggregate

APPENDIX NO.	NAME/ U.S.B.M. NO.	LOCATION 7½' QUAD	COMMOD-ITY	MRZ ZONE	COMMENTS AND REFERENCES	MAP NO.
57	Borrow Pit	Riverside West T3S R5W NE 1/4 Sec 30	Base Agg	MRZ-3a CS(c-2) p. 61	Located on the southwest side of McAllister Street. Weathered quartz monzonite probably used for road material.	37
58	Borrow Pit	Riverside West T3S R5W SW 1/4 Sec 29	Base Agg	MRZ-3a CS(c-2) p. 61	Located on the southeast side of McAllister Street. Weathered gabbro probably used for road material.	38
59	Borrow Pit	Steele Peak T4S R4W NW 1/4 NE 1/4 Sec 26	Base Agg	MRZ-3a CS(c-2) p. 61	Weathered quartz diorite mined for unknown purpose.	134
60	Borrow Pit	Steele Peak T4S R4W SW 1/4 NE 1/4 Sec 26	Base Agg	MRZ-3a CS(c-2) p. 61	Weathered quartz diorite mined for unknown purpose.	135
61	Borrow Pit	Steele Peak T4S R4W NW 1/4 Sec 26	Base Agg	MRZ-3a CS(c-2) p. 61	Weathered quartz diorite mined for unknown purpose.	136
62	Borrow Pit	Steele Peak T4S R4W SW 1/4 Sec 36	Base Agg	MRZ-3a CS(c-2) p. 61	Weathered quartz diorite mined for unknown purpose.	137
63	Borrow Pit	Lake Elsinore T5S R5W NE 1/4 Sec 24	Base Agg	MRZ-3a CS(c-2) p. 61	Road material quarried from metavolcanic rocks. Quarry face 75 feet long and 50 feet high.	178
64	Borrow Pits	Lake Elsinore T6S R4W NW 1/4 Sec 8	Base Agg	MRZ-3a CS(c-2) p. 61	Two borrow sites on north side of hill overlooking City of Lake Elsinore. Western pit has open face 200 feet long and about 60 feet high. Eastern site has open face 200 feet long and 10 to 25 feet high. Weathered granodiorite probably used for road material.	203
65	Borrow Pit	Lake Elsinore T6S R4W S 1/2 Sec 15	Base Agg	MRZ-3a CS(c-2) p. 61	On northeast side of Freeway I-15. Elsinore Materials Company mines fill material from weathered granodiorite.	218

Construction Aggregates

Base Aggregate

APPENDIX NO.	NAME/ U.S.B.M. NO.	LOCATION 7½' QUAD	COMMOD-ITY	MRZ ZONE	COMMENTS AND REFERENCES	MAP NO.
66	Borrow Pit	Lake Elsinore T6S R4W S 1/2 Sec 15	Base Agg	MRZ-3a SG(c-1) p. 67	On southwest side of Freeway I-15. E.L. Yeager Construction Company removed base material for construction of freeway.	219
67	Borrow Pit	Romoland T6S R3W NE 1/4 Sec 5	Base Agg	MRZ-3a CS(c-2) p. 61	Weathered surface material of granodiorite used for road base.	226
68	Borrow Pit	Murrieta T7S R3W E 1/2 Sec 7 W 1/2 Sec 8	Base Agg	MRZ-3a SG(c-1) p. 67	Area on southwest side of freeway excavated for freeway construction material by E.L. Yeager Construction Company. Now covered by housing.	245
69	Borrow Pit	Murrieta T7S R3W NW 1/4 Sec 10	Base Agg	MRZ-3a SG(c-1) p. 67	Area on west side of Freeway I-15E excavated for freeway construction material by E.L. Yeager Construction Company. Now covered by housing.	246
70	Borrow Pit	Murrieta T7S R3W NW 1/4 Sec 16	Base Agg	MRZ-3a SG(c-1) p. 67	Unconsolidated Quaternary sediments on northeast side of freeway excavated for freeway construction by E.L. Yeager Construction Company.	247
71	Borrow Pit	Bachelor Mtn T7S R2W SE 1/4 Sec 7	Base Agg	MRZ-3a CS(c-2) p. 61	Weathered granodiorite material probably used in construction of nearby San Diego Aqueduct.	251
72	Borrow Pit	Temecula T8S R2W N 1/2 Sec 30	Base Agg	MRZ-3a CS(c-2) p. 61	Weathered quartz monzonite used for road base.	252
73	Bundy Canyon Road Pit	Lake Elsinore T6S R4W SE 1/4 Sec 23	Base Agg	MRZ-2a CS(b-3) p. 63	Presently mined by the Riverside County Road Department for Class III base. Deeply weathered granodiorite being excavated to road level on a 85-acre parcel.	221
74	Christensen Pit	Lake Elsinore T6S R4W W 1/2 Sec 11	Base Agg	MRZ-2a CS(b-2) p. 62	This pit is adjacent to the Riverside County Road Department Railroad Canyon Road Pit. Both are used intermittently as a source of Class III base material. Deeply weathered granodiorite is mined.	215

Construction Aggregates

Base Aggregate

APPENDIX NO.	NAME/ U.S.B.M. NO.	LOCATION 7½' QUAD	COMMOD-ITY	MRZ ZONE	COMMENTS AND REFERENCES	MAP NO.
75	Coplin Granite Pit 0060650235	Corona North T3S R6W SW 1/4 Sec 29	Base Agg	MRZ-3a CS(c-2) p. 61	Mined weathered granodiorite from low hill north of the Atchison, Topeka and Santa Fe Railroad tracks. Probably used for road material. Reference: Saul and others, (1968)	21
76	Jensen Quarry North 0060650535	Fontana T2S R5W NW 1/4 Sec 5	Base Agg	MRZ-3a CS(c-1) p. 61	Although the Jensen Quarry is known for its limestone production, a small quarry on the northern part of the property produced aggregate from a body of granodiorite. Reference: Saul and others, (1968), p. 871.	7
77	Markham Road Pit	Steele Peak T4S R4W SW 1/4 Sec 2	Base Agg	MRZ-2a CS(b-1) p. 62	This 10-acre parcel is owned and mined by the Riverside County Road Department. Deeply weathered granodiorite is selectively mined from the surface for use as Class III base on an intermittent basis.	124
78	Old City Quarry 0060650539	Riverside West T2S R5W S 1/2 Sec 14	Base Agg	MRZ-3a CS(c-1) p. 61	This quarry produced crushed stone for macadam and concrete around the year 1900. Several types of rock were quarried, including a deeply weathered granodiorite, limestone (marble), and metamorphic rocks consisting of biotite schist and gneiss.	27
79	Railroad Canyon Road Pit	Lake Elsinore T6S R4W W 1/2 Sec 11	Base Agg	MRZ-2a CS(b-2) p. 63	The Riverside County Road Department owns about 14 acres of land from which it intermittently mines Class III base material. This parcel is adjacent to the Christensen Pit which is to the west. Weathered granodiorite is excavated from the surface.	216
80	Riverside County Gravel Pits	Corona North T3S R6W SW 1/4 Sec 4	Base Agg	MRZ-3a CS(c-2) p. 61	Two reclaimed road material pits. Both pits were shallow. The northern pit is now part of Ingalls Park.	16
81	Riverside County Gravel Pits	Riverside West T2S R6W SW 1/4 Sec 25	Base Agg	MRZ-3a CS(c-2) p. 61	Two abandoned pits on the north bank of the Santa Ana River. Riverside County Road Department excavated decomposed granodiorite for road material.	28
82	Riverside County Gravel Pits	Riverside West T3S R6W NE 1/4 Sec 12	Base Agg	MRZ-3a CS(c-2) p. 61	Two borrow pits on the northern and eastern sides of a small hill 1/8-mile west of Van Buren Avenue and immediately south of Challen Street. Riverside County Road Department previously mined weathered granodiorite for road material from these two sites.	33

Construction Aggregates

Base Aggregate

APPENDIX NO.	NAME/ U.S.B.M. NO.	LOCATION 7½' QUAD	COMMOD-ITY	MRZ ZONE	COMMENTS AND REFERENCES	MAP NO.
83	Riverside County Pit	Lake Elsinore T6S R4W SW 1/4 Sec 8	Base Agg	MRZ-3a CS(c-2) p. 61	Reclaimed road material pit on north side of Railroad Avenue on the south side of hill. Open-face cut about 500 yards long and about 120 feet high with a 45° slope on face. Road material mined by Riverside County Road Department from weathered granodiorite and metamorphic rocks.	204
84	Riverside County Pits	Romoland T5S R3W NW 1/4 Sec 29	Base Agg	MRZ-3a CS(c-2) p. 61	Two abandoned road material pits on the west side of Sun City. Selective mining of weathered granodiorite, leaving spheroidally weathered resistant boulders. The two pits are about 100 yards apart at the base of low hills.	222
85	Riverside County Pit	Romoland T5S R3W NE 1/4 Sec 26	Base Agg	MRZ-3a CS(c-2) p. 61	A very shallow pit about 300 yards west of the intersection of Menifee and Simpson Roads. Riverside County Road Department removed decomposed granodiorite for use as road material.	224
86	Riverside County Pit	Murrieta T7S R3W NW 1/4 Sec 21	Base Agg	MRZ-3a SG(c-1) p. 67	Riverside County Road department mined material from a Quaternary sandstone unit for use as road material. The site is now a maintenance yard.	249
87	Riverside Sand Company	Riverside West T2S R6W Sec 25	Base Agg	MRZ-3a CS(c-2) p. 61	Riverside Sand Company mined decomposed granite for use as base and fill from 1967 to 1976 from a 40-acre site on the north bank of the Santa Ana River. The site is just east of Van Buren Boulevard.	29
88	Unknown Name Gravel Pit	Fontana T2S R5W SE 1/4 Sec 10	Base Agg	MRZ-1	Gravel pit or pits along the northwest bank of the Santa Ana River, just north of Freeway 60. Now covered by landfill.	12
89	Unknown Name Gravel Pit	Murrieta T7S R3W NE 1/4 Sec 22	Base Agg	MRZ-3a SG(c-1) p. 67	Located 700 feet south of Murrieta Hot Springs Road. Borrow pit 100 feet by 100 feet with a 10-foot-high back wall. Mined unconsolidated Quaternary sediments (Pauba Formation) for unknown purpose.	248
90	Unknown Name Quarry	Steele Peak T4S R4W NE 1/4 Sec 32	Base Agg	MRZ-3a CS(c-2) p. 61	Quarry in weathered granodiorite rock on south side of Santa Rosa Road. Probably used as road material.	145
91	Unknown Name Quarry	Steele Peak T4S R4W NW 1/4 Sec 32	Base Agg	MRZ-3a CS(c-2) p. 61	Top of small hill quarried for decomposed granodiorite. Use unknown.	148

Construction Aggregate

Concrete Aggregate

APPENDIX NO.	NAME/ U.S.B.M. NO.	LOCATION 7½' QUAD	COMMOD-ITY	MRZ ZONE	COMMENTS AND REFERENCES	MAP NO.
92	All American Asphalt and Aggregates Company	Corona South T3S R6W Sec 33, E 1/2 Sec 32	Conc Agg	MRZ-2a CS(c-2) p. 59	This mine is currently producing concrete aggregate and base material and has been in operation since 1975. Crushed stone is mined from a hard granodiorite body on permitted property covering 100 acres.	74
93	Atkinson Quarry (Ormand Quarry) 0060650537	Fontana T2S R5W NW 1/4 Sec 9	Conc Agg	MRZ-2b CS(c-1) p. 60	This property is intermittently mined for aggregate from existing spoil material on the quarry floor. The quarry has produced riprap for breakwaters since 1925. The old quarry face is about 2,200 feet long with a maximum height of about 290 feet. The rock is a fine- to coarse-grained gray, hard granodiorite.	9
94	C.L. Pharris Company, Dawson Canyon Pit 0060650700	Lake Mathews T4S R6W Secs 1, 2, 27, 34, and 35	Conc Agg	MRZ-2a SG(c-3) p. 65	C.L Pharris Company presently mines stream alluvium from 212 acres in Temescal Wash to produce asphaltic concrete aggregate and road base. The mine has been active since 1975. Reference: Evans and others, 1979, p. 38.	108
95	C.L. Pharris Company, Maitri Pit	Lake Mathews T5S R6W Secs 2 and 11	Conc Agg	MRZ-2a SG(c-3) p. 65	C.L.Pharris Company presently mines alluvial fan material from the Mayhew Canyon fan to produce a full range of construction aggregates. The company started mining here in 1975. This is one of the largest sand and gravel mines in the Temescal Valley area. Reference: Evans and others, 1979, p. 38.	112
96	CalMat, Corona Quarry (L.S. Hawley Quarry, see also Temescal Canyon Rock Quarry)	Corona South T3S R6W Sec 33	Conc Agg	MRZ-2a CS(c-2) p. 59	CalMat Company began production of crushed stone for concrete aggregate here in July of 1990. As the quarry is enlarged to the east the rock type encountered will change. There are two elongate bands of igneous rock parallel to the face of the quarry that will be encountered first. The western-most of those is a granodiorite body and the next, to the east, is a quartz monzonite body. The remainder of the 337-acre quarry area to the east is underlain by quartz latite porphyry. The quarry has previously been a source of riprap.	75
97	Chandler's Palos Verdes, Corona Pit	Lake Mathews T5S R6W SE 1/4 Sec 1	Conc Agg	MRZ-2a SG(c-3) p. 65	Chandler's Palos Verdes Company mined a small amount of alluvial material from the streambed of Temescal Wash from 1976 to 1985 and trucked it to their Maitri Plant. There are no plans to mine this 32-acre parcel in the future.	113

Construction Aggregates

Concrete Aggregate

APPENDIX NO.	NAME/ U.S.B.M. NO.	LOCATION 7½' QUAD	COMMOD-ITY	MRZ ZONE	COMMENTS AND REFERENCES	MAP NO.
98	Chandler's Palos Verdes, Glen Ivy Pit	Lake Mathews T5S R6W Sec 2, 3, and 11	Conc Agg	MRZ-2a SG(c-3) p. 64	Chandler's Palos Verdes Company is presently mining at this site and has been in operation since 1976. The alluvium of the Coldwater Canyon fan is excavated to a depth of several hundred feet and provides a full range of construction aggregates. This plant is one of the largest sand and gravel producers in the area. Reference: Evans and others, 1979, p. 38.	109
99	Corona Rock Company 0060650838	Corona South T3S R6W Sec 32	Conc Agg	MRZ-2b SG(c-4) p. 65	This instream mining operation ceased several years ago and has since been reclaimed. Concrete aggregate was produced on this 100-acre parcel from alluvium in the Temescal Wash beginning in 1971. During its last years of operation it was run by All American Asphalt and Aggregate Company. Reference: Evans and others, 1979, p. 37 and 38.	73
100	Crestmore Quarry (Riverside Cement Company) 0060650240	Fontana T2S R5W SE 1/4 Sec 3 SW 1/4 Sec 2	Conc Agg	MRZ-2b CS(c-2) p. 60	The Crestmore Quarry was operated for many years (1909-1986) as a limestone mine for cement. There is now pending an application to mine the two remaining hills on the property for construction aggregate. The material is mostly quartz diorite and some remaining limestone.	10
101	Elsinore Ready Mix, Inc. McVicker Canyon Pit 0060650969	Alberhill T5S R5W Secs 27, 31, 33, and 34	Conc Agg	MRZ-2a SG(c-4) p. 65	Elsinore Ready Mix Company has mined the alluvium from the channel and upper part of the fan of McVicker Canyon and Rice Canyon since 1958. The Rice Canyon operation ceased several years ago. A full range of construction aggregates are produced by this plant. A tract of homes is approved to be built up to the eastern edge of the property and could be a threat to this mine. Reference: Evans and others, 1979, p. 38	171
102	Fontana Paving Company, Corona Plant 0060650450	Corona South T4S R3W, T3S R6W Secs 4 and 5, Sec 33, resp.	Conc Agg	MRZ-2a SG(c-2) p. 65	Fontana Paving, Inc. (now owned by Boral Resources, Inc.) has operated a sand and gravel mine here since 1962. Most of the alluvium excavated from the streambed of Temescal Wash is used to produce asphaltic aggregate. Reference: Evans and others 1979, p. 38 and 39.	78

Construction Aggregates

Concrete Aggregate

APPENDIX NO.	NAME/ U.S.B.M. NO.	LOCATION 7½' QUAD	COMMOD-ITY	MRZ ZONE	COMMENTS AND REFERENCES	MAP NO.
103	Foster Sand and Gravel Pit (Werner Corporation)	Alberhill T5S R6W Sec 11	Conc Agg	MRZ-2a SG(c-3) p. 65	This sand and gravel pit has been in production since 1975. Alluvium from the Mayhew Canyon fan is used to produce a wide range of construction aggregates. The fan is mined to a depth of several hundred feet on the 180-acre parcel. This is one of the largest sand and gravel producers in the area. Reference: Evans and others 1979, p. 38 and 39.	165
104	Harlow Quarry (Blarney Stone Quarry) 0060650218	Lake Mathews T4S R6W W 1/2 Sec 15	Conc Agg	MRZ-2a CS(c-3) p. 60	The quarry is presently operated by Hubbs Construction Company. This quarry has also been known as the Blarney Stone Quarry. It has produced riprap for many years and has recently begun producing construction aggregates as a by-product. The rock being mined is a meta-andesite porphyry.	97
105	J.F. and T. Sand Pit	Lake Mathews T5S R6W NW 1/4 Sec 11	Conc Agg	MRZ-2a SG(c-3) p. 65	West Coast Sand and Gravel Company has produced concrete aggregate since 1975 from a 35-acre parcel on the Coldwater Canyon fan. The operation will continue for only a few more years. Reference: Evans and others 1979, p. 38.	111
106	Mobil Sand Company Pit 0060650495	Lake Mathews and Corona South T4S R6W Secs 22 and 27	Conc Agg	MRZ-2a SG(c-3) p. 65	Mining of sand and gravel from the alluvium of Temescal Wash began here in 1979. The property is divided into two sections totalling 50 acres, about 1/4-mile apart. The plant produces concrete aggregate and plaster sand.	101
107	Owl Rock Products, Inc., Prado Pit (Prado Plant) 0060650973	Prado Dam T3S R7W Sec 19	Conc Agg	MRZ-2a SG(c-1) p. 64	Owl Rock Products Corporation presently mines asphaltic aggregate and base from a coarse-grained section of the Sycamore Canyon Member of the Puente Formation. The beds are folded into an east-plunging syncline, with dips ranging from 40° to 60°. The gravel content is about 15% with an arkosic sandstone matrix. The deposit covers about 1/2 mile and may be as much as 1,000 feet thick. References: Evans and others, 1979, p. 34 and 35; Miller and Corbaley, 1981, p.4.	14
108	R.J. Noble Company, Coldwater Canyon Pit	Lake Mathews T5S R6W Secs 10 and 11	Conc Agg	MRZ-2a SG(c-3) p. 65	R.J. Noble Company presently mines alluvium from a 55-acre parcel on the Coldwater Canyon fan. The mine opened in 1982 and has produced mostly asphaltic aggregate. The property was part of the J.F. and T. Sand Pit.	110

Construction Aggregates

Concrete Aggregate

APPENDIX NO.	NAME/ U.S.B.M. NO.	LOCATION 7½' QUAD	COMMOD-ITY	MRZ ZONE	COMMENTS AND REFERENCES	MAP NO.
109	Santa Ana River Rock, Eagle Valley Quarry	Corona South Lake Mathews T4S R6W SW 1/4 Sec 3 NW 1/4 Sec 10	Conc Agg	MRZ-2a CS(c-2) p. 59	Santa Ana River Rock Company (Boral Resources, Inc.) began mining here in 1986. They now produce asphaltic aggregate and other construction aggregates from crushed rock. The 128-acre site is underlain by a hard quartz latite porphyry.	91
110	Service Rock Company Pits 0060650534	Fontana T2S R5W NE 1/4 Sec 10	Conc Agg	MRZ-2b SG(c-2) p. 65	The Service Rock Company mined sand and gravel from pits near the intersection of Rubidoux Boulevard and 24th Street some years ago. The largest pit, east of the intersection, is being reclaimed as a solid waste site.	11
111	Stringfellow Quarry(Bly Brothers and McGilliard, Shannahan) 0060650823	Fontana T2S R6W NW 1/4 and SE 1/4 Sec 1	Conc Agg	MRZ-2a CS(c-1) p. 59	The Stringfellow Quarry lies in the central part of the Jurupa Mountains at the north end of Pyrite Street. It has been a source of riprap since before 1915. In the last few years the Hubbs Construction Company has been producing concrete aggregate as a by-product of riprap. The material is crushed on-site and sized. The 60-acre site is underlain by granodiorite and small bodies of older metamorphic rocks. The metamorphic rocks are not used as aggregate.	4
112	Transit Mixed Concrete Company, Corona Pit 0060650848	Corona North T3S R6W SE 1/4 Sec 30 SW 1/4 Sec 29	Conc Agg	MRZ-2b SG(c-4) p. 66	The Transit Mixed Concrete Company began mining sand and gravel from the lower Temescal Wash near Corona before 1942. Four pits were excavated in the floodplain of the wash about one mile east of Corona. The pits were abandoned several years ago.	20
113	Triangle Rock Products, Inc., Mira Loma Pit 0060650828	Guasti T2S R6W NE 1/4 Sec 6	Conc Agg	MRZ-3a SG(c-1) p. 67	The pit area, last active in 1969, has been reclaimed as a flood control basin. Triangle Rock Products, Inc. produced concrete aggregate from a coarse alluvial layer in the fan of Deer and Day Creeks.	1

APPENDIX NO.	NAME/ U.S.B.M. NO.	LOCATION 7½' QUAD	COMMOD-ITY	MRZ ZONE	COMMENTS AND REFERENCES	MAP NO.
114	Beehive	Sitton Peak T8S R6W Sec 1	Cu Au	Not Zoned; out of study area	Located at an elevation of about 1,400 feet on the west side of San Mateo Canyon, 2/3-mile west-southwest of the junction of Nickel and San Mateo Canyons. Accessible by the Potrero Truck Trail and the Clark Trail. Several irregular pods of chloritized, brecciated and sheared granitic and aplitic rocks occur within fresh, unaltered granodiorite country rock. Mineralized rock contains bornite, chalcopyrite, malachite, and chalcanthite. The mineralized bodies reportedly are elongate N-S parallel to and within shear zones. The largest mineralized bodies are reportedly 150 feet by 50 feet. Mineralized rock reportedly assayed 7 % copper, $4.00 per ton in gold, and traces of silver. The mineralization reportedly was explored by a 10-foot adit in 1916 and a 100-foot adit driven northward in 1932 (now caved). The 100-foot adit reportedly was in rock containing 2 1/2 % copper. This property has been inactive since 1932. References: Engel and others, 1959, p. 111; Gay, 1955, unpublished field notes.	236
115	Collins Copper Prospect 0060650855	Corona South T4S R6W NE 1/4 Sec 4	Cu	MRZ-3a (h-1) pg. 26	Located in the mountains west of the Cajalco Tin mine (appendix no. 259, map no. 92) this prospect is one of copper and silver mineralization occurring along a narrow zone of shears in quartz latite. Most mineralization is in the main shear which strikes N10°E in the south and N45°W in the north, a curving structure. The dip is vertical or near vertical and width of the shear varies from 4 to 8 feet. Ore mineralization consists of chrysocolla, malachite, azurite and other copper oxides. Tourmaline has been observed in fractures in association with copper oxides, most notably in the eastern part of the prospect area. Production has been primarily from these oxide zones, with the greatest mineralization in the vicinity of intersecting faults and breccia zones. Frederick (1956) observed that the enriched, oxidized zone extends from the surface to about 30 feet in depth. Total shipments (in 1950 and 1956), from this oxidized ore, were about 150 tons. Frederick (1956) assayed 47 samples which ranged from 12.96% copper to a trace, and 156 oz/ton to 0.2 oz/ton silver. Samples for this study more moderate: 1.26 oz/ton to 0.15 oz/ton copper and 2.07 oz/ton to 0.03 oz/ton silver. Gold values were negligible (0.001 oz/ton). Mineralization occurs in minor parallel and some crosscutting fractures throughout the area, and the area has been prospected by many pits and dozer cuts. The main shear has been developed originally by numerous open cuts and at least 2 vertical shafts (Frederick, 1956). Later development consisted of more open cuts and a trench 250 feet long, 30 feet deep and 10 feet wide. Reference: Frederick, 1956.	79

APPENDIX NO.	NAME/ U.S.B.M. NO.	LOCATION 7½' QUAD	COMMOD-ITY	MRZ ZONE	COMMENTS AND REFERENCES	MAP NO.
116	Electric Copper and Gold 0060650524	Murrieta T6S R4W Sec 25	Cu Au Ag	MRZ 4	Reportedly located in Bundy Canyon at an elevation of 1,500 feet, about 5 miles southeast of Elsinore. This property could not be located during a reconnaissance of the area as part of this study. This property consists of one patented claim, of approximately 17 acres. The deposit is on a contact between granite and schist. The irregular contact has a general strike of N10°W and dips at 65° to the east. The copper, silver and gold values are reported to be distributed in the schist over a width of 20 feet from the granite foot-wall. On the foot-wall side there is a zone which varies in width from two to six feet, where the values are higher than the average. The minerals observed were cuprite, impure (black) chrysocolla, chalcopyrite and pyrite. Assays up to 36.5% copper, 22 ounces of silver and $2.00 gold have been reported from composite samples taken across widths up to ten feet (Tucker and Sampson, 1929). Development consists of an incline shaft 60 feet deep. At the bottom of this shaft a crosscut was driven east 20 feet. Drifts were then driven 10 feet north and south. In 1929 the shaft was full of water to within 20 feet of the surface. References: Eric, 1948, p. 292; Gay, 1955, unpublished field notes; Tucker and Sampson, 1929, p. 470, and 1945, p. 125.	241
117	Silver Shine 0060650820	Sitton Peak T8S R5W SW 1/4 Sec 6	Cu	Not Zoned; within a wild-erness area	Located adjacent to the Mammoth Claims (appendix no. 212, map no. 238) at an elevation of about 800 feet in San Mateo Canyon about 1/4 mile northeast of the juncture of Nickel and San Mateo Canyons. Accessible by Indian Potrero Truck Trail, Clark Trail, and San Mateo Trail. A quartz vein reportedly carrying minor amounts of chalcopyrite and secondary copper carbonate minerals is traceable several hundred feet. The vein strikes N60°E and dips 88°SE within a body of sheared diorite within andesitic country rock (Santiago Peak Volcanics). The vein has been prospected by means of a small open cut and a short adit prior to 1932. There has not been any production. Reference: Engel and others, 1959, p. 112.	237

Dumortierite

APPENDIX NO.	NAME/ U.S.B.M. NO.	LOCATION 7½' QUAD	COMMOD-ITY	MRZ ZONE	COMMENTS AND REFERENCES	MAP NO.
118	Home Gardens Prospect 0060650939	Corona South T3S R6W Sec 33	Dum	MRZ 3a (h-1) p. 26	The Home Gardens Prospect is located north of the Collins Copper Prospect (appendix no. 115, map no. 79). The prospect was reported as a kyanite group mineral prospect in U.S.Bureau of Mines records. The vein is reportedly quartz, tourmaline, muscovite, dumortierite. Observed minerals on trench shear wall were gouge, iron oxides, tourmaline, and quartz. The shear has been developed by an open cut trench 200 feet by 20 feet by 15 feet deep and smaller pits to the south. The strike of the shear is N21° to 30°W; dip ranges from 78°N to 87°N. The prospect is on a shear that is north of and sub-parallel to the shear hosting the Collins Copper prospect. The property appears to have been further prospected as an extension of the Collins shear. Dozer cuts are scattered throughout the area. References: Gray, 1961, p. 82; Pampeyan, 1952, p. 53.	76

Feldspar and Silica

APPENDIX NO.	NAME/ U.S.B.M. NO.	LOCATION 7½' QUAD	COMMOD-ITY	MRZ ZONE	COMMENTS AND REFERENCES	MAP NO.
119	Bundy-Murrieta Deposit 0060650424	Romoland T6S R3W SE 1/4 Sec 17	Feld Si	MRZ-4	Located just northwest of the junction of Bundy Canyon Road and Murrieta Road about 10 miles south of Perris. A poorly exposed pegmatite dike as much as 15 feet wide reportedly cuts deeply weathered diorite. The dike was not located during a reconnaissance for this study. There are several single-family residences in the area. The dike reportedly strikes N25°E and appears to be vertical. The outcrop was traceable for about 230 feet. The dike is composed of quartz and feldspar and minor proportions of biotite and allanite. The quartz formed a continuous central zone in the dike surrounding irregular masses of feldspar as much as 3 feet thick. Some of the quartz and feldspar occurs as graphic intergrowths, but much of the material is pure. The feldspar is microcline (field identification); quartz is milky and massive. Fragments of allanite crystals, found on the dump, are weakly radioactive. The dike was explored by a shaft about 30 feet deep which is partially caved. Production is undetermined. Reference: Saul and others, (1968), p. 1129.	230

Feldspar and Silica

APPENDIX NO.	NAME/ U.S.B.M. NO.	LOCATION 7½' QUAD	COMMOD-ITY	MRZ ZONE	COMMENTS AND REFERENCES	MAP NO.
120	California Land and Mineral Company (American Encaustic Tiling Company) 0060650431	Murrieta T7S R3W Sec 4	Feld Si	MRZ-4	Located about 3 miles north-northeast of Murrieta and comprising Section 4 and the northwest corner of the Temecula Rancho. The entire area is now a large development, mostly single family residences. Workings no longer exist. The following description of this property is after Tucker and Sampson (1931). The deposits occurred in roughly parallel zones in the granite. The strike of these zones is S75°W and the dip is about 40° to the southeast. The feldspar, which is orthoclase, occurs in masses in the quartz and is also segregated on each wall between the granite and silica in sheets. Thickness varies from 1 to 6 feet. Total thickness of feldspar and quartz at one point is 80 feet. A pit 60 feet deep, 40 feet wide, and 120 feet long has been excavated. From the bottom of this pit crosscuts were driven north a distance of 40 feet to the north wall of the deposit. Stoping was carried beyond the east end of the open pit a total developed length of 250 feet. It was estimated that there were reserves of 30,000 to 50,000 tons. Material was hoisted from the pit in 3/4-ton cars by a 15-h.p. gas engine hoist and dumped into a 3 1/2-foot trommel. After washing, the two products were conveyed to a two-compartment, 40-ton bin, which discharged into trucks below. On the north side of a small hill about one-half mile west of the above-described pit, a crosscut passed through 40 feet of granite into a lens of feldspar and quartz which it has penetrated to 30 feet. The top 3 feet of this deposit is feldspar. Numerous small open cuts are scattered over the property. One of these is reported to have produced 2000 tons of feldspar. According to Tucker and Sampson (1931) the company was shipping some 250 tons of silica per month. Shipments of feldspar from the property are reported to have totaled about 50,000 tons. References: Saul and others, (1968), p. 1130-1133; Tucker and Sampson, 1929, p. 502-503, and 1931, p. 421.	243

APPENDIX NO.	NAME/ U.S.B.M. NO.	LOCATION 7½' QUAD	COMMOD-ITY	MRZ ZONE	COMMENTS AND REFERENCES	MAP NO.
121	Nettleton 0060650521	Lake Elsinore T6S R4W NW 1/4 Sec 14	Si	MRZ-4	Patented land located on the north and east sides of a prominent hill (between elevations 1,800 feet and 2,180 feet) east of Hill 2262, about 4 miles southeast of Elsinore and 1 2/3 miles south of Railroad Canyon Dam. Engel and others (1959) described the prospect as a body of aplitic and pegmatitic leucogranitic rock within granodiorite contains pods of milky white quartz, and a mass of quartz-sericite rock. The quartz, on the north side near the top of the hill, has been extensively exposed and quarried. The quartz-sericite rock, on the east side of the hill, has been explored in minor workings. The quartz occurs as an irregular vein-like body, or bodies, in a discontinuously exposed zone that trends about N45°E and dips steeply southeastward to vertical. The zone is 20 to 30 feet wide and at least 300 feet long. Adits several hundred feet farther northwest may reach extensions of the zone underground but quartz is not exposed on the surface. Individual lenses or pods in the zone are as large as 6 feet wide and 15 feet long, although larger masses may have been removed. The quartz-bearing zone is highly shattered, slickensided, and sheared. Bodies of pure quartz are separated by impure gouge material containing ground quartz, feldspar, mica, chlorite, and iron oxides. Unfilled drusy cavities and outlines of quartz crystals as long as several inches are present in the deposit. Small segregations of muscovite crystals, some nearly a half inch across, and a few thin veins of quartz, orthoclase, and muscovite are present. A fault strikes N35°E an dips 60°NW to bound cleanly the quartz zone against leucogranite on the south. The quartz-sericite rock appears to be mainly confined to a 15-foot wide belt associated with a fault zone that trends N15°E and dips 75°NW. Development of the main workings, near the top of the hill, consists of a large sidehill open cut at the southeastern end of the exposure. This pit is about 30 feet wide and 50 feet long, with a face as high as 40 feet. An irregular inclined opening, about 8 by 10 feet in plan, leads from the quarry floor and reportedly through the quartz-bearing zone 50 feet down to a 100-foot haulage adit. A cable-drawn rail tramway was used to move the quartz about 150 yards straight down the hill for loading on horse-drawn wagons. Caved portals and substantial dumps at the wagon-loading station indicate level workings of undetermined length. The deposit has been inactive since about 1930 when an undetermined tonnage of quartz was quarried. The area north of andadjacent to this deposit is undergoing extensive residential development. Reference: Engel and others, 1959, p. 99-100, 135; Saul and others, (1968).	220

APPENDIX NO.	NAME/ U.S.B.M. NO.	LOCATION 7½' QUAD	COMMOD-ITY	MRZ ZONE	COMMENTS AND REFERENCES	MAP NO.
122	Perris Mining Co. Deposit (Blom Mine) 0060650423	Romoland T6S R3W SW 1/4 Sec 16 (Approx. location)	Feld Si	MRZ-4	Located just north of Bundy Canyon Road, half a mile east of Murrieta Road. The mine was not located during a reconnaissance for this study. Development in the area includes single-family residences. The mine was worked from the World War I period to about 1929. The product was trucked to Perris for rail shipment to Los Angeles for use in manufacture of porcelain and tile. The weathered diorite country rock is cut by a quartz-feldspar pegmatite dike as much as 30 feet wide which strikes N65°E and dips 40°SE. The dike is exposed for about 100 feet on the north slope of a low knoll. Massive quartz makes up most of the deposit. Feldspar, however, is reported to occur in masses as much as 20 feet in thickness (Tucker and Sampson, 1929). The dike was explored by inclined shaft driven S15°E for a slope distance of 150 feet. An 80-foot shaft was sunk 50 feet west of the shaft and the two are connected at the 50-foot level by a stope which is open to the surface. A 50-foot drift was driven northwest at the 75-foot level of the shaft. In the face of an open cut about 15 feet deep, 50 feet west of the vertical shaft, an exploratory adit was driven 500 feet east but nothing of value was found. The products were milled and graded at the mine. The mine reportedly was flooded in 1959. References: Saul and others, (1968), p. 1145-1146; Tucker and Sampson, 1929, p.506.	231
123	Stone and Alexander Quarry 0060650540	Riverside West T2S R5W Sec 19	Feld Si	MRZ-4	Pegmatite vein in quartz diorite located in the Pedley Hills west of Riverside. Minerals were massive pink feldspar, some with graphic intergrowths, rose quartz, smokey quartz, tourmaline, muscovite and biotite. Trend along single open cut along the vein is N40°W. Property is now a new residential development. No production records. Reference: Saul and others, (1968).	25

APPENDIX NO.	NAME/ U.S.B.M. NO.	LOCATION 7½' QUAD	COMMOD-ITY	MRZ ZONE	COMMENTS AND REFERENCES	MAP NO.
124	Alice 0060650427	Romoland T6S R3W S 1/2 Sec 24	Au	MRZ-3a (h-7) p. 28	Located at elevations of 1,510 to 1,540 feet, on the south side of the low hills in the southern half of Section 24, about 3/4 mile south of Bundy Canyon Road and 4/10 to 7/10 mile west of Briggs Road. Gold mineralization occurs in a quartz vein or veins, in coarse-grained, deeply weathered gabbro. At the surface the vein appears to be 1 1/2 to 2 feet thick, strikes N78°W, and reportedly dips 35°NE. Exposures are poor; the western portion of the vein is comprised of parallel veins forming a vein system as much as 15 feet in thickness. A portion of the western segment of the vein system is exposed discontinuously over a strike distance of about 500 feet. The extreme western segment of the vein is obscured by deeply weathered gabbro that has been plowed. The vein appears to terminate before reaching a granodiorite body not shown on the geologic map in this report. The granodiorite appears to be younger than the gabbro. The vein is exposed in a prospect pit 1,400 feet to the southeast of the western exposures, on the south side of a northwest trending ridge. About 700 feet northwest of the prospect pit, the vein is obscured by colluvium and soil from the deeply weathered gabbro, as evidenced by abundant quartz vein fragments and fragments of associated massive tourmaline in the colluvium. The colluvium has obscured the vein where the vein crosses a broad saddle located between the western and eastern segments of the vein. The quartz vein is comprised of milky white quartz and black, massive tourmaline. The tourmaline occurs as an intimate mixture with and possibly replacing the quartz. Weathered tourmaline rock is smooth on weathered surfaces but dull and earthy looking on broken surfaces. The western segment of the vein has elongate and irregular open cavities containing abundant limonite as well as pyrite. The open spaces contain boxworks of secondary iron oxides after primary sulphides. The eastern exposures of the vein are stained with limonite along fractures, but limonite staining and fracture fillings are not as pervasive as in the western exposures. Two samples of quartz vein material with abundant limonite and boxworks from the western segment of the vein assayed 0.04-0.21 oz/ton silver and 0.019-0.367 oz/ton gold. A sample of tourmaline rock assayed 0.01 oz/ton silver and 0.001 oz/ton gold. The gold and silver seem to accompany the sulphide mineralization. A sample of quartz from the eastern segment of the vein assayed 0.03 oz/ton silver and 0.001 oz/ton gold.	233

APPENDIX NO.	NAME/ U.S.B.M. NO.	LOCATION 7½' QUAD	COMMOD-ITY	MRZ ZONE	COMMENTS AND REFERENCES	MAP NO.
					The main workings are in the western part of the vein and consist of several pits and a caved shaft now obscured by vegetation. The Alice Mine was located early in the 1890's and by 1894, a shaft was started in the hanging wall (Crawford, 1984). In 1895 the mine passed into the possession of a stock company. A 5-stamp mill was installed, the shaft was reported to be down 85 feet, and 500 tons of ore were said to be ready for milling with two years reserves. The ore was reported to yield about $30.00 per ton in gold. In 1896 all operations were suspended (Crawford, 1896). Production is undetermined. References: Crawford, 1894, p. 221, and 1896, p. 310; Merrill and Waring, 1919, p. 534; Saul and others, (1968), p. 279-280; Tucker and Sampson, 1929, p. 472, and 1945, p. 127; Sampson, 1935, p. 508.	
125	Argonaut Group 0060650518	Lake Elsinore T6S R4W NE 1/4 Sec 9	Au	MRZ-4	Located at an elevation of 1,480 feet, in the southern part of the low hills about 2 miles east of Elsinore. Remaining workings consist of a 9-foot by 12-foot prospect pit on the nose of a southern pointing small ridge. The topography south of the prospect pit has been graded as part of a large residential development. Some of the workings, the 12-foot and 75-foot adits, described by Engel and others (1959) have been destroyed. The remaining prospect pit is on the contact between metavolcanic rocks or metamorphosed dikes. The contact strikes N12°E and dips about 70°SE. The rock west of the contact is tentatively identified as meta-andesite, the rock to the east is tentatively identified as meta-rhyolite. These rocks do not appear to be altered or mineralized. The country rock in the area is deeply weathered San Marcos gabbro. According to Engel and others (1959) gold was sought in or adjacent to aplitic and basic dikes. Numerous dikes intrude the dioritic to gabbroic country rock, but in the area of the Argonaut Group, the contact zones are not extensively altered nor significantly mineralized. Little or no production; idle for many years. Reference: Engel and others, 1959, p. 113.	213

APPENDIX NO.	NAME/ U.S.B.M. NO.	LOCATION 7½' QUAD	COMMOD-ITY	MRZ ZONE	COMMENTS AND REFERENCES	MAP NO.
126	Arlington Tunnel 0060650551	Steele Peak T4S R5W Sec 31	Au	MRZ 4	Location uncertain. Part of a project to develop the Gavilan area (now the Hartford Springs area). The tunnel was the adit-level drainage way. Reference: Saul and others (1968), p. 288.	120
127	Binkley's and Tyler's diggings 0060650508	Lake Elsinore T6S R4W Sec 2(?), 10(?), 11(?), 12(?)	Au	MRZ-4	Located near the junction of Cottonwood Creek and the San Jacinto River, east of Elsinore, these placer diggings were active in 1876, but little else is known. Reportedly, a 12-inch elder tree was growing in an old arrastre bottom in the early 1880's. Cottonwood Canyon was an area of placer gold mining during the early 1800's to the late 1870's. References: Engel and others, 1959, p. 62; Merrill and Waring, 1919, p. 527.	214
128	Blue Goose 0060650889	Sitton Peak T7S R6W NW 1/4 Sec 23	Au Ag	Not Zoned; within a wild-erness area	Located near the north rim of Verdugo Canyon at an elevation of about 2,200-2,300 feet near Los Chinos Spring, about 1/2 mile southwest of Wheeler Ranch. Reportedly consists of a brecciated zone near the contact of andesite (Santiago Peak volcanics) and a dacite porphyry where the host rock and fractures within the zone are replaced or filled by quartz, sericite, and limonite from the oxidation of pyrite. Assayed low. Reference: Engel and others, 1959, p. 114.	235
129	Brady Prospect 0060650511	Lake Elsinore T6S R4W NW 1/4 Sec 4	Au	MRZ-4	Located at an elevation of 1,800 feet, northwest of hill 1962, about 1 1/2 miles east of Elsinore. This prospect reportedly is along the contact zone between San Marcos gabbro and metasedimentary rocks of the Bedford Canyon Formation which generally strike N35°W and dip about 50°NE. A 5-foot wide aplite dike with quartz veining is fractured, weathered and stained with manganese oxides. The dike strikes N50°W, is vertical and reportedly explored by a 35-foot vertical shaft and lateral workings of unknown extent. Other workings are a 15-foot shaft, now caved, and a 25-foot adit driven north, a 35-foot shaft and 3 caved pits near the contact zone. Production is doubtful. Now Idle. References: Engel and others, 1959, p.114.	208

APPENDIX NO.	NAME/ U.S.B.M. NO.	LOCATION 7½' QUAD	COMMOD-ITY	MRZ ZONE	COMMENTS AND REFERENCES	MAP NO.
130	C & C Consolidated 0060650002	Steele Peak T4S R4W SE 1/4 Sec 32 SW 1/4 Sec 33	Au Ag	MRZ-3a (h-5) p. 27	Located on the west side of the Maywood Gun Club Road, east of the San Antonio mine (appendix no. 159, map no. 155). Idle since the early 1890's. Prospect on an unexposed quartz vein reportedly in metasediments. Strike underground is N50°E and 60°S (Goodyear, 1888b). Goodyear reported free gold and silver-rich galena and there were reports of $30 to $40 rock. Picked dump samples assayed poorly: 0.001 oz/ton gold and 0.002 oz/ton silver. Workings flank the wash and consist of a shaft (caved), trench, open cuts short adits and adits of unknown length. An arrastre survives on the property. Goodyear reported a 150-foot tunnel. References: Goodyear, 1888b, p. 526; Crawford, 1896, p. 357; Merrill and Waring, 1919, p. 357.	158
131	Colorado-Justice Claims 0060650855	Steele Peak T4S R4W Sec 32	Au Ag	MRZ-3a (h-5) p. 27	Patented claims on unexposed quartz vein in weathered diorite and gabbro. Workings consist of 6 small pits/adits around a small mound (all caved) and a shaft and adit of unknown extent located within a valley about a quarter mile northeast of the smaller pits. A zone of quartz veinlets in the adit wall has a strike of N9°W and dips 15°S. No production figures available but dump at shaft collar indicates some development. Assays of dump grab sample were low: 0.002 oz/ton gold and 0.03 oz/ton to 0.04 oz/ton silver. References: Crawford, 1894, p.221; Crawford, 1896, p. 308; Merrill & Waring, 1919, p. 531.	151
132	Corona (Peggy) 0060650468	Steele Peak T4S R4W NW 1/4, SE 1/4 Sec 32	Au	MRZ-3a (h-5) p. 27	Located on the north side of a ridge, the prospect is a poorly exposed quartz vein in diorite, reported to be 4 inches wide and outcropping a length of 500 feet with an attitude of N75°W, Dip 25°S. Iron oxide stain and scattered biotite are present. The vein has been explored by 1 short adit and 2 inclined shafts. In 1939, 25 tons of ore yielded 4 ounces gold and 20 ounces silver. Reference: Saul and others, (1968), p. 357.	152

APPENDIX NO.	NAME/ U.S.B.M. NO.	LOCATION 7½' QUAD	COMMOD-ITY	MRZ ZONE	COMMENTS AND REFERENCES	MAP NO.
133	Dr. Musick 0060650454	Steele Peak T4S R4W Sec 19	Au	MRZ-3a (h-4) P. 27	A poorly exposed quartz vein strikes N5°W, 70°S in diorite. The vein is 1 inch to 2 inches in width and reported to have an 80 foot shaft and two 100 foot long drifts. Flooded in 1959 to 30 feet of the surface. Not examined. Reference: Saul and others, (1968), p. 357	126
134	Elsinore Peak	Wildomar T6S R4W SW 1/4 Sec 31 T6S R5W SE 1/4 Sec 36	Au	MRZ-3a (h-8) p. 29	Located at elevation 3240-3575 feet just west of Elsinore Peak, about 3 1/2 miles due west of Wildomar. The area is accessible via Forest Service Road 6S07 off State Highway 74 and south seven miles. The following is from P.K. Morton, 1989, unpublished report and personal communication: The prospect is in the contact zone between Paleocene-age sediments of the Silverado Formation and overlying olivine basalts of Miocene age. The Silverado Formation unconformably overlies granodiorite which crops out in lower elevations throughout the area. Sediments of the Silverado Formation are friable, white, biotite-rich sandstones that crop out with a subdued expression in the gentle terrain between Elsinore Peak and Hill 3448. The Silverado Formation and the granodiorite are both overlain by fine-grained olivine basalt flows of Late Miocene age (Kennedy, 1977). These occur at higher elevations usually above 3,360 feet. The basalt is aphanitic and composed primarily of plagioclase feldspar, olivine, and biotite with minor pyrite. The contact zone between the Silverado Formation and Miocene basalts is poorly exposed but, where observed, is deeply altered, probably by pre-basalt weathering and later hydrothermal activity. Anomalously high gold contents were found both above and below the contact. Ten samples collected by P.K. Morton had gold values ranging from a trace to 0.030 oz/ton and silver values of 0.010 to 0.283 oz/ton (fire assay). References: Engel, 1959; Rogers, 1965; Kennedy, 1977; P.K. Morton, unpublished and personal communication, 1990.	240

APPENDIX NO.	NAME/ U.S.B.M. NO.	LOCATION 7½' QUAD	COMMOD-ITY	MRZ ZONE	COMMENTS AND REFERENCES	MAP NO.
135	Gavilan Mine 0060650207	Steele Peak T4s R4W SE 1/4 Sec 19	Au	MRZ-3a (h-4) p. 27	An historical property first worked by Mexican settlers and mentioned in many reports. The mine lies just south of the Ida Leona (appendix no. 141, map no. 132) and has been idle since the 1890's. It is reported to be a quartz vein along a fault in diorite and exposed for about 50 feet. The 1- to 2-inch vein strikes N70°W and dips 50° to the SW. Ore minerals were reported to be "free milling" gold occurring with iron oxides in the vein. A shaft was reported to be 485 feet deep. The property is now a residence and was not visited for this study. References: Goodyear, 1888b, p. 527; Storms, 1892, p. 366-367; Crawford, 1894, p. 221; Crawford, 1896, p. 311; Merrill and Waring, 1919, p. 528; Sampson, 1935, p. 508; Tucker and Sampson, 1945, p. 135-136; Larsen, 1948, p. 310, Saul and others, (1968), p. 505.	131
136	Golden Chariot (Golden Charlotte) 0060650463	Steele Peak T4S R4W NE 1/4 Sec 31	Au Ag	MRZ-3a (h-5) p. 27	South of the Santa Rosa Mine (appendix no. 161, map no. 139). A poorly exposed quartz vein which strikes N10°W, dips 45° to 55°S, is believed to be the southern extension of the Santa Rosa Vein. Assays ranged from 0.001 to 0.007 oz/ton gold and 0.04 to 0.05 oz/ton silver from selected dump grab samples and altered wallrock. Workings reported to be a 310-foot decline and a drift of unknown length. All are now caved and the workings were flooded to within 50 feet of the surface in 1959. References: Saul and others, (1968), p. 450; Crawford, 1894, p. 311; Merrill & Waring, 1919, p. 529; Tucker, 1929, p. 479; Sampson, 1935, p. 509.	140
137	Golden Nugget 0060650459	Steele Peak T4S R4W NW 1/4 SEC 30	Au	MRZ-3a (h-4) p. 27	Located 1/2-mile southwest of the Ida Leona mine (appendix no. 141, map no. 132). Reported to be a quartz vein in diorite. Unknown production, shaft flooded in 1959. Not examined for this study. Reference: Saul and others, (1968), p. 457.	130

APPENDIX NO.	NAME/ U.S.B.M. NO.	LOCATION 7½' QUAD	COMMOD-ITY	MRZ ZONE	COMMENTS AND REFERENCES	MAP NO.
138	Golton Group (Mineral Chief) 0060650492	Lake Elsinore T5S R4W NW 1/4 Sec 20	Au	MRZ-4	Located on the northwest side of a small valley east of hill 1834 at an elevation of about 1,640 feet about 2 1/2 airline miles north-northeast of North Elsinore. Accessible by 1/4- to 1/2-mile hike from gravel road that branches eastward from Bull Canyon Road. Closest route is by a jeep trail up Hill 1834 then east on foot. The rocks in the southwest portion of the property are slates and schists of the Bedford Canyon Formation. A 2,000-foot wide belt of porphyritic rock, possibly correlative with the Temescal Wash quartz latite, lies to the east of and is in contact with the metasediments. Dikes of fine-grained granite, diorite, and felsites are prevalent. Mineralization, and tourmaline, reportedly occur along contacts with dikes (Tucker and Sampson, 1929). Two vuggy quartz veins 1 1/2 and 3 feet wide reportedly occur about 250 yards apart in northerly trending, steeply dipping zones 3 to 5 feet wide consisting of sheared, porous, iron- and manganese-stained siliceous rocks in Temescal Wash quartz latite porphyry. The westerly vein is explored by a 10-foot open cut and a 15-foot decline. The easterly vein is explored by a 65-foot adit driven N25°W in a zone of shearing. Iron and manganese stained rock is explored by a 12-foot deep pit about 200 yards north of the easterly vein, and by a few small open cuts. One quarter mile to the southeast, a zone of iron- and manganese-stained vuggy quartz has been explored by a small shaft which was flooded to within 7 feet of the surface in the late fifties. Production from this property, if any, is not known but would have been small. The property has been idle for many years prior to the late 1950's. References: Engel and others, 1959, p. 115; Tucker and Sampson, 1929, p. 480.	180

APPENDIX NO.	NAME/ U.S.B.M. NO.	LOCATION 7½' QUAD	COMMOD-ITY	MRZ ZONE	COMMENTS AND REFERENCES	MAP NO.
139	Good Hope (Gold Prince, Goodhope, San Jacinto) 0060650205	Lake Elsinore T5S R4W W 1/2 Sec 15	Au	MRZ-3a (h-6) p. 27	Located at an elevation of about 1,680 feet, in the low hills a few hundred feet northwest of Highway 74 about 5 airline miles northeast of Lake Elsinore. At the present time none of the surface or subsurface workings are visible. All mine tailings have probably been used to backfill open shafts and have been spread with a bulldozer to form a thin layer covering the surrounding area. A small pile of pinkish-colored mill tailings is located 400 feet east of Highway 74 (NE 1/4 Sec 15) and south of and adjacent to the dirt road that branches eastward from Highway 74 (east of the Good Hope mine shaft symbol on the Lake Elsinore quadrangle). All buildings, headframes, and other structures have been removed from the mine site. The property reportedly includes 160 acres of patented land mainly in the NW 1/4 Sec 15 and extending northeast into Sec 10. From the cross section showing the underground workings (Engel and others, 1959) it is possible to approximately locate 17 mine shafts or exploration shafts ranging in depth from 8 feet to 575 feet. These workings delineate the surface trend of the quartz vein system that carries the gold at the Good Hope mine. The system of quartz veins at the Good Hope mine occurs within deeply weathered Cretaceous age quartz monzonite host rock. The rock is a gray, homogeneous quartz diorite which ranges in composition from syenite granite to diorite. The country rock is strongly chloritized and kaolinized. Mineralized zones are delimited by seams of gouge, talcose minerals, and clay. The system of quartz veins reportedly strikes about N12°E, dips about 60°NW, and is discontinuously exposed in pits and shaft collars along the strike for more than 3,300 feet. At the surface, the vein system is 100 feet wide, and consists of several subparallel quartz seams, 3 to 20 feet apart, that appear to join about 200 feet below the surface. At depth the veins form an irregular mineralized zone, 3 to 10 feet wide, which locally splits into two or more zones. The main ore shoot averages 18 inches in width in a 5-foot wide vein. Dip increases from 45° to 75° at the 350-foot level. The vein quartz is strongly fractured and impregnated with secondary calcite. The richest mineralization commonly is found in the quartz veins along the footwall of the zone, particularly at irregularities in the wall, or in small off-shoots into the footwall. With depth the vein becomes more regular and increases in richness (Engel and others, 1959). Ore is native gold in quartz, but gold in sulphides (mostly pyrite) increases with depth. Small amounts of galena are reported; silver values are low (less than one ounce per 100 ounces of gold).	183

APPENDIX NO.	NAME/ U.S.B.M. NO.	LOCATION 7½' QUAD	COMMOD-ITY	MRZ ZONE	COMMENTS AND REFERENCES	MAP NO.

The Good Hope vein was discovered in 1874 by placer miners who had been working in the arroyo east of the mine site. It was found through systematic prospecting upstream. Remnants of the original arrastres can be found near the wash south of the millsite. Development began on the Good Hope claims at the north end and by 1889, when the property was acquired by J.M. Sigafus and E.A. Bird, the vein was also being worked 1,000 feet to the south, on the San Jacinto claims, but no workings were deeper than 110 feet. By then, $260,000 reportedly had been produced (Burnham, 1893 in Engel and others, 1959). During the period of the mine's greatest activity, a total of 24 months from 1889 to 1894, development connected the Good Hope and the San Jacinto underground workings and deepened the mine to over 500 feet. The mine employed more than 100 men and netted $5,000 to $10,000 per month (Bird, 1919 in Engel and others, 1959). Financial difficulties and mine safety problems closed the mine in 1936. Between 1947 and 1953, the main shaft was reopened to 115 feet and a new 50-foot shaft was sunk near the south end of the property, however there was no production at this time. All workings have been inaccessible since 1955.

The grade of the ore was consistent over the 3,300-foot length of the vein. In the period 1890-92 ore mined along 1,875 linear feet of the vein averaged 24 inches in width and returned $15 to $20 per ton from the mill (gold $20.67 per troy ounce). An early report (Burnham 1893) quotes an average recovered value of $23.78 per ton, from the record of the entire mill run to that date. The same report states that the width of pay ore in all open workings averaged 18 inches. A comprehensive assay survey throughout the mine, made about 1895, showed an average assay value of $22.51 per ton in gold for 209 samples. Ore shoots sampled were rarely wider than 30 inches, and usually were 18 inches or less in width.

For this investigation, three samples were collected from a low hill near the main shaft and the millsite. The hill was covered with scattered dump tailings. A sample of quartz plus calcite vein filling contained 0.295 oz/ton gold and 0.26 oz/ton silver. A sample of quartz plus calcite vein with abundant sulphides assayed 0.001 oz/ton gold and 0.01 oz/ton silver. A sample of altered quartz diorite host rock with pyrite on fracture surfaces assayed 0.001 oz/ton gold and 0.01 oz/ton silver. A grab sample of mill tailings from the tailings dump east of Highway 74 assayed 0.012 oz/ton gold and 0.01 oz/ton silver. Only two samples contained significant values; the samples cannot be considered representative of the deposit as a whole.

APPENDIX NO.	NAME/ U.S.B.M. NO.	LOCATION 7½' QUAD	COMMOD-ITY	MRZ ZONE	COMMENTS AND REFERENCES	MAP NO.
					The total value of mine production to 1908 was reported as $600,000 to $700,000 by J.M. Sigafus, owner of the mine since 1889. Combining the $260,000 produced before 1889 (Burnham, 1893) and the less than $10,000 produced in the 1930's, (Harford, H.M., 1954, personal communication in Engel and others, 1959), the total value of output is less than a million dollars. During one of the mine's most steadily active periods, from March 4, 1890 to February 1, 1892, a return of 3,165 ounces of bullion of various fineness, containing $51,465 in gold and $438 in silver, is listed in unverified returns from the U.S. Assay Office. These figures do not support the commonly quoted production figures of $1,500,000 (Cheatham 1909, in Engel and others, 1959) and $2,000,000 (Merrill and Waring, 1919) in bullion. References: Burnham, 1893, in Engel and others, 1959; Crawford, 1894, p. 221-223; Crawford, 1896, p. 311; Daniell, 1948, in Engel and others, 1959; Dudley, 1935, p. 488, 506; Fairbanks, 1893, p. 106-107, 384; Goodyear, 1888b, p. 527; Goodyear, 1890, p. 151; Larsen, 1948, p. 129-130; Larsen, 1951, p.46; Merrill and Waring, 1919, p. 529, p. 532-533; Sampson, 1935, p. 509-511, pl. VIII; Tucker, 1921, p. 222; Tucker and Sampson, 1929, p. 471, 480; Tucker and Sampson, 1945, p. 132-133, 134, pl. 35.	
140	Hoag Mine 0060650552	Steele Peak T4S R4W NE 1/4 NW 1/4 Sec 24	Au	MRZ-3a (h-4) p. 27	The Hoag lies within the Hartford Springs County Park. Surface expression of the workings has been practically obliterated. The vein was reported to be a poorly exposed quartz vein in diorite country rock, striking NW and dipping 40°S. Ore was reported to be of limited extent in lenses ranging from 2 1/2 feet to inches in thickness. Workings were 3 shafts and 1 decline with a maximum depth of 300 feet and 400 feet of drifts. U.S.B.M. records report 3,657 tons produced 231.79 oz gold and 110 oz silver. References: Saul and others, (1968), p. 499; Sampson, 1935, p. 512; Tucker and Sampson, 1945, p. 135.	123

APPENDIX NO.	NAME/ U.S.B.M. NO.	LOCATION 7½' QUAD	COMMOD-ITY	MRZ ZONE	COMMENTS AND REFERENCES	MAP NO.
141	Ida Leona 0060650208	Steele Peak T4S R4W NE 1/4 Sec 30	Au	MRZ-3a (h-4) p. 27	This property is located 400 feet south of the Gavilan Mine (appendix no. 135, map no. 131). This property was most active during the 1930's but apparently was working at the time of the gold closing order L-208. The workings are now caved and obscured. In 1959 the workings consisted of 3 incline shafts and drifts of unknown length at various levels. In 1945, the workings were reported to consist of a 2-compartment shaft 350 feet deep. Production was rumored to be $50,000 from an unknown tonnage. Not visited for this study. References: Saul and others, (1968), p. 505; Sampson, 1935, p. 508-509; Tucker and Sampson, 1945, p. 135-136; Larsen, 1948, p. 130.	132
142	Indian Rose Queen (Indian Rose Quartz Queen) 0060650469	Steele Peak T4S R4W NW 1/4 Sec 32	Au	MRZ-3a (h-5) p. 27	Located in the Santa Rosa area, the prospect consists of two ore zones in diorite country rock. One zone consists of anastomosing quartz veinlets outcropping in wall of a filled in shaft (with an adit heading off in the west wall). The zone is 6 feet wide and exhibits bleaching and argillic alteration. Minerals are kaolin, quartz and biotite. A second vein exposed about 75 feet west of the main workings is a crushed quartz vein in a shear about 2 feet wide. The rocks have been bleached and silicified and there is abundant iron oxide staining. The vein strikes N78°E and dips 58°S. Assays from this vein were poor: 0.002 oz/ton gold and 0.02 oz/ton silver. The workings are all caved but reported to have been only 65 feet deep. References: Saul and others, (1968), p. 508; Crawford, 1896, p. 311; Mining and Scientific Press, 1899, v. 79, p. 750; Merrill and Waring, 1919, p. 531, Tucker and Sampson, 1929, p. 482; Sampson, 1935, p. 512.	142

APPENDIX NO.	NAME/ U.S.B.M. NO.	LOCATION 7½' QUAD	COMMOD-ITY	MRZ ZONE	COMMENTS AND REFERENCES	MAP NO.
143	Jumbo 0060650461	Steele Peak T4S R4W NE 1/4 Sec 30 NW 1/4 Sec 31	Au	MRZ-3a (h-5) p. 27	The Jumbo site is at the east end of a ridge which lies south of the Santa Rosa Mine Road. Just west of the Indian Rose Queen mine (appendix no. 142, map no. 142). The prospect is reported to be a 2-inch-wide vein in diorite with an attitude of N10°W, dipping 29°S. Exposed are shear zones of crushed quartz veinlets accompanied by wallrock alteration and minor silicification. Observed workings consist of a series of adits at various elevations on the NE end of the ridge and a caved decline (shaft?) on the north end of the ridge. The shaft is reported to be 50 feet deep. Channel sample across the shear zone assayed low at 0.003 oz/ton gold and 0.01 oz/ton silver. U.S.Bureau of Mines data records report total gold production of 1,382.1 oz and 477 oz. of silver. References: Crawford, 1896, p. 312; Tucker and Sampson, 1929, p. 482; Sampson, 1935 p. 512.; Saul and others, (1968), p. 521.	141

APPENDIX NO.	NAME/ U.S.B.M. NO.	LOCATION 7½' QUAD	COMMOD-ITY	MRZ ZONE	COMMENTS AND REFERENCES	MAP NO.
144	Lake View Prospect 0060650512	Lake Elsinore T6S R4W NW 1/4 Sec 4	Au	MRZ-4	Located at an elevation of 1,600 feet, on the south side of the low hills about 1 1/2 miles northeast of Lake Elsinore, and 1/4-mile north of the western boundary of the City of Elsinore landfill. The area is accessible by gravel road west of the city landfill. The workings are on or near the contact between dioritic-gabbroic rocks of the San Marcos gabbro to the north and metamorphic rocks to the south. The contact appears to be intrusive and strikes generally N59°E and dips 50°-65°SE. The workings consists of an open cut or pit 25 feet deep where measured along the west side of the pit. To the southwest are three open cuts; the westernmost of the three cuts is at the entrance to a 12-foot, north-trending adit in the diorite-gabbro. Farther to the southwest is a pit, partially caved, and overgrown. The diorite-gabbro is deeply weathered and chloritized. According to Engel and others (1959) gold was prospected in shear zones that strike north to northeast and dip 35° to 60°SE. These shear zones reportedly contain alaskitic, aplitic, and pegmatitic dikes. Although the rocks are sheared and are intruded by felsic dikes, evidence of hydrothermal alteration accompanied by mineralization is lacking. Two samples from these workings were fire assayed for gold and silver: a grab sample from the mine dump at the northeast end of the workings, and a composite chip sample from the two adjacent small open cuts, in the area between the adit and the open pit northeast of the adit. Silver content ranged from 0.01 to 0.03 oz/ton; gold content of both samples was 0.001 oz/ton. The Lake View prospect does not appear to be significantly mineralized. These workings have been inactive for many years, and there has been little, if any, production. Reference: Engel and others, 1959, p. 116.	205

APPENDIX NO.	NAME/ U.S.B.M. NO.	LOCATION 7½' QUAD	COMMOD-ITY	MRZ ZONE	COMMENTS AND REFERENCES	MAP NO.
145	Lee Prospects 0060650817	Lake Elsinore T6S R5W SE 1/4 Sec 14	Au	MRZ-4	Located in the bottom of a ravine at an elevation of 1,480 feet, and on the southeasterly to easterly facing ridge north of the ravine, up to an elevation of 1,720 feet. The area is about 1/2-mile west of the west shore of Lake Elsinore and about 1/2-mile southeast of Highway 74. The country rock is San Marcos gabbro that has been intruded by several conspicuous parallel, granitic to pegmatitic dikes that strike N15° to 20° and dip about 70°NE. The dikes are a few feet thick and are comprised of potassium feldspar, quartz (mostly milky to clear but some rose-colored, some bluish-violet), with subordinate amounts of mica and black tourmaline. Hydrothermally altered gabbro is exposed in a shaft at an elevation of 1,720 feet on the southeast-facing ridge north of the ravine. The alteration occurs along shears and forms veins stained with iron and manganese(?) oxides. The veins are in various orientations. One vein exposed in the wall of the shaft strikes N20°W and is vertical. A grab sample of altered gabbroic rock was collected from the mine dump. The sample was unusually light weight, signifying loss of mass during alteration. In hand specimen the sample shows intense argillic and possibly sericitic alteration and limonite staining. The sample assayed 0.02 oz/ton silver and 0.002 oz/ton gold. ICP analysis showed enrichment in copper (341 ppm), iron (8.53%), strontium (177 ppm), barium (223 ppm), and possibly molybdenum (55 ppm), nickel (45 ppm), cobalt (21 ppm), arsenic (32 ppm), vanadium (95 ppm), and chromium (24 ppm). This alteration may be associated with previous hydrothermal activity along the western margin of the Elsinore fault zone. Workings consist of a 12-foot by 15-foot rectangular shaft, 15 to 20 feet deep, now caved, a crosscut adit 150 feet southeast of and 60 feet downslope from the shaft, and possibly intersecting the shaft. South of these workings, an adit was driven S48°W for an unknown distance, probably to crosscut the pegmatitic dikes that crop out west of the adit. Other workings reported in Engel and others, 1959, were not located. No known production. Long Idle. Reference: Engel and others, 1959, p. 116.	217

APPENDIX NO.	NAME/ U.S.B.M. NO.	LOCATION 7½' QUAD	COMMOD-ITY	MRZ ZONE	COMMENTS AND REFERENCES	MAP NO.
146	Leon 0060650206	Romoland T6S R2W NW 1/4 Sec 18 T6S R3W NE 1/4 Sec 13	Au Ag	MRZ-4	The main workings are located at an elevation of about 1,580 feet on the south slope of Hill 1700, 3/4-mile north of Bundy Canyon Road. The mine was opened in the late 1800's and was regarded as promising by Merrill and Waring (1919). The country rocks at the Leon Mine are quartzites, quartz schists, and phyllites correlative with the Bedford Canyon Formation. Foliation and bedding strikes N70°W and dips 60°NE. On the hill above and north of the main workings, the quartzites strike N45°W and dip 70°NE. The quartzite is generally fine to medium grained and dark gray in color with off-white laminae parallel to the bedding. These could represent slight compositional differences within quartzite layers. The main mine dump contains fragments of a dark grey very fine grained hypabyssal rock (dike or sill) with white "blebs" giving it a "spotted" appearance. An open trench trends northwesterly from a 20-foot deep pit, a caved shaft at the main workings. A quartz vein in a shear zone was apparently well exposed during early development of the mine. About 40 feet beyond the western end of the trench in quartz schist, a shear zone strikes N60°W and dips 65°N. parallel or subparallel to the foliation and bedding in the metasedimentary rocks. Saul (Saul and others, (1968)) described the shear zone as about 3 feet wide, striking N55°W, dipping 70°NE and extending about 1500 feet. Crawford (1894) described the quartz vein at the Leon Mine as 1 to 2 feet thick. The footwall rocks at the northwest end of the trench are light gray micaceous quartzites with numerous, small (<1 mm to 1 cm thick), quartz-filled fractures resembling gash veins. These veins occur in at least two and probably three sets of fractures. A chip sample of the footwall assayed 0.03 oz/ton silver and 0.006 oz/ton gold; the gold and silver may be associated with the quartz veinlets, although in hand specimen they do not appear to be mineralized. Three samples from the main dump were assayed. A sample of gray to white (mottled) quartzite assayed 0.04 oz/ton silver and 0.031 oz/ton gold. This sample had jarosite(?) stain on fracture surfaces and rusty "blebs", possibly oxidized pyrite within the groundmass. Quartz schist (fine-grained, micaceous quartzite) assayed 0.03 oz/ton silver and 0.008 oz/ton gold. Grey to white to rusty-brown, mottled quartzite with jarosite(?) stain and rusty-brown "eyes" of iron oxide assayed 0.05 oz/ton silver and 0.002 oz/ton gold.	232

APPENDIX NO.	NAME/ U.S.B.M. NO.	LOCATION 7½' QUAD	COMMOD-ITY	MRZ ZONE	COMMENTS AND REFERENCES	MAP NO.
					Workings at the Leon mine reportedly consisted of two vertical shafts, a shallow pit, and a trench. The collars of the shafts are on the vein and about 200 feet apart, and the northwesterly shaft is 50 feet higher in elevation. The northwest shaft, now caved, was reportedly 150 feet deep (Crawford, 1896). The depth of the southeast shaft was not determined. The pit and trench explore the shear zone between the two shafts. An adit (now caved) appears to have been a crosscut driven northerly from southeast of the main shaft. A small mine dump was observed about 500 feet northwest of the main workings at an elevation of about 1,600 feet on the west face of Hill 1700. Total production is unknown. One oz/ton gold and 1 oz/ton silver were reportedly produced from three tons of ore mined in 1950. Idle since the 1950's. References: Crawford, 1894, p. 223, and 1896, p. 312; Larsen, 1948, p. 130; Merrill and Waring, 1919, p. 534-535; Saul and others, (1968), p. 531-532; Tucker and Sampson, 1929, p. 483.	
147	Little Maggie (Maggie) 0060650470	Steele Peak T4S R4W Sec 32	Au	MRZ-3a (h-5) p. 27	This mine is located south of the Santa Rosa road. It was originally located in 1894 and last worked in the 1940's, and is a quartz vein in weathered diorite. The vein strikes N85°W, dips 50°S and crops out for about 100 feet. The vein is crushed quartz 1 inch to 2 inches in thickness. At depth, the thickness was reported to be 8 inches. Some argillic alteration and silicification in the wallrock around the vein is observed. Minor iron oxide staining is present. Reported workings were an 80-foot shaft, a 200-foot decline, a 60-foot adit, and an open cut, as well as several shallow prospect pits. Remaining workings are 4 declines 75 to 175 feet deep - all caved. Assay from a "selected" sample from the exposed vein was good: 0.746 oz/ton gold and 0.15 oz/ton silver. References: Saul and others, (1968), p. 566; Crawford, 1896, p. 312; Mining and Scientific Press, 1899, vol 78, # 10, p. 267; Merrill & Waring, 1919, p. 534, Tucker and Sampson, 1929, p. 484, Sampson, 1935, p. 513.	143

APPENDIX NO.	NAME/ U.S.B.M. NO.	LOCATION 7½' QUAD	COMMOD-ITY	MRZ ZONE	COMMENTS AND REFERENCES	MAP NO.
148	Lucky Boy (Walker) 0060650422	Romoland T6S R3W NW 1/4 Sec 9	Au	MRZ-4	Location is uncertain and the site was not located during a reconnaissance of the area for this study. The deposit was discovered in 1892 and has remained idle since prior to 1917. The mine was previously described as a vein in country rock of deeply weathered diorite of the Bonsall tonalite. The outcrop is barely 100 feet long and was obscured by brush, soil, and the caved state of the mine. The vein appeared to strike N55°W and was vertical. It was reportedly 4 inches to one foot thick and faulted in two places (Storms, 1892). The quartz vein is reportedly fractured and recemented and pocketed with iron oxides. There is no report on the gold content. Storms (1892) estimated some high grade to run about $40 per ton. Pyrite reportedly occurs in the ore below the water table. In 1896, the workings were filled or caved. Two shafts, 50 and 60 feet deep respectively, reportedly were sunk on the vein. Water was reported to be the principal problem (Crawford, 1896). Production is undetermined. References: Crawford, 1894, p. 223-224; 1896, p. 312; Merrill and Waring, 1919, p. 534; Sampson, 1935, p. 513; Storms, 1892, p. 385; Tucker and Sampson, 1929, p. 484; Saul and others, (1968), p. 553-554.	229

APPENDIX NO.	NAME/ U.S.B.M. NO.	LOCATION 7½' QUAD	COMMOD-ITY	MRZ ZONE	COMMENTS AND REFERENCES	MAP NO.
149	Lucky Strike (Ophir) 0060650493	Lake Elsinore T6S R6W SW 1/4 Sec 21	Au Ag	MRZ-4	Located at an elevation of 1,640 feet at the northeast base of a low hill southeast of Highway 74 about 3 airline miles northeast of Elsinore in an area developed by single family residences. The current owner of the property on which the mine is located confirmed that the mine workings are inaccessible. The country rock is deeply weathered quartz diorite. The prospect is reportedly a quartz vein as much as 15 inches wide at the surface with a strike of N80°E and dip of 45°S in the collar of the main shaft. The vein consists of anastomosing quartz stringers, and is 15 inches wide. It turned to strike N55°E and dip 55°SE where it was exposed 100 feet to the east in a second shaft. The vein was discontinuously exposed for several hundred feet across the hill. At the surface the vein reportedly was strongly stained with iron oxides and had a well-defined clay selvage. A second, more northerly quartz vein, not exposed at the surface, is reported to strike E-W and dip 35°S and intersect the main vein at the 50-foot level of the mine workings. On the 50-foot level the main vein is reported to range from 2 to 24 inches in thickness with an average thickness of about 10 inches. On this level the ore shoot is reported to be about 85 feet long. Some ore reportedly carries 25 ounces of silver and $8.00 in gold per ton. The quartz veins reportedly contain free gold, silver, marcasite, pyrite, arsenopyrite, and copper mineral stains; the north vein reportedly has a higher content of silver. The mine reportedly was developed by a main shaft inclined 45° and 150 feet deep, along the main vein. A second inclined shaft of undetermined depth is located about 100 feet east of the main shaft. Other workings include a 100-foot drift on the 50-foot level, and a 150-foot drift on the 150-foot level. The 150-foot level is reported to have exposed a 30-inch width of sulphide ore. The mine was in existence as early as 1896 when the hoist engine was reportedly removed; the mine apparently remained idle for many years and work resumed in 1917, and the mine reportedly was active in 1918. In 1945 the lower (150-foot) level was reportedly under water. In 1955 the shafts were caved at a depth of 20 to 30 feet and were inaccessible. References: Crawford, 1896, p. 313; Engel and others, 1959, p. 67-68; Gay, 1955, unpublished field notes; Merrill and Waring, 1919, p. 529; Tucker and Sampson, 1929, p. 486, and 1945, p. 137-138; Sampson 1935, p. 513; Saul and others, (1968), p. 558-560.	189

APPENDIX NO.	NAME/ U.S.B.M. NO.	LOCATION 7½' QUAD	COMMOD-ITY	MRZ ZONE	COMMENTS AND REFERENCES	MAP NO.
150	Mammoth Group 0060650822	Romoland T6S R3W Sec 8	Au	MRZ-4	Located at an elevation of about 1,700 feet, on the northeast slope of a low northeast trending ridge about 0.6 mile west of Murrieta Road and about 1,800 feet east of Hill 2048. A lenticular body of quartz is well exposed on the southeast slope of a low granodiorite (Bonsall tonalite) ridge through a horizontal distance of about 250 feet. The vein strikes northeast, dips about 15° northwest, and is as much as 7 feet thick. Fractures and fissures in the quartz are filled or lined with iron oxides. The vein reportedly contains free-milling gold and pyrite. The deposit has been explored by means of a 60-foot vertical shaft, an inclined shaft, an adit, two open-cuts and several shallow prospects. The inclined shaft reportedly is 200 feet deep and is connected to vertical 60-foot air-shaft via a crosscut drift (Crawford, 1896). The portal of the inclined shaft is at the face of an open-cut as much as 8 feet deep and 60 feet long, in the west lobe of the vein outcrop. The cut and shaft trend N40°W. The tapering, east end of the outcrop is explored by the adit and second open-cut. The adit trends N40°W for 60 feet. The open cut, 40 feet farther east, is parallel to the adit and is 30 feet long. At the portal of the adit the vein appears to have divided into three roughly parallel veins as much as 6 inches thick separated by tabular bodies of country rock 1 to 2 feet in thickness. This group of claims was reportedly patented in 1896, at which time development of the mine was well advanced. Activity ceased prior to 1917 and no activity has been reported since that time. References: Crawford, 1896, p. 312; Merrill and Waring, 1919, p. 534; Sampson, 1935, p. 513; Saul and others, (1968), p. 567-568; Tucker and Sampson, 1929, p. 484.	228

APPENDIX NO.	NAME/ U.S.B.M. NO.	LOCATION 7½' QUAD	COMMOD-ITY	MRZ ZONE	COMMENTS AND REFERENCES	MAP NO.
151	Menifee Mine 0060650420	Romoland T6S R3W SE 1/4 Sec 5	Au Ag	MRZ-4	Located at an elevation of about 1,520 feet, within 1/4-mile west of Murrieta Road, about 2 miles south of Sun City. By 1885 the Menifee mine was well developed and a five-stamp mill was being constructed to avoid the continued shipment of concentrates to San Francisco via San Diego (Mining and Scientific Press, 1885). The mine apparently operated continuously through 1896 (Crawford, 1896). In 1899 the mine was idle and had passed into the hands of a Chicago interest (Mining and Scientific Press, 1899). U.S. Bureau of Mines records show that in 1900 G.S. Allen operated the mine, followed in 1901 by W.F. Bray, and in 1903 by Morrison and Anderson. These men may have been lessees. Tom Chaffin owned the Menifee mine in 1917 (Merrill and Waring, 1919) and as late as 1935 (Sampson). The mine was part of the Rhodes Ranch in 1959. The vein is no longer exposed, but reportedly it was along a diorite-schist contact. Strike was northeast and dip was 80°NW to a depth of 40 feet where it flattened to 65°NW. The vein was reported to range from one foot to 30 inches in thickness and to yield about $24 per ton in gold. Traces of pyrite were reported present (Storms, 1892). Ore on the old dump is fractured vein quartz with coatings and pockets of iron oxides. The vein was explored through 4 shafts 30, 55, 100, and 125 feet deep with accompanying drifting and stoping. In 1959 the shafts were filled and the mine long abandoned. Production figures were compiled by the U.S. Bureau of Mines and, with permission of the owner, were included in the Riverside County Report (Saul and others, (1968)):	227

Year	Crude ore (tons)	Recoverable metals Gold (ounces)	Silver (ounces)
1900	-	29.02	282
1901	-	41.12	
1903	45	21.77	

References: Storms, 1892, p. 385; Crawford, 1896, p. 312; Merrill and Waring, 1919, p. 533; Tucker and Sampson, 1929, p. 484; Sampson, 1935, p. 513; Saul and others, (1968), p. 575-577; Mining and Scientific Press, 1885, v. 51, p. 120 and 1899, v. 79, p. 750.

APPENDIX NO.	NAME/ U.S.B.M. NO.	LOCATION 7½' QUAD	COMMOD-ITY	MRZ ZONE	COMMENTS AND REFERENCES	MAP NO.
152	Morris-Washington Prospects 0060650455	Steele Peak T4S R4W S 1/2 Sec 22	Au Ag	MRZ-4	Quartz veins are arranged around a small gabbro outlier. One, outcropping on the south side of the hill, is an unmineralized pegmatite, striking N30°W, dipping 30°S. It is explored by a trench and short adit. A vein outcrops on the east side of the hill and strikes N5°W and dips 44°S. This vein is 2 to 6 inches wide and exhibits iron oxide mineralization, some specular hematite is present, and minor boxworks. Calcium carbonate and silica have filled veins and veinlets in the zone and there is argillic alteration surrounding the vein. The vein has been explored by 2 short adits. A 20 foot wide fault zone on the west side of the hill displays massive argillic alteration and shows anastomosing calcium carbonate and silica veins and veinlets. The fault has been developed by an open cut and an adit, now caved. No iron oxides or any sulfides observed on the west side of this prospect. Assays from this prospect ranged from 0.001 to 0.003 oz/ton gold and 0.03 to 0.31 oz/ton silver. Reference: Saul and others, (1968), p. 598.	133
153	Musick 0060650496	Lake Elsinore T5S R4W NE 1/4 Sec 23	Au	MRZ-4	Located in low hills at an elevations of 1,400 to 1,450 feet on the west side of Railroad Canyon, 400 to 500 feet west of the San Jacinto River Channel. Thin quartz stringers 1 to 2 inches wide reportedly occur along planes of schistosity in slates of the Bedford Canyon Formation. The foliation strikes N5°-20°W and dips 50°-70°NE. The metasediments have been explored for a distance of 400 feet or more along a northerly trend by shallow surface pits and trenches, an adit, and a vertical shaft. The shaft, now inaccessible, is reportedly about 40 feet deep and is partly caved. It is located on the north side of a ravine between low hills at the westerly bend of the San Jacinto River channel. An adit has been driven southwesterly into the south side of the ravine just south of the shaft. The shallow trenches and pits are caved and overgrown. The thin quartz stringers discussed above appear to be layers of quartz resulting from recrystallization of thin quartzitic beds during metamorphism of the sedimentary rocks. Rocks exposed on the mine dump adjacent to the shaft did not include any fragments from a typical quartz vein. The rock on the dump did not appear to be hydrothermally altered or mineralized. This property has been inactive since the early 1900's or earlier; no known production. Reference: Engel and others, 1959, p. 117.	188

APPENDIX NO.	NAME/ U.S.B.M. NO.	LOCATION 7½' QUAD	COMMOD-ITY	MRZ ZONE	COMMENTS AND REFERENCES	MAP NO.
154	Owens	Lake Elsinore T5S R4W NE 1/4 Sec 15	Au	MRZ-4	Located at an elevation of about 1,640 feet in an area of low relief about 1/2 mile southeast of Highway 74 about 5 miles northeast of Elsinore and 3/5 mile due east of the Good Hope mine (appendix no. 139, map no. 183). The prospect is reportedly a N10°E trending 3- to 5-foot-wide aplite dike that is discontinuously exposed for 100 yards or more through deeply weathered quartz diorite. It is explored by 4 shallow pits and shafts in a line trending for 75 yards N25°E across the dike. The deepest shaft, located at the southwest end of the workings, reportedly is 30 feet deep but caved near the collar and inaccessible. Iron-stained, fractured vein quartz was found on the dump. Owner reported no known production; workings abandoned since prior to 1900. Ruins of a stone arrastre reported at the road corner 250 yards southwest of the 30-foot shaft. The old workings were not located for this study. The area is presently scattered residential. References: Engel and others, 1959, p. 118.	184
155	Prospect Mtn	Lake Mathews T5S R5W NE 1/4 Sec 4	Au Ag	MRZ-3b (h-1) p. 30	Prospect near intrusive contact of gabbro and metasediments. Probably on a fault or shear striking N55° and dipping 41°S. Country rock is altered, bleached meta-volcanics displaying boxworks, argillic and hematitic alteration. Samples assayed at 0.001 oz/ton gold and 0.05 oz/ton silver. Workings reported to be one shaft 30 feet deep (personal communication with owner Mr. Schwinn) now filled. No production.	116
156	Purple Hope (Bob Cat No. 1) 0060650810	Lake Elsinore T5S R5W E 1/2 Sec 24	Au	MRZ-4	Located at on the north side of Hill 2102 about 2 3/4 miles east of Alberhill. There are two groups of workings: the main (southern) workings adjacent to the jeep trail on the north side of Hill 2102; and the northern workings, located on both sides of the ravine north-northeast of the main workings. The workings are in regionally metamorphosed tuffs and flows that are thought to be correlative with the Santiago Peak volcanics although these rocks are included in the Temescal Wash quartz latite on the geologic map (this study). The southern workings consist of an open trench 40 to 50 feet long, trending N42°E, a shallow pit or decline located 20 feet northwest of the south end of the open trench. An open cut partly covered with timbers is about 15 feet north of the decline. A fault that strikes N35°W and dips 55°NE is exposed in the decline and in the south end of the open cut. The hanging wall is a weathered and weakly kaolinized tuffaceous rock possibly containing sparsely disseminated pyrite evidenced by small, limonite-stained cavities. The hanging wall rocks are parallel to the fault. The footwall is volcanic rock but is poorly exposed. The wallrock adjacent to the fault zone is strongly kaolinized and weakly silicified. Limonite staining along fractures in the hanging wall rock is most prevalent along the fault zone.	176

APPENDIX NO.	NAME/ U.S.B.M. NO.	LOCATION 7½' QUAD	COMMOD-ITY	MRZ ZONE	COMMENTS AND REFERENCES	MAP NO.
					The northern workings at the Purple Hope consist of two pits along the contact between brownish-maroon metavolcanic rock (flattened vesicles suggest that the rock is probably a flow) on the east, and brownish-green metavolcanic rock (a pyroclastic unit) on the west. The contact strikes N60°W and dips about 70°W. Limonite stain on fractures appears to be due to oxidation of finely disseminated pyrite. Epidote occurring along fractures indicates weak propylitic alteration. Weak propylitic and kaolinitic alteration of the metavolcanic country rocks is probably associated with emplacement of the elongate body of quartz monzonite which crops out along the crest of the ridge to the west of the Purple Hope workings. Four samples from the Purple Hope workings were assayed for gold and silver: a 15-foot composite chip sample from the south end of the 40-foot long trench in the south workings; a composite sample from the decline and from the mine dump adjacent to the jeep trail; samples of the two volcanic rock types from the south pit in the north workings. All samples assayed low: 0.01 oz/ton silver and 0.001 oz/ton gold. This property has been long idle, and there is no known production. References: Engel and others, 1959, p. 118-119.	
157	Red Bird No. 1 0060650809	Lake Elsinore T5S R5W SE 1/4 Sec 24	Au	MRZ-4	Located on the northeast side of Hill 2102 about 2 3/4 miles east of Alberhill, this property includes a main area of workings at elevation 1,650 feet near the base of the hill and an adit at an elevation of 1,760 feet, up the hill to the west-northwest of the main workings. The main workings consist of a trench leading southwesterly into an open cut about 20 feet high at the back, 25 feet wide, and 35 feet long in metamorphosed and weathered rocks with foliation that strikes N25°-46°W and dips 60°-70°SW. In the area of the trench the rocks are highly weathered and resemble either the metasediments of the Bedford Canyon Formation or metavolcanic rocks of the Santiago Peak Volcanics. On the basis of nearby exposures, these rocks are believed to be metavolcanics correlative with the Santiago Peak volcanics. However, the rocks in the area of the mine are included within the Temescal Wash quartz latite porphyry on the geologic map (this study). The volcanics are a maroon-brown to green with an aphanitic matrix surrounding clear quartz phenocrysts. Chloritic alteration is pervasive. The volcanic rocks are covered with a deeply weathered veneer of cobble-bearing colluvium exposed along the west face of the open cut. About 600 feet to the west of the cut, the volcanic rocks are in contact with a younger northwesterly trending elongate body of quartz diorite. The size of the mine dump and mill tailings suggest that the workings are more	177

APPENDIX NO.	NAME/ U.S.B.M. NO.	LOCATION 7½' QUAD	COMMOD-ITY	MRZ ZONE	COMMENTS AND REFERENCES	MAP NO.
					extensive than presently revealed or that rock from other mines and prospects was milled at the site. Rocks exposed in the open cut are extensively weathered, masking any hydrothermal alteration that might have affected these rocks. Relatively unweathered rock from the mine dump shows chloritic alteration resulting from regional metamorphism and the effects of the nearby intrusion of quartz monzonite. About 500 feet to the west-northwest of the open pit is a narrow 15-foot open cut at the entrance to a 6-foot long adit. These workings are in a vein of coarsely crystalline calcite that strikes N28°W and dips 80°-85°NE. The calcite is almost clear, to white to light honey-colored. The vein is at a maximum thickness of 5 feet near the floor of the adit. The host rocks are metavolcanics which have been replaced at the margins of the vein by fine-grained calcite. The calcite vein appears to be along a fault. The vein extends southeasterly about 600 feet as evidenced by calcite in the colluvium. Volcanic rock from the main workings assayed at 0.001 oz/ton gold and 0.01 oz/ton silver; mill tailings assayed 0.001 oz/ton gold and 0.05 oz/ton silver. No known production. Idle for many years. Reference: Engel and others, 1959, p. 119.	
158	Romoland Group 0060650417	Romoland T5S R3W SW 1/4 Sec 23 NW 1/4 Sec 26	Au	MRZ-4	Located at an elevation of about 1,700 feet, about 1/4-mile northwest of Hill 2141, 1 1/4 miles east of Sun City. The Romoland Group is on a north-trending ridge comprised of diorite and gabbro. On the north and east slopes of the ridge, narrow, poorly exposed quartz veins lie in shear planes that strike N25°E to N25°W and dip 50°SE to 70°NE as exposed in the workings. The quartz is unevenly mineralized with open-space fillings of iron oxides. Saul (Saul and others, (1968)) reports that a sample of the iron oxides, when panned, showed traces of gold. The veins range from a fraction of an inch to 2 inches in thickness. A shear zone on the north slope of the ridge was explored by a 15-foot shaft inclined 45° on a S20°E trend. The shaft is partly caved. On the east slope another shaft was sunk about 50 feet on the 70° dip of a quartz vein. In a shallow ravine on the west side of the ridge an adit was driven S85°E in hornblende gabbro. The portal is partly caved; the adit appears to be about 40 feet in length. It may be caved as Saul reports that the adit appears to be at least 100 feet in length. The gabbro is deeply weathered but does not appear to be hydrothermally altered or mineralized. Production, if any, is undetermined; the workings have been idle for many years. Reference: Saul and others, (1968), p. 671-672.	223

APPENDIX NO.	NAME/ U.S.B.M. NO.	LOCATION 7½' QUAD	COMMOD-ITY	MRZ ZONE	COMMENTS AND REFERENCES	MAP NO.
159	San Antonio Mine 0060650466	Steele Peak T4S R4W SE 1/4 Sec 32	Au	MRZ-3a (h-5) p. 27	Located adjacent and south of the Royal Black Granite quarries (appendix no. 234, map no. 156). Prospect is a quartz vein developed by 6 incline shafts, 5 adits and an open cut. The vein is 1 to 6 inches wide with a strike of N70°E and dip of 25°S. Gabbro country rock is deeply weathered. No ore minerals observed, however the quartz is stained with iron oxides from the red soil. Assays collected for this study were 0.001 oz/ton gold and 0.02 to 0.01 oz/ton silver. Reported production by Saul and others (1968), from the U.S.Bureau of Mines, from 1935 to 1940 was 5.97 oz gold, total. References: Saul and others, (1968), p. 682.	155
160	Santa Fe Mine 0060650465	Steele Peak T4S R4W NW 1/4 Sec 31	Au	MRZ-3a (h-5) p. 27	Patented claims located west of the Santa Rosa mine (appendix no. 161, map no. 139). The prospect is a quartz vein and veinlet system. The vein is crushed with fragments stained with iron oxides. Minor black tourmaline is present. Dioritic wallrock has undergone argillic alteration over a thickness of 6 feet to 10 feet from the vein. Some silicification is also present. The main vein is reported to have a N70°W strike and a 45°S dip. Workings reported to be one incline shaft and a 700-foot adit. All workings now caved and abandoned before 1900. Assays from a dump grab sample were 0.009 to 0.001 oz/ton gold and 0.03 to 0.01 oz/ton silver. References: Saul and others, (1968), p. 686; Mining and Scientific Press, 1895, v. 70, p.106.	138
161	Santa Rosa Mine (Rosalia, Northern Belle, Old Mina Rosalia) 0060650462	Steele Peak T4S R4W NE 1/4 Sec 31	Au Ag Cu	MRZ-3a (h-5) p. 27	The Santa Rosa mine is an old Mexican prospect in the Pinacate district. It is a quartz vein in weathered diorite striking N10°W and dipping 45°S. The vein does not crop out at the surface. The workings are reported to be 200 feet deep and 1,000 feet along strike. The southern extension of the vein is the Golden Chariot property (appendix no. 136, map no. 140). Reported production (U.S. Bureau of Mines) was 6,745 oz gold from 1895 to 1901. Workings inaccessible as early as 1919. References: Saul and others, (1968), p. 688; Goodyear, 1888b, p. 527; Storms, 1892, p. 376; Merrill and Waring, 1919, p. 592; Tucker and Sampson, 1929, p. 487, 1945, Pl. 35; Sampson, 1935, p. 514; Jenkins, 1948, p. 265.	139

APPENDIX NO.	NAME/ U.S.B.M. NO.	LOCATION 7½' QUAD	COMMOD-ITY	MRZ ZONE	COMMENTS AND REFERENCES	MAP NO.
162	Santiago Peak	Santiago Peak T5S R6W NE 1/4 Sec 29	Au Ag	MRZ-4	Located along the Main Divide Truck Trail on the steep eastern slope of Santiago Peak in the Santa Ana Mountains, elevation 4,200 feet to 4,600 feet. A zone of oxidation and limonite staining in Santiago Peak Volcanics containing as much as 5% to 15% pyrite (hand specimen estimate), was sampled and analyzed for gold and silver. Some samples are of rocks mapped by Engel (1959) as intrusives genetically related to the Santiago Peak Volcanics and, for this study, are included in the Santiago Peak Volcanics. The volcanics have been intruded by granodiorite. Pyritization of the volcanics occurs near the contact with the granodiorite and is probably associated with hydrothermal activity accompanying emplacement of the granodiorite. The pyrite is disseminated within the host rocks and is also in small fractures forming pyrite veinlets. The host rocks are generally fine grained to aphanitic; some contain phenocrysts of both feldspar and quartz. On fresh surfaces, these rocks are typically gray to dark gray to greenish-gray; some, probably altered rhyolite, are nearly white. All of these rocks have been weakly metamorphosed to greenschist facies. Propylitic alteration has been overprinted on these regionally metamorphosed rocks, resulting in greater chloritization and pyritization as compared to Santiago Peak Volcanics sampled elsewhere. The alteration includes formation of chlorite (variety clinochlore) and replacement of silicate minerals by pyrite. Strongly pyritic and weakly to non-pyritic volcanic rocks contain sericite or illite, plagioclase, and quartz. The silver content of seven strongly pyritized samples assayed from 0.01 to 0.03 oz/ton and 0.1 to 0.5 ppm (ICP). The gold content of these seven samples is 0.001 oz/ton. For comparison, silver content of nine samples of the weakly- to non-pyritic Santiago Peak Volcanics assayed from 0.01 to 0.71 oz/ton (0.1 to 2.7 ppm (ICP)) and assayed low for gold: 0.001 oz/ton (all assays are fire assay).	164
163	Stanford Mine 0060650484	Steele Peak T5S R4W Sec 9	Au	MRZ 4	The prospect,located on the west side of a north-south trending ridge just east of Steele Peak, is a silicified fault striking N25°W and dipping 45°S. Cutting through metasediments, the fault zone is as much as 3 feet wide and, where exposed at the top of the ridge (appendix no. 194, map no. 162), is crushed and contains abundant iron oxides. Development consists of a 125-foot-deep shaft and joined by a 50-foot crosscut from an adit located about 30 feet lower on the slope. The property is reported to have had a 5-stamp mill on site. Two dump grab samples assayed at 0.001 oz/ton gold and 0.01 and 0.02 oz/ton silver. Active in the 1890's, the mine was idle by 1896. References: Saul and others, (1968), p. 710; Crawford, 1894, p. 225; 1896, p. 314; Merrill and Waring, 1919, p. 532; Tucker and Sampson, 1929, p. 487.	161

APPENDIX NO.	NAME/ U.S.B.M. NO.	LOCATION 7½' QUAD	COMMOD-ITY	MRZ ZONE	COMMENTS AND REFERENCES	MAP NO.
164	Top-of-the-World (La Plomo, Victor Victor-La Plomo, Steele) 0060650472	Steele Peak T4S R4W Sec 32	Au	MRZ-3a (h-5) p. 27	This prospect was said to have had free gold and silver-rich galena. Located on the north edge of Steele Valley, south of the San Antonio claims (appendix no. 159, map no. 155), the mine was opened before 1888 and most development was done at that time. Development consisted of a 1,200-foot tunnel off a 100-foot shaft, and a 1-stamp mill. Idle from the early 1890's to the 1930's. Some trenching has been carried out in the area, probably during the 1930's or 1940's. The vein is near the contact between diorite and metasediments. Although not exposed at the surface, the vein is reported to strike between N10°E and N20°E and dip 45°N. various attitudes are reported in the literature. The host rock at the adit is argillically altered, and debris on the surface consists of vein quartz and aplitic dike material. Assays for this study were low: 0.04 to 0.01 oz/ton silver and 0.001 oz/ton gold. All workings are caved. References: Saul and others, (1968), p. 734; Goodyear, 1888b, p. 527; Storms, 1892, p. 384; Crawford, 1894, p. 225; 1896, p. 314.	154
165	Twin Buttes No. 1 0060650399	Romoland T5S R2W S 1/2 Sec 18	Au	MRZ-4	Located at an elevation of 1,840 feet, on a north trending ridge in the northwest portion of Double Butte, 3 miles southeast of Romoland. A 12- to 18-inch-wide massive quartz vein in granodiorite is exposed on the north trending ridge top in the northwestern part of the hills that form Double Butte. The vein strikes E-W and dips 65°-70°N and crops out just west of the top of the ridge and extends 100 yards to the east. The quartz is milky white in outcrop but portions are clear in hand specimen. The vein is slightly stained brown to red-brown with oxides of iron, mostly as thin coatings on surfaces of fractures. In outcrop the quartz is barren of other minerals. A sample of iron-stained quartz collected along the western portion of the vein assayed 0.02 oz/ton silver and 0.001 oz/ton gold. Pegmatite dikes in the Twin Buttes area strike generally E-W and consist of orthoclase and quartz with micas and black tourmaline. Reportedly, there are two en echelon shear zones of milky vein quartz ranging from 0 to 4 feet thick. The quartz is described as being highly fractured and sheared with fissures and cavities filled with oxides of iron. The west vein is explored by a 6-foot pit, a 60-foot shaft, is crossed by a trench 60 feet long, and, at its eastern extreme, by a prospect pit and a second shallow trench. The east vein is reportedly explored by a 60-foot shaft joined at the 15-foot level by a 30-foot adit driven west on the shear. The workings described previously have apparently been destroyed, caved or overgrown. Production is unknown; workings were idle in 1959. Reference: Saul and others, (1968), p. 740.	225

APPENDIX NO.	NAME/ U.S.B.M. NO.	LOCATION 7½' QUAD	COMMOD-ITY	MRZ ZONE	COMMENTS AND REFERENCES	MAP NO.
166	Unknown Name Placers	Lake Elsinore (Elsinore) T5S R4W Sec 14, 15, 23 (Locations approximate)	Au	MRZ-4	Locations are only generally known as interpreted from the literature. Placer deposits in the gently sloping wash between the Good Hope mine and the San Jacinto River in Railroad Canyon were among the first to be worked in the region around Lake Elsinore and were active in the middle and late 1800's. This area is described by Crawford (1894) as an ancient north-trending river bed whose source lay to the north; the river bed is readily traceable from a point two miles north of Good Hope for several miles toward Elsinore. Where it reaches the San Jacinto River it is several hundred feet wide, more than 100 feet deep and apparently consists of two or more channels. Although little deep or systematic mining of the river bed was in evidence in 1894, most of the area had been worked by Mexican miners, and every gulch and ravine cutting the river bed is reported to have contained gold. Lack of water for hydraulic mining presumably hampered mining operations. From Crawford's description it is not possible to determine the location of the ancient river channel with any degree of accuracy, nor was an attempt made to trace it during field work for this study. It is probably accurate to conclude that some placer mining was undertaken in the drainage system east of the Good Hope gold mine (appendix no. 139, map no. 183). References: Crawford, 1894, p. 220-221; Engel and others, 1959, p. 61-62.	187
167	Unknown Name Prospect(s)	Fontana T2S R5W Sec 6	Au	MRZ-4	Located on the east face of the wash between the Jensen quarries (appendix nos. 76 and 220, map nos. 7 and 8) and the Stringfellow quarry (appendix no. 111, map no. 4) on the south slope of the Jurupa Mtns. This group of prospects is on quartz stringers and veins, some pegmatitic, in gabbro and quartz diorite. No ore minerals observed. No production. Samples assayed at 0.001 oz/ton gold and 0.01 oz/ton silver. References: MacKevett, 1951, p. 14; Pampeyan, 1951, p. 43.	5
168	Unknown Name Prospect	Fontana T2S R5W Sec 6	Au	MRZ-4	Located at the mouth of a wash between the Jensen quarry (appendix no. 220, map no. 8) and the Stringfellow quarry (appendix no. 251, map no. 4) on the south slope of the Jurupa Mtns. Prospect is in metasediments (quartzite) which has been sheared. No evidence of mineralization is observed. Workings consist of one short adit. No production. References: Mackevett, 1951, p. 14; Pampeyan, 1951, p. 43.	6

APPENDIX NO.	NAME/ U.S.B.M. NO.	LOCATION 7½' QUAD	COMMOD-ITY	MRZ ZONE	COMMENTS AND REFERENCES	MAP NO.
169	Unknown Name Prospect	Corona South T4S R7W Sec 8	Au? Sn?	MRZ-4	Located above Tin Mine Canyon, just west of Skyline Drive at the 2,360-foot elevation. The prospect is developed in an area where tourmalinized quartzites of the Bedford Canyon Formation are in contact with the Santiago Peak Volcanics. A target for prospecting is the shear on the south side of the prospect which shows some iron oxide and strikes N40°W and dips 82°N. Calcite is abundant, epidote is common and tourmalinization and silicification are the major alteration modes. No ore minerals were observed. Development is by one open cut which faces east, is 300 feet long, 100 feet wide and 30 feet deep in places. In general the open cut parallels the slope. The dumps reflect the large prospect cut. Assays were 0.001 oz/ton gold and 0.01 oz/ton silver. No information exists on this prospect. The presence of tourmaline alteration suggests the possibility that this may have been a tin prospect.	52
170	Unknown Name Prospect	Corona South T4S R7W Sec 9	Au? Sn?	MRZ-4	Located on the south side of Tin Mine Canyon about 10 feet above flow line of Canyon, just beyond the point where the canyon trends southwest. The adit is about 4 feet high and appears to extend at least 60 feet back in black phyllites. Minor iron oxides present, no ore minerals observed, no dump present. It is possible that this adit was cut to access the "Tin Mine Canyon Fault". Adit floor flooded.	55
171	Unknown Name Prospect	Corona South T4S R7W Sec 9	Au?	MRZ-4	Located on the south side of Tin Mine Canyon. The prospect is a short adit 3 feet by 4 feet by 8 feet. Small dump of quartz vein material. No mineralization.	56
172	Unknown Name Prospect	Corona South T4S R7W Sec 9	Au?	MRZ-4	Adit on south side of Tin Mine Canyon dug perpendicular to shear striking N74°W, 86°N. No mineralization observed. Assay from nearby shear 0.001 oz/ton gold and 0.04 oz/ton silver.	57
173	Unknown Name Prospect	Corona South T4S R7W SE 1/4 Sec 14	Au	MRZ-4	Main Street Canyon. Numerous small prospect pits in black quartzites of the Bedford Canyon Formation. No mineralization observed.	70
174	Unknown Name Prospect	Corona South T4S R7W NW 1/4 Sec 23	Au	MRZ-4	Adit at least 50 feet long in the north wall of Main Street Canyon. Country rock is appears to be a lithic tuff. Flooded. No mineralization observed. No dump observed.	71

APPENDIX NO.	NAME/ U.S.B.M. NO.	LOCATION 7½' QUAD	COMMOD-ITY	MRZ ZONE	COMMENTS AND REFERENCES	MAP NO.
175	Unknown Name Prospect	Lake Mathews T4S R5W NE 1/4 Sec 30	Au Ag	MRZ-3a (h-3) p. 26	Located at the head of a short canyon west of Monument Peak, the prospect is a shear striking east-west, dipping 48°S. Country rock is bleached silicified metasediments. Pyrite is disseminated throughout the host rock and in the vicinity of the shear, has been altered to iron oxides. Tourmaline in blebs and veinlets is abundant. Sample taken at adit assayed 0.062 oz/ton gold and 0.10 oz/ton silver. Development is a trench with an adit at the east end. The remains of an arrastre are located on the dump a short distance from the adit.	99
176	Unknown Name Prospect	Lake Mathews T4S R5W Sec 29	Au	MRZ-3a (h-3) p. 26	A series of prospects located at the head of a short north branch of Dawson Canyon, south of Monument Peak. The most prominent prospects are on a highly altered shear zone which is on the contact between older quartz latite and the quartz monzonite of Monument Peak. The shear strikes N70°E to N50°E and is near vertical. The zone is 3 feet to over 6 feet wide and exhibits a high degree of mylonitic texture and argillic alteration, saussuritization and some silicification. Tourmaline occurs in veinlets. No ore minerals were observed. Assays 0.001 oz/ton gold and 0.04 oz/ton silver. Zone is developed by a shaft and a series of prospect pits and trenches and dozer cuts which extend over a vertical elevation of 200 feet. This shear may extend as much as a mile, to an unknown name prospect (appendix no. 175, map no. 99).	100
177	Unknown Name Prospect	Lake Mathews T4S R5W Sec 33	Au Ag	MRZ-3b (h-1) p. 30	Located off a short jeep trail, in a wash just east of Gavilan Springs Ranch Road. The prospect is a 1-foot-wide quartz vein in altered hematitic volcanics. The vein strikes N9°W and dips 65°N. Although there is an abundance of iron oxides present, and some boxworks developed in vugs, no pyrite or ore minerals were observed. Development consists of a short adit and a 6-foot by 6-foot by 4-foot stoped area.	114
178	Unknown Name Prospect	Lake Mathews T4S R5W Sec 34	Au Ag	MRZ-3b (h-1) p. 30	Prospect located on top of a small hill just west of Estelle Mtn Road. The prospect is a sheared crushed quartz vein striking east-west and dipping 64°S. Vein is up to 10 feet wide and displays boxworks and limonite stringers in the crushed quartz. Hematite, manganese oxides, present. Host rock is bleached and argillically altered and shot with quartz veinlets. Assays were low: 0.001 and 0.002 oz/ton gold and 0.11 oz/ton silver. The vein has been developed by an east-west trending 10-foot-long trench, 6 feet deep, a 10 foot long adit, and a number of prospect pits.	115

APPENDIX NO.	NAME/ U.S.B.M. NO.	LOCATION 7½' QUAD	COMMOD-ITY	MRZ ZONE	COMMENTS AND REFERENCES	MAP NO.
179	Unknown Name Prospect	Lake Mathews T4S R5W Sec 4	Au Ag	MRZ-3b (h-1) p. 30	Prospect is 12-inch-wide shear zone in an argillically altered zone 12 feet wide and striking N40°E and dipping 60°S. Altered zone displays greenish gouge, manganese oxides and minor iron oxides. The prospect is developed with a pit 10 feet by 12 feet by 6 feet deep. Assays from channel sample across 2 feet of vein were 0.001 oz/ton gold and 1.94 oz/ton silver.	117
180	Unknown Name Prospect	Lake Mathews T4S R5W Sec 4	Au Ag	MRZ-3b (h-1) p. 30	This prospect is located just below the west side of a ridge overlooking a drainage in Sec 4. The workings, one large and one smaller open cut, are located above and below a primitive road, nearly overgrown. The most spectacular feature of this prospect is the boxworks textures: both the amount and variety. The prospect is a crushed quartz zone of about 6 feet in width. The quartz diorite has been highly altered. No sulfides are observed. Iron oxides are abundant. The large open cut is 20 feet by 20 feet and ore has been broken but not removed from the site. A smaller open cut 6 feet by 4 feet is above the road. This location has been used as a collection area for quartz crystals. Assays results were 0.001 oz/ton gold and 0.10 oz/ton silver. Extent of vein was not determined because of overgrown nature of the slope.	118
181	Unknown Name Prospect	Steele Peak T4S R4W Sec 13	Au Ag	MRZ-4	Located in Hartford Park, this prospect is a quartz-filled shear zone. The shear strikes N88°E, dips 63°S, is about 1-foot-wide and consists primarily of gouge, blue and white quartz. Argillic alteration is pervasive in the diorite host rock. Although there is tourmaline in the area, there is none associated with this prospect. No sulfides and little iron oxide was observed. Samples assayed low: 0.001 oz/ton gold and 0.06 oz/ton silver. Workings consist of at least 3 declines, now caved and numerous pits and adits along a strike of 250 to 300 feet.	121
182	Unknown Name Prospect	Steele Peak T4S R4W Sec 24	Au Ag	MRZ-4	Located about 0.2-mile south of Hartford Springs, west of highway. The prospect is in deeply weathered quartz diorite, and no vein crops out although there is a small pile of pegmatitic-looking vein material. Workings consist of a 15-foot, east-west trending trench with a caved adit at the west end. No samples taken.	122

APPENDIX NO.	NAME/ U.S.B.M. NO.	LOCATION 7½' QUAD	COMMOD-ITY	MRZ ZONE	COMMENTS AND REFERENCES	MAP NO.
183	Unknown Name Prospect	Steele Peak T4S R4W Sec 24	Au Ag	MRZ-3a (h-4) p. 27	Prospects located east and south of the Hoag (appendix no. 140, map no. 123). In Hartford Park. A bulldozer trench parallels a 1-foot-wide zone of crushed quartz in granodiorite exposed in the floor. Trend of the 175-foot long trench is N75°E, and it is 20 feet wide and 8 feet deep. Nearby are numerous small dumps of vein material of quartz, feldspar, muscovite and minor tourmaline and iron oxide stain. One dump contained an anomalous sample of iron oxides. South of the trench, 3 adits are located on the west side of the wash, about 10 feet apart. The remains of a small rock and adobe building are on the site. The adits are caved and are in deeply weathered granodiorite. No veins are exposed. Dumps consist of decomposed granitic material and barren quartz.	125
184	Unknown Name Prospect	Steele Peak T4S R5W Sec 24	Au Ag	MRZ-3a (h-4) p. 27	Prospect located in the east Hartford Park area, on the north side of a wash. A poorly exposed quartz-filled shear exposed on the back of an adit strikes N65°W and dips 74°S. The shear consists of a gouge zone, quartz only as veinlets, host rock, quartz diorite is argillically altered. Quartz on the dump displays rare minor boxworks, little iron oxide stain. Samples assayed 0.011 oz/ton gold and 0.04 oz/ton silver. Development consists of an adit of unknown length, now caved, and a trench about 100 feet long, developed along the wash. An elaborate concreted arrastre survives on the property.	127
185	Unknown Name Prospect	Steele Peak T4S R5W Sec 24	Au	MRZ-3a (h-4) p. 27	Placer prospects in Hartford Park. Numerous small pits, the largest is 9 feet by 6 feet by 4 feet deep.	128
186	Unknown Name Prospect	Steele Peak T4S R5W Sec 24	Au	MRZ-3a (h-4) p. 27	Prospect located in the southern part of Hartford Park, about 1/2-mile west of the Gavilan mine (appendix no. 135, map no. 131). The prospect was on a quartz vein or veins, now unexposed. Quartz float on old dumps is barren. Host rock is weathered quartz diorite. Workings consist of a shaft now partly filled, and trenches and pits extending along a length of 315 feet, striking N10°E, north and south of the old shaft. No samples.	129
187	Unknown Name Prospect	Steele Peak T4S R4W Sec 32	Au	MRZ-3a (h-5) p. 27	A group of prospects located in the Santa Rosa area of the Pinacate district and east of the Little Maggie mine (appendix no. 147, map no. 143). The prospects are along quartz veins in diorite. The diorite is deeply weathered and resistant portions weather out as boulders. The veins strike mostly northwest with the largest striking N81°W and dipping 56°N. One assay from this area assayed at 0.003 oz/ton gold and 0.02 oz/ton silver. Development in the area consists of prospect pits, the largest is 20 feet by 20 feet by 10 feet deep.	144

APPENDIX NO.	NAME/ U.S.B.M. NO.	LOCATION 7½' QUAD	COMMOD-ITY	MRZ ZONE	COMMENTS AND REFERENCES	MAP NO.
188	Unknown Name Prospect	Steele Peak T4S R4W NW 1/4 Sec 32	Au	MRZ-3a (h-5) p. 27	Located in the Santa Rosa mine area of the Pinacate district, these prospects are developed by a series of trenches which follow a slightly silicified shear zone in highly altered diorite. The zone strikes N67°E and dips steeply. The zone exhibits mainly gouge, no sulfides and little iron oxides. Assays uniformly low: 0.001 oz/ton gold and 0.02 oz/ton silver.	146
189	Unknown Name Prospect	Steele Peak T4S R4W E Sec 32	Au	MRZ-3a (h-5) p. 27	This prospect is south of the Little Maggie mine (appendix no. 147, map no. 143) and lies on the west flank of the quarry (appendix no. 234, map no. 156). The prospect is developed by a shaft of unknown depth, adits and trenches on 1 foot to 2 foot thick quartz vein. The vein contains kaolinized feldspars, sericite and abundant iron oxide, mostly as stain. No sulfides observed. Highest assay was 0.009 oz/ton gold and 0.02 oz/ton silver.	147
190	Unknown Name Prospect	Steele Peak T4S R4W SW 1/4 Sec 32	Au	MRZ-3a (h-5) p. 27	This prospect is developed with a trench 100 feet long, 15 feet wide and about 8 feet deep trending N86°E, and appears to be quartz veinlets in a zone which is now mostly gouge and red alteration halos around quartz veinlets (1 inch to 1/2-inch) visible in the south wall. Attitude of quartz veinlets is N50°W, dipping 43°S.	150
191	Unknown Name Prospect	Steele Peak T4S R4W SW 1/4 Sec 32	Au	MRZ-3a (h-5) p. 27	Large open pit just northeast of the Victor Mine (appendix no. 164, map no. 154). Pit is 150 feet by 20 feet by 8 feet deep. Walls exhibit extremely weathered diorite with many barren quartz veinlets cropping out.	153
192	Unknown Name Prospect	Steele Peak T4S R4W Sec 33	Au	MRZ-3a (h-5) p. 27	Prospect on contact between granodiorite and metasediments.	159
193	Unknown Name Prospect	Steele Peak T5S R4W Sec 5	Au	MRZ 4	Prospect located on the southwest edge of Steele Valley, just west of the intersection of two country roads. An open pit (20 feet by 20 feet by 15 feet deep) has an adit in the east wall. Numerous prospect pits are found along a quartz vein or veins. Veins are in granodiorite host rock and are associated with a shear zone which crops out a distance of 300 feet, with an attitude of N15°W, dipping 85°E to vertical. Argillic alteration is associated with the shear. Iron oxides are rare and no sulfides are observed. The ruins of an arrastre are on site. References: Saul and others, (1968), p. 712; Crawford, 1894, p. 225.	160

Gold and Silver

APPENDIX NO.	NAME/ U.S.B.M. NO.	LOCATION 7½' QUAD	COMMOD-ITY	MRZ ZONE	COMMENTS AND REFERENCES	MAP NO.
194	Unknown Name Prospect	Steele Peak T5S R4W Sec 9	Au	MRZ-4	Prospects located on top of ridge above Stanford mine (appendix no. 163, map no. 161). These are on a fault zone of crushed quartz as much as 3 feet wide and exhibits abundant iron oxides. Appears to be an extension of the Stanford vein.	162
195	Unknown Name Prospect	Steele Peak T4S R4W Sec 9	Au	MRZ-4	Prospect located in valley south of Steele Peak. The prospect is on a shear trending N87°W, vertical, and 3 feet to 6 feet wide. The shear is mostly greenish gouge with a discontinuous quartz vein which ranges from 6 inches to 1/4 inch wide. Manganese oxide stain and very minor iron oxide stain are present.	163
196	Unknown Name Prospect	Alberhill T5S R5W SE 1/4 Sec 15 NE 1/4 Sec 22	Au	MRZ-4	Located along the northeast base of the low hills 1/3- to 3/4-of-a-mile east of Alberhill. The northernmost prospect reportedly consists of a 10-foot adit driven southwest into a west-trending fault zone in metavolcanic rocks of the Santiago Peak volcanics. This prospect has been idle for many years, and there is no record of production. The southernmost prospect reportedly consists of a 185-foot crosscut adit driven S40°W into sheared and weathered shale and slate of the Bedford Canyon Formation. These metamorphic rocks strike N30°W and dip 60°NE. This prospect has been idle many years, and there is no record of production. Reference: Engel and others, 1959, p. 121.	168
197	Unknown Name Prospect	Lake Elsinore T5S R4W N 1/2 Sec 14	Au	MRZ-4	Located at an elevation of about 1,560 feet, in rolling hills about 7 airline miles northeast of Elsinore, 4/5-mile southeast of Highway 74, 150 yards south of the center of the north boundary of Section 14. A 3-foot wide glassy quartz vein reportedly strikes N-S and dips 70° to 80°W, parallel to bedding in metasedimentary rocks (schist and slate) of the Bedford Canyon Formation. A septum of decomposed granitic rock divides the vein. Fragments of quartz could be traced several hundred feet to the north in float. The vein reportedly was explored by a vertical shaft 50 or more feet deep. Production, if any, not determined; long idle. This prospect could not be located during a reconnaissance of the area. There are a few private residences in the area. Reference: Engel and others, 1959, p. 121.	185

APPENDIX NO.	NAME/ U.S.B.M. NO.	LOCATION 7½' QUAD	COMMOD-ITY	MRZ ZONE	COMMENTS AND REFERENCES	MAP NO.
198	Unknown Name Prospect	Lake Elsinore T5S R4W W 1/2 Sec 23	Au	MRZ-4	Located at an elevation of about 1,600 feet, on the northwest side of the hills between Railroad Canyon and Highway 74, about 4 1/2 airline miles northeast of Lake Elsinore. The area is developed by nearby single family residences. The area is underlain by slates and phyllites of the Bedford Canyon Formation. These rocks generally strike northwesterly and dip about 50° to the northeast. In the area of the prospect, these rocks are reportedly cut by NE-SW trending faults, and by NW-SE trending aplitic and alaskitic bodies. The area is near the contact with a body of quartz monzonite. Quartz, occurring in shear zones, and "disintegrated siliceous material" were reportedly prospected by a linear series of trenches and shallow pits over a distance of nearly 1/4 of a mile in a NW-SW direction. The workings were caved and overgrown in the mid-1950's. Reference: Engel and others, 1959, p. 120-121.	191
199	Unknown Name Prospect	Lake Elsinore T5S R4W SW 1/4 Sec 4	Au? Sn?	MRZ-4	Located in an area of low relief between elevation 1,480 and 1,520 feet, just west of the arroyo west of the city landfill, 1 mile east of Lake Elsinore. Workings are three shallow prospect pits. The southernmost pit is 8-foot by 8-foot-square in gray, fine-grained quartzite, probably correlative with the Bedford Canyon Formation. The other two pits, located about 550 feet due north, are in metamorphic rocks (metasediments?) north of an east-west trending contact between these metamorphic rocks and San Marcos gabbro (diorite-gabbro). The nature of the contact was not determined. The west pit is 12 feet in diameter, the east pit about 8 feet in diameter. The country rocks in the area are deeply weathered but do not appear to be hydrothermally altered or mineralized.	206

APPENDIX NO.	NAME/ U.S.B.M. NO.	LOCATION 7½' QUAD	COMMOD-ITY	MRZ ZONE	COMMENTS AND REFERENCES	MAP NO.
200	Unknown Name Prospect	Lake Elsinore T6S R4W E 1/2 Sec 4	Au	MRZ-4	Located at an elevation of 1,670 feet, about 1,000 feet southwest of Hill 1962, 2 miles east of Lake Elsinore. The workings are in the contact zone between diorite or quartz diorite on the west and metasediments consisting of fine-grained quartzite and very fine-grained mica schist of the Bedford Canyon Formation on the east. The contact strikes N20°W and is vertical or steeply dipping to the northeast. Foliation and bedding in the metasediments strikes N3°-10°W and dips 65° to 70°NE. The country rocks, especially the diorite, are highly weathered. Argillic alteration is intense but localized and accompanied by limonite-stained boxworks. A grab sample of the hydrothermally altered diorite assayed 0.07 oz/ton silver and 0.001 oz/ton gold. ICP analyses indicate enrichment in copper (1164 ppm), iron (14.59 %) vanadium (149 ppm), and possibly cobalt (31 ppm) and strontium (41 ppm). Workings consist of a small prospect pit in weathered and altered metasedimentary rocks east of the contact with the diorite, and a caved adit driven eastward in the diorite, probably to crosscut the contact between the diorite and metasediments. The adit is located about 50 feet S85°W of the open pit. Little, if any, production. Idle for many years.	210
201	Unknown Name Prospect	Lake Elsinore T6S R4W SE 1/4 Sec 4	Au?	MRZ-4	Located at an elevation of 1,600 feet, on the west slope of a ridge 1,950 feet south-southwest of Hill 1962, about 2 miles east of Lake Elsinore. This prospect is part of the Palisades Group (appendix no. 216, map no. 212) and is a zone of complex shearing in quartz diorite that has been intruded by diabase. The contacts between the diorite and diabase are both intrusive and fault contacts. A 50-foot long decline driven N75°E explores the main zone of shearing that strikes N20° to 37°E and dips 60° to 76°SE. Diorite is the footwall and diabase the hanging wall. The country rocks exhibit blocky fracturing and are deeply weathered. Caliche has been deposited along shears and fractures. Weak chloritic alteration is evident along fractures and calcite, other than caliche, has been deposited in fractures along with some pyrite evidenced by small boxworks. Iron oxide (limonite) occurs along fractures. Pyrite also occurs as trace disseminations in the diorite and the diabase. An assay of a composite sample of diorite and diabase indicated 0.06 oz/ton in silver and 0.001 oz/ton in gold. Production is unknown. Idle for many years. References: Engel and others, 1959, p. 123; Tucker and Sampson, 1929, p. 491, and 1945, p. 148.	211

APPENDIX NO.	NAME/ U.S.B.M. NO.	LOCATION 7½' QUAD	COMMOD-ITY	MRZ ZONE	COMMENTS AND REFERENCES	MAP NO.
202	Unknown Name Prospect	Murrieta T6S R3W NE 1/4 Sec 33	Au	MRZ-4	Located at an elevation of 2,000 feet, on the southeast slope of Hill 2123 about 4 miles northeast of Murrieta. A local resident reported that gold was prospected in a cross-cut adit and that the workings had been destroyed for safety considerations. No trace of the workings remains. A pegmatite dike intrudes a lenticular mass of granodiorite, part of a large intrusive ring complex. It is as much as 4 feet thick and consists of quartz and K-feldspar and a small amount of muscovite. Quartz and feldspar occur in irregular veins and lenses. No sulphide minerals were observed in these rocks. There are numerous pegmatite and aplite dikes associated with the ring complex. None appear to be significantly mineralized, although some may have been prospected for feldspar and silica. It is doubtful that any gold was produced from this prospect.	242
203	Virginia Shay (Missing Link, Shay, Virginia) 0060650471	Steele Peak T4S R4W NE 1/4 Sec 32 NW 1/4 Sec 33	Au	MRZ-3a (h-5) p. 27	Location uncertain. First developed in 1893 with a single shaft but was idle from 1895 through 1929. A second shaft was sunk in 1930 or 1931. In 1945, two more shafts were sunk to about 200 feet and two drifts of 75 feet and 150 feet were dug. The property is reported to be two parallel veins, as wide as 3 feet, about 200 feet apart. North vein attitude is N75°E, dipping 56°S; south vein attitude is N50°E, dipping 60°S. Reportedly averaging $8.00 to $10.00 per ton gold. No production has been recorded. References: Saul and others, (1968), p. 754; Storms, 1892, p. 385; Crawford, 1894, p. 225; 1896, p. 313; Merrill and Waring, 1919, p. 532; Tucker and Sampson, 1929, p. 485; Tucker and Sampson, 1945, p. 138-139.	157
204	Wrench Prospect 0060650505	Lake Elsinore T5S R4W S 1/2 Sec 34	Au	MRZ-4	Located at an elevation of about 1,500 feet, about 1 mile northwest of the Railroad Canyon Dam, 2 1/2 miles northeast of Lake Elsinore. Quartzite and slate of the Bedford Canyon Formation reportedly contain quartz stringers and irregular silicification in a 3- to 4-foot-wide shear zone that is nearly parallel to the schistosity. The foliation in the Bedford Canyon strikes N70°W and dips 45°NE. Workings include an open cut 10 feet wide and 20 feet long. A moderate-sized mine dump reportedly indicates concealed (caved) underground workings. Production, if any, is reportedly small. The area is being developed as part of the large residential development that surrounds Railroad Canyon Reservoir. Reference: Engel and others, 1959, p. 120.	201

APPENDIX NO.	NAME/ U.S.B.M. NO.	LOCATION 7½' QUAD	COMMOD-ITY	MRZ ZONE	COMMENTS AND REFERENCES	MAP NO.
205	Yvonne (Lucas Canyon Claims)	Sitton Peak T7S R6W Sec 10 NW 1/4 Sec 11	Au	Not Zoned; out of study area	Located at the head of Lucas Canyon at elevations of 1,100 to 1,450 feet, 1 1/2 miles northwest of Wheeler Ranch. According to Larsen (1951) gold was discovered in placers in Lucas Canyon around the turn of the century (early 1900's). The prospectors are said to have seldom made more than $1.00 a day, although two men panned out $40.00 an hour in one place. Barren gravel 10 to 20 feet thick reportedly covered the pay dirt. Claims in the area have been active as recently as the early 1950's but no estimate of production is available (Engel and others, 1959). References: Engel and others, 1959, p. 62-63; Larsen, 1951, p. 48.	234

Gypsum (Gypsite)

APPENDIX NO.	NAME/ U.S.B.M. NO.	LOCATION 7½' QUAD	COMMOD-ITY	MRZ ZONE	COMMENTS AND REFERENCES	MAP NO.
206	Big Chief (Freeman-Nonhof, Ware Deposit) 0060651108	Corona South T4S R7W SE 1/4 Sec 9 SW 1/4 Sec 10	Gyp	MRZ-4	Originally part of the White Gypsum Group (appendix no. 211, map no. 58).	59
207	Capitol Dome	Corona South T4S R7W NE 1/4 Sec 15 S 1/2 Sec 14	Gyp	MRZ-4	Part of the Main Street Canyon deposits (appendix no. 210, map no. 65).	66
208	Eagle Canyon Gypsum (Frazer) 0060650920	Corona South T4S R7W SW 1/4 Sec 13 NW 1/4 Sec 24	Gyp	MRZ-4	The deposit occurs in a belt 500 feet wide which outcrops sporadically for 1,500 feet. The belt, located near the Elsinore fault strikes N70°W and is steeply dipping. The gypsum occur in narrow veinlets in hydrothermally altered Santiago Peak Volcanics. Gypsum content was about 15%. Workings consist of adits of not more than 100 feet long, and open cuts. The deposit was mined for agricultural gypsum from 1913 to 1917, then was idle except for a brief testing period in 1943 and 1944. References: Merrill and Waring, 1919, p. 579; Tucker and Sampson, 1945, p. 168; Ver Plank, 1952, p. 58, 125, 132; Gray, 1961, p. 83-84, 115.	69
209	Hagador Canyon Gypsum Deposit 0060650927	Corona South T4S R7W NW 1/4 Sec 15 SW 1/4 Sec 10 NE 1/4 Sec 16	Gyp	MRZ-4	The deposit occurs in a zone striking northwest and lying along the southwest side of the Elsinore fault. The zone extends from the east side of Hagador Canyon to the south side of Tin Mine Canyon, where it terminates. The zone reportedly varies in width from 3,000 feet to 300 feet. The deposit consists of gypsum veinlets in hydrothermally altered Santiago Peak Volcanics and gypsum-bearing hydrothermal clays (gypsite). The gypsum (gypsite) was mined for agricultural purposes by several large adits and open cuts, now caved and flooded. Major production was from 1926 to 1934, but the deposit was mined earlier, in 1910 and 1915 to the early 1920's. References: Merrill and Waring, 1919, p. 579; Ver Planck, 1952, p. 126, 132; Gray, 1961, p. 115.	61

Gypsum (Gypsite)

APPENDIX NO.	NAME/ U.S.B.M. NO.	LOCATION 7½' QUAD	COMMOD-ITY	MRZ ZONE	COMMENTS AND REFERENCES	MAP NO.
210	Main Street Gypsum Deposit	Corona South T4S R7S NE 1/4 Sec 15 S 1/2 Sec 14	Gyp	MRZ-4	The largest part of the deposit is on the west side of Main Street Canyon and consists of gypsum veinlets in hydrothermally altered Santiago Peak Volcanics, and in shales of the adjacent Silverado Formation. The gypsum (gypsite)-bearing zone trends northwest over the ridge on the west side of Main Street Canyon and is 600 to 1,500 feet wide. Development was by short adits and trenches from about 1900 to 1935, for agricultural use. References: Aubury, 1906, p. 286; Merrill and Waring, 1919, p. 579; Tucker and Sampson, 1945, p. 168, Ver Plank, 1952, p. 57-58, 126, 136, 140; Gray 1961, p. 85-86, 115, Saul and others, (1968), p. 784.	65
211	White Gypsum Group (Freeman-Nonhof, Big Chief, Ware Deposit) 0060650915	Corona South T4S R7W SE 1/4 Sec 9 SW 1/4 Sec 10	Gyp	MRZ-4	Located on the south side of Tin Mine Canyon, this deposit consists of veinlets of gypsum (gypsite) in hydrothermally altered Santiago Peak Volcanics. Mined for agricultural uses about 1923, the property was examined in 1943, 1947 and 1954 to 1956. Development is by short adits small pits and open cuts. References: Ver Plank, 1952, p. 127, 142, 146; Gray, 1961, p. 116, Saul and others, (1968), p. 767.	58

APPENDIX NO.	NAME/ U.S.B.M. NO.	LOCATION 7½' QUAD	COMMOD-ITY	MRZ ZONE	COMMENTS AND REFERENCES	MAP NO.
212	Mammoth 0060650822	Sitton Peak T7S R5W Sec 31 T7S R6W Sec 36 T8S R5W Secs 6, 7	Fe	Not Zoned; within a wilderness area	Located adjacent to the Silver Shine copper prospect (appendix no. 117, map no. 237), at an elevation of about 800 feet in San Mateo Canyon, about 1/4-mile northeast of the juncture of Nickel and San Mateo Canyons. Accessible by Indian Potrero Truck Trail, Clark Trail, and San Mateo Trail. The Mammoth claims reportedly cover a discontinuously exposed belt of magnetite-bearing rock that trends N45°W for about a mile northwest and half a mile southeast of San Mateo Creek. The zone follows the trend of a fault. Country rock is andesite of the Santiago Peak volcanics (Engel and others, 1959). The most extensive outcrops of magnetite are on the Mammoth No. 3 claim. Outcrops extend nearly the 1,500-foot length of the claim, separated by areas, 100 to 300 feet wide that are covered with overburden. The exposed magnetite bodies reportedly dip steeply and range in width from about 5 to about 20 feet. The largest single outcrop, on the south bank of San Mateo Creek, is about 18 feet wide and 30 feet long. Assays reportedly indicate 62% iron, with traces of chromium, vanadium, nickel, cobalt, and titanium. Magnetite, in very fine grains, apparently has replaced sheared andesitic country rock. Unreplaced siliceous material is abundant throughout most of the magnetite rock as streaks and disseminated grains. The rock has a dull black, almost powdery appearance on fresh fractures. Except when pulverized, even the most siliceous appearing fragments of the magnetite-bearing rock are strongly attracted to a magnet. Pyrite is present in small grains in some of the magnetite rock, and thin seams of gypsum fill many joints. Although known for nearly 60 years, the Mammoth deposits remained undeveloped largely because of the steep and inaccessible terrain. A 12-foot adit and bulldozer cuts expose the large magnetite body on the southeast bank of San Mateo Creek, but only exploration with a magnetic detector has been done on the other outcrops. In 1946-47 several miles of jeep road, with grades as steep as 17% were bulldozed from Indian Potrero down the west side of San Mateo Canyon to the deposits. By 1953, when rains washed out the road, about 15 tons of magnetite rock were hauled up from Mammoth No. 3 claim for tests that were in progress in 1955. References: Engel and others, 1959, p. 71, 122; Gay, 1955, unpublished field notes.	238

Lead, Silver, Zinc and Antimony

APPENDIX NO.	NAME/ U.S.B.M. NO.	LOCATION 7½' QUAD	COMMOD-ITY	MRZ ZONE	COMMENTS AND REFERENCES	MAP NO.
213	Corona Lead-Zinc Mine 0060650922	Corona South T4S R7W SE 1/4 Sec 14	Pb Zn	MRZ-4	Originally located in the early 1940's, the deposit is reported to be mineralized areas along a fracture zone in a pod of Bedford Canyon Formation, which is caught up in the Santiago Peak Volcanics. The mineralized zone is in a fracture which is 2 to 6 feet wide and is mostly limonite stained calcite with some vein quartz. Host rock is pyritized. Reported assays were 10% lead 14% antimony and 40 oz/ton silver. The mine reportedly was developed by an open cut 360 feet long and a 92-foot crosscut tunnel. No mineralization was observed in 1953. Not located for this study. References: Tucker and Sampson, 1945, p. 147-148; Goodwin, 1957, p. 601-602; Gray, 1961, p. 61-62, 116; Saul and others, (1968).	67
214	Mountain Group (Crowell Mine, Erenreich Gold Mines) 0060650441	Black Star Canyon T4S R7W NW 1/4 Sec 8	Sb	MRZ-4	The property is reported to be located on the 1,700-foot contour of the east side of Mabey canyon. Mineralization occurs in a zone 200 feet by 500 feet. The zone is reportedly a series of veins and shears dipping 110° to 25°E and striking north. Vein minerals are reported to be stibnite, pyrite, quartz and calcite. Oxides of iron and a yellow oxide alteration of stibnite are also present. The mine workings are reported to be a 140 foot lower adit 20-foot upper adit, and a 50 foot open cut. All workings were caved by 1942. Re-development in 1942, resulted in a shipment of ore sent to the Harshaw Chemical Company Smelter. After two more shipments in 1948, no further production is reported. References: Crawford, 1896, p. 31; Merrill and Waring, 1919, p. 524; Tucker, 1921, p. 324; Tucker and Sampson, 1929, p. 468; Tucker and Sampson, 1943, p. 65-66; Tucker and Sampson, 1945, p. 123. Saul and others, (1968), p. 51-56.	41

APPENDIX NO.	NAME/ U.S.B.M. NO.	LOCATION 7½' QUAD	COMMOD-ITY	MRZ ZONE	COMMENTS AND REFERENCES	MAP NO.
215	Old Dominion Mine (Ortega, Acme)	Alberhill T6S R5W SE 1/4 Sec 7	Pb Ag Zn As Mn Au	Not Zoned; out of study area	Located at an elevation of 3,000 feet near the head of Long Canyon in the Santa Ana Mountains, the mine is accessible by a 1/2-mile foot trail leading south from the Main Divide Truck Trail that branches northwestward from Highway 74 just east of El Cariso Guard Station. The Old Dominion mine has been intermittently active on a small scale, yielding several hundred tons of complex sulphide ore between 1894 and 1943. Steady production reportedly was hampered by metallurgical difficulties associated with treatment of the ore (Engel and others, 1959). Underground mine openings have been entirely flooded or caved since prior to 1953. A decline at the southern edge of the workings follows the mineralized vein (Old Dominion vein) beneath Long Canyon on a 45° decline eastward. The shaft was 65 feet long in 1942, and was deepened to 130 feet in the early 1940's, when a 20-foot drift was driven northwest at the 50-foot level. About 100 feet north of the decline a crosscut adit used for mine drainage was driven about N70°W. A fault encountered in the workings is reportedly the source of water which presently floods the adit. The northern mine workings are about 300 feet northwest of the decline. In these workings the Old Dominion vein strikes N40°W and dips 70°NE. A crosscut adit was driven N70°W through quartzite and marble just north of the mill site. Fifty feet from the portal is a north-trending vertical fault that was explored by a 180-foot drift. This fault is explored for 75 feet southward by a drift that joins the bottom of a 45-foot shaft sunk on the intersection of the fault and the Old Dominion vein. A 40-foot winze inclined 35°W from the bottom of the shaft, reaches a depth of 80 feet where the drainage adit joins the winze from the southwest. At this depth the dip of the fault flattens somewhat to the west, and the Old Dominion vein is cut off. A mill once stood just southeast of the northern workings. Mineralization at the Old Dominion mine is characterized by a zone of parallel veins, the Old Dominion vein, in a zone of shearing in metamorphic rocks of the Bedford Canyon Formation. The zone is as much as 10 feet wide where exposed at the surface at the northern workings. In underground workings the zone reportedly averages 12 feet in width (Sampson, 1935). The zone strikes N20°-30°W and dips from 45°NE in the southern workings to 68-72°NE in the northern workings. The wallrocks of the southern portion of the shear zone are fine-to very fine-grained quartzites and quartz schists of the Bedford Canyon Formation, with a foliation that strikes N12°-45°W and dips 55°-75°NE. Reportedly, dacite forms the footwall and marble forms the hanging wall in the northern workings where the attitude of the shear zone and of the mineralized veins is sub-parallel to the foliation in the metamorphic rocks.	172

APPENDIX NO.	NAME/ U.S.B.M. NO.	LOCATION 7½' QUAD	COMMOD-ITY	MRZ ZONE	COMMENTS AND REFERENCES	MAP NO.

The Old Dominion vein is exposed intermittently for about 300 feet along strike, and, where the zone is well exposed, it consists of brecciated and sheared metasedimentary rock consisting of very fine-grained quartzites and quartz schists. In outcrop, mineralization within the zone occurs in veins varying from less than an inch to a few inches in width. Veins occur along individual shears and some form an anastomosing vein system within the zone of shearing.
At the surface the minerals are oxidized forming a porous, black, earthy vein filling. Below the zone of oxidation the veins reportedly form an intimate mixture of siderite, quartz, altered feldspars, hornblende, pyrrhotite, pyrite, galena, sphalerite and chalcopyrite. X-Ray diffraction analysis of mineralized rock (this study) identified the manganese-rich amphibole, kozulite, and the manganese silicate, braunite. Copper oxides are also present. Analyses by ICP of four samples taken from mine dumps and from the Old Dominion vein exposed in open cuts (this study) indicate that the ore carries iron (5.10 to 11.60 %), manganese (5,382 to 18,059 ppm), lead (3,873 to 7,468 ppm), zinc (1,861 to 5,708 ppm), arsenic (355 to 4,322 ppm), antimony (25 to 796 ppm), copper (123 to 296 ppm), silver (57.2 to 214.7 ppm), cadmium (15.3 to 42.9 ppm), and nickel (12 to 21 ppm). Fire assay of these four samples indicate that they carry 1.69 to 4.75 oz/ton silver and 0.002 to 0.010 oz/ton gold.
Assays from various parts of the mineralized zone reportedly indicate erratic distribution of values, making difficult the development of a consistently effective milling process. Assays range from 2% to 20% lead, from a trace to 10% zinc, and from a trace to nearly 5% silver. A shipment of 100 tons of ore in 1942 assayed 0.02 oz/ton gold, 25.8 oz/ton silver, 0.3% copper, 3.5% lead, 3.1% zinc, and 21% iron. Fifteen tons of selected ore was reported to assay 0.03 oz/ton gold, 45.2 oz/ton silver, 8.7% lead, and 9.11% zinc (Engel and others, 1959).

References: Crawford, 1894, p. 25; Engel and others, 1959, p. 72-75, 123; Larsen, 1951, p. 48; Sampson, 1935, p. 514; Sayers, 1946, p. 11.

APPENDIX NO.	NAME/ U.S.B.M. NO.	LOCATION 7½' QUAD	COMMOD-ITY	MRZ ZONE	COMMENTS AND REFERENCES	MAP NO.
216	Palisades Group 0060650510	Lake Elsinore T6S R4W SE 1/4 Sec 4	Pb Ag Cu Au	MRZ-4	Located at elevation from 1,560 to 1,600 feet, near the top of a ridge 2,750 feet southwest of Hill 1962, about 2 miles east of Elsinore. This group of prospects was described by Engel and others (1959) and Tucker and Sampson (1929 and 1945). Three exploration pits along a northeast-southwest alignment are located just west of the ridge top. The 6-foot by 8-foot pit nearest the ridge top is in diorite. A second pit located less than 20 feet downslope to the southwest is roughly 8 feet in diameter and explores an altered (silicified) flinty rock. A third pit 7 feet by 15 feet, is located about 40 feet farther downslope to the southwest. This pit is in deeply weathered diorite and exposes an andesitic(?) porphyry dike with aphanitic groundmass. These rocks exhibit chloritic alteration but do not appear to be significantly hydrothermally altered and mineralized. A grab sample of siliceous rock from the pit near the ridge top assayed low: 0.01 oz/ton silver and 0.001 oz/ton gold. A grab sample from the pit 20 feet downslope to the southwest assayed 0.05 oz/ton silver and 0.001 oz/ton gold. ICP analysis showed this sample to be enriched in copper (253 ppm) and manganese (644 ppm). A small prospect pit in melanocratic, meta-igneous(?) rock is located about 250 feet south of the three prospect pits described above. Rock exposed in the pit does not appear to be significantly altered or mineralized. These prospects have been idle for many years; production is undetermined but small, if any. References: Eric, 1948, p. 294; Tucker and Sampson, 1929, p. 491, and 1945, p. 148.	212

Limestone

APPENDIX NO.	NAME/ U.S.B.M. NO.	LOCATION 7½' QUAD	COMMOD-ITY	MRZ ZONE	COMMENTS AND REFERENCES	MAP NO.
217	Best Ranch 0060650501	Lake Elsinore T5S R4W S 1/2 Sec 28	Lmst	MRZ-4	This deposit is composed of discontinuous limestone bodies which extend 1/2-mile along a strike of N70°-75°W and dip of 50°-65°NW. The main limestone body is lens-shaped, becoming thinner both to the east and to the west of the hilltop southeast of the ruins of two stone kilns. The limestone exposed in the hill is about 75 feet in maximum thickness. This limestone body extends about 550 feet east of the hilltop and about 1,000 feet west of the hilltop. The limestone is mottled gray in color, and occasionally dolomitic with numerous chert and jasper streaks and pods locally. In eastern exposures, the limestone is tremolitic. Only the largest body forming the hill southeast of the kilns has been developed. Workings consist of a 5-foot deep pit, a bench 20 feet long and 8 feet deep, an adit and a 60-foot crosscut. Although two stone kilns survive on the property, production is unknown but believed to be small. References: Engel and others, 1959, p. 97-99, 134; Goodyear, 1890, p. 151; Saul and others, (1968), p. 901.	197
218	Crestmore Quarry (Riverside Cement Co.) 0060650240	Fontana T2S R6W SW 1/4 Sec 2	Lmst	MRZ 2b L(i-1) p. 51	The Crestmore quarry is located in the eastern-most Jurupa Mountains in the northwest corner of Riverside County. The deposit was originally developed in the 1890's by the American Beet Sugar Company and later quarried by the Sky-Blue Marble and Onyx Company for building stone and lime. In 1909, the Riverside Portland Cement Company built a dry-process cement plant and mined limestone from Crestmore by the modified block caving method until March 1955, when room and pillar mining was initiated. The Crestmore deposit consists of two lenticular limestone bodies within the Jurupa Series metamorphic rocks. These rocks strike north and dip 45°E within quartz diorite country rock. The bodies extend 2,500 feet along strike. The upper body is 200 to 500 feet wide and the lower is 200 to 400 feet wide. The limestone is white, fine to coarse grained and contains some brucite. Crestmore is a locality of many exotic minerals species. Maximum depth of the quarry is 1,500 feet. Known reserves are 136 million tons of which 90% has 90% $CaCO_3$ (oral comm. Pat Hill, 1990). Most reserves are confined to the upper body. Water problems have forced suspension of mining activities commencing July, 1985.	10

APPENDIX NO.	NAME/ U.S.B.M. NO.	LOCATION 7½' QUAD	COMMOD-ITY	MRZ ZONE	COMMENTS AND REFERENCES	MAP NO.
					References: Aubury, 1906, p. 75-76; Eakle, 1917 , p. 327-360; Merrill and Waring, 1919, p. 555-559; Tucker, 1921, p. 324-325; Tucker & Sampson, 1929, p. 517-519; Robotham, 1934, 20 p.; Woodford, 1943, p. 333-365; Woodford and others, 1944, p. 351-381; Bucky, 1945, p. 114-124; Tucker and Sampson, 1945, p. 173-174; Wightman, 1945, p. 215-224; Logan, 1947, p. 272-273; Burnham, 1954, p. 54-57, 61-70; Persons, 1955, p. 76-78; Wightman, 1956, p. 33-36, 78; Wightman and others, 1957, p. 450-454; Long and Obert, 1958, 21 p.; Burnham, 1959, p. 879-919; Murdoch, 1961, p. 245-257; Utley, 1961, p. 127-130; Bowen and Gray, 1962, p. 7, 10, 11; Saul and others, (1968), p. 866-873.	
219	Glen Avon (Mathews, Mira Loma) 0060650826	Fontana T2S R6W SW1/4 Sec 2	Lmst	MRZ-4	This deposit consists of two parallel limestone lenses in siliceous metasediments of Paleozoic age. The bodies strike east-west, dip steeply north and extend 1,000 feet along strike. Thickness is 80 feet. The limestone is light gray to white medium to coarse crystalline and banded. The deposit was first mined in 1928 as poultry grit. In 1942, it was known as the Mira Loma Dolomite and was used as a refractory. Total production was probably several thousand tons with only minimal reserves. Idle since 1950. References: Saul and others (1968), p. 914; Tucker and Sampson, 1929, p. 516; Tucker and Sampson, 1945, pl. 1; Mackevett, 1951, p. 13.	3
220	Jensen Quarry South (Snow Rock Quarry, Sno-Top Rock Quarry) 0060650535	Fontana T2S R5W SW 1/4 Sec 5 SE 1/4 Sec 6	Lmst	MRZ-4	The Jensen quarry was the main source of limestone for the Riverside Cement Company from World War I until 1927. From February 1954 until March 1955, the Jensen quarry was the major source of limestone for the Crestmore Cement Plant, while the new Crestmore underground mine was being readied. From 1953 to 1960, Sno-Top Rock operated a small screening and crushing facility on the property, producing roofing granules and asphalt tile filler from limestone with a high magnesium content. In 1961, Snow Rock took over Sno-Top's operation and in 1963, began producing white aggregate from the Jensen North Quarry. Production was 60 to 100 tons/day. The limestone at the Jensen Quarry occurs in two bodies which strike Northeast and dip 60° to 80°S. Maximum thickness in 200 feet. Outcrop area was approximately 1,500 feet by 2,000 feet. The limestone is white, medium to coarse grained calcite, and has been intruded by Bonsall Tonalite. Graphite, brucite, periclase, magnesite, spinel, pyrite and diopside occur.	8

APPENDIX NO.	NAME/ U.S.B.M. NO.	LOCATION 7½' QUAD	COMMOD-ITY	MRZ ZONE	COMMENTS AND REFERENCES	MAP NO.
					The Jensen Quarry has three main workings: the North quarry, the Main quarry and the South quarry. Cement grade limestone was produced from the main quarry which has a north face of 230 feet. The south quarry is 320 feet by 200 feet and 100 feet deep. The north quarry is 1,000 feet long and has a maximum depth of 150 feet. The North quarry was working in 1963 by Snow-Rock, and is now closed. Total production was several million tons. References: Mackevett, 1951; Cooney, 1956; Saul and others, (1968), p. 920-923; Pat Hill, Riverside Cement Co., personal communication, 1990.	

APPENDIX NO.	NAME/ U.S.B.M. NO.	LOCATION 7½' QUAD	COMMOD-ITY	MRZ ZONE	COMMENTS AND REFERENCES	MAP NO.
221	Beal-McClellan (Black Eagle and Newport, Brum and Newport,East Group, Elsinore: East Group and West Group 0060650016	Lake Elsinore T5S R4W SW 1/2 Sec 23	Mn Ag	MRZ-3a (s-1) p. 30	Located at an elevation ranging from about 1,640 to 1,690 feet, along the crest of the northeasterly trending ridge northwest of Railroad Canyon, about 5 1/2 airline miles northeast of Elsinore. Various property names have been used for these prospects. Engel and others (1959) names are used here. Manganese mineralization here and elsewhere within the metamorphic rocks of the Bedford Canyon Formation, typically parallels the bedding in these rocks. Here, the slate and phyllite have a foliation and bedding that strike N60°-65°W and dip 50°NE. The manganese-bearing zone is 3 to 4 feet wide as exposed in mine workings, and can be traced for more than 250 yards eastward down a steep ravine. The manganese occurs in a siliceous layer described by Trask (1950) as banded chert. In the main workings just east of the ridge line, manganese mineralization occupies nearly the entire 3- to 4-foot width of the siliceous layer. In outcrop the manganese content decreases to the east and west, and consists of parallel dark bands in siliceous slates. The ore consists of black manganese oxides, apparently formed by partial to complete oxidation of rhodonite. Prismatic rhodonite crystals as long as 0.2-of-an-inch have been reported (Wilson, in Trask and others, 1950). Rhodonite was also identified by X-Ray diffraction (this study). Dark-brown, massive, opaline material was tentatively identified as neotocite or bementite (Wilson, in Trask and others, 1950). A sample from the property contained 34.42 % manganese, 9.52 % silica, and 0.14 % phosphorus (Bradley, 1918). A sample from the dump contained 30.87 % manganese (Wilson, in Trask and others, 1950). The most completely oxidized, and most valuable ore, appears to be within 20 feet of the ground surface. The oxidized ore grades downward into unoxidized rhodonite and siliceous material. ICP analysis of a sample from the main workings near the ridge top showed that the oxide ore is enriched in molybdenum (322 ppm), zinc (507 ppm), silver (24.5 ppm), nickel (804 ppm) , cobalt (1,120 ppm), manganese (10%), arsenic (753 ppm). strontium (595 ppm), cadmium (24.2 ppm), antimony (23 ppm), vanadium (589 ppm), barium (1,239 ppm), and tungsten (347 ppm); fire assay for silver showed 0.52 oz/ton, and no gold. A sample from a shallow trench near the saddle about 400 feet northwest of the main workings was enriched in copper (316 ppm), nickel (40 ppm), manganese (18.1%), strontium (218 ppm), and antimony (32 ppm); assay showed silver at 0.01 oz/ton and no gold.	192

APPENDIX NO.	NAME/ U.S.B.M. NO.	LOCATION 7½' QUAD	COMMOD-ITY	MRZ ZONE	COMMENTS AND REFERENCES	MAP NO.

Mining has been confined to the richest part of the oxidized zone which is in the 75-foot segment just east of the ridge. About 50 feet below the ridge line an irregular drift extends westerly about 80 feet into the hillside. A portion of the adit may have caved, forming a trench at the entrance to the adit. Near the entrance, the adit has been mined upward to form an irregular open stope about 25 feet high and 3 to 4 feet wide. Two 10-foot crosscuts into the hanging wall, at 40 and 60 feet from the portal, reportedly penetrate barren slate. About 150 feet below and east of the main workings, black and white banded siliceous rock along strike from the main workings, has been prospected in a small cut. About 450 feet farther east along the strike, similar rock carries a 2-foot width of black manganese-bearing rock exposed in an open cut about 30 feet long, 10 to 15 feet wide, and as much as 5 feet deep. As early as 1900, development was reported in the area of this deposit (Aubury, 1906), but not until the Second World War was ore removed on a commercial basis. Wilson (in Trask and others, 1950) stated that production of 50 tons is listed from this claim; the 1941 production is reportedly 30 tons. The property was idle in 1945, but several cars of ore reportedly containing 30% to 35% manganese were shipped previously to Kaiser Steel Company at Fontana (Tucker, 1945). Wilson estimated that no more than 100 tons of additional oxide ore could be expected from the developed ore bed.

References: Aubury, 1906, p. 336; Bradley, 1918, p. 56-58, 94; Harder, 1912, p. 165; Jenkins, 1943, p. 83, 154-155, map; Merrill and Waring, 1919, p. 546; Sampson, 1935, p. 515; Saul and others, (1968), p. 955-960; Tucker and Sampson, 1929, p. 493, and 1945, p. 150; Wilson, in Trask and others, 1950; p. 180-182.

APPENDIX NO.	NAME/ U.S.B.M. NO.	LOCATION 7½' QUAD	COMMOD-ITY	MRZ ZONE	COMMENTS AND REFERENCES	MAP NO.
222	Unknown Name Prospect	Lake Elsinore T5S R4W E 1/2 Sec 33	Mn?	MRZ-4	Located adjacent to a jeep trail at an elevation of 1,650 feet, on the south side of a ravine on the east slope of the rolling hills about 1 1/2 airline miles west of Railroad Canyon Reservoir and about 2 airline miles northeast of Lake Elsinore. This prospect consists of an adit and prospect pit that explore deeply weathered pelitic metasedimentary rocks of the Bedford Canyon Formation. The foliation in these rocks strikes N68°W and dips 70°-75°NE. The black color of these rocks may be caused by manganese. These rocks do not appear to be mineralized to any significant extent.	198
223	Unknown Name Prospect	Lake Elsinore T5S R4W NW 1/4 Sec 34	Mn	MRZ-4	Located at an elevation of about 1,500 feet, in low hills about 2 miles southeast of Highway 74, about 2 1/2 miles northeast of Lake Elsinore. Foliation and bedding in slate of the Bedford Canyon Formation reportedly strikes N 65°W and dips 50°NE. A siliceous bed 4 1/2 feet thick reportedly contains black manganese oxides, siliceous rock that is stained black (presumably with manganese minerals), and a small amount of pink rhodonite. The manganese-bearing layer is reportedly exposed along a 20-foot long trench with 5-foot face. A segment of a similarly mineralized zone is reportedly exposed in a shallow pit southeast of the trench. The area is currently being developed as part of a large housing tract, part of the extensive development surrounding the Railroad Canyon Reservoir. Reference: Engel and others, 1959, p. 125.	199

Specialty Sand

APPENDIX NO.	NAME/ U.S.B.M. NO.	LOCATION 7½' QUAD	COMMOD-ITY	MRZ ZONE	COMMENTS AND REFERENCES	MAP NO.
224	Corona Clay/ Sand Deposit 0060650863	Corona South T4S R6W NW 1/4 NW 1/4 Sec 16 NE 1/4 NE 1/4 Sec 17	SS	MRZ-2a SS(i-1) p. 48	The Corona clay/sand deposit is located about four miles southeast of Corona, between Freeway I-15 and Temescal Wash. The deposit was discovered in 1954 by drilling by the Gladding, McBean Co. The property is now owned by Pacific Clay Products, Inc. The Corona Industrial Sand Company is mining industrial sand from the deposit and leaving the clay fraction for use by Pacific Clay Products, Inc. The deposit consists of a series of sedimentary and residual clays overlain by a grey sand and alluvium. The alluvial cap is 20 to 50 feet thick and thickens to the west. The grey sand layer ranges from 10 to 100 feet thick. The underlying clays are considered to be Paleocene-age Silverado Formation, the grey sands may by Eocene Santiago Formation or an equivalent. The sand is sold for industrial uses such as golf course sand, sand blasting, play sand and glass manufacture. This property is also classified for clay resources (see appendix no. 7).	82
225	Coronita Ranch Sand 0060651113	Corona South T4S R6W SW 1/4 Sec 16 SE 1/4 Sec 17	SS	MRZ-3a SS(i-3) p. 49	The Coronita Ranch deposit is on the outwash of Bedford Canyon, just west and adjacent to the Owens-Illinois property (appendix no. 227, map no. 86). The deposit is in the lower part of the Silverado formation of Paleocene age. The deposit is lenticular and lies at an attitude of N45°W and dips 8° to 10°SW. The property has never been developed. In the 1950's, 10 holes were drilled on the property and showed good grade silica sand in thicknesses from 38 feet to over 88 feet, thickening to the west. Overburden is 2 feet to 90 feet. The deposit is now the site of Freeway I-15.	85
226	Jackson and Havens 0060650918	Corona South T4S R7W Sec	SS	MRZ-3a SS(i-1) p. 49	Location uncertain. Possible site occupied by orchards. Small production of molding sand prior to 1924. Deposit approximately 30 feet thick within the Silverado Formation of Paleocene age. References: Saul and others, (1968), p. 1128, Gray, 1961, p. 120.	62

Specialty Sand

APPENDIX NO.	NAME/ U.S.B.M. NO.	LOCATION 7½' QUAD	COMMOD-ITY	MRZ ZONE	COMMENTS AND REFERENCES	MAP NO.
227	Owens-Illinois Glass Company (Corona Silica Sand Deposit) 0060650868	Corona South T4S R6W SW 1/4 Sec 17	SS	MRZ-3a SS(i-3) p. 49	The Owens-Illinois Glass Co. quarries are located east and west of the Temescal road just south of Cajalco Road. Silica sand was mined from the lower beds of the Paleocene-age Silverado formation. The silica-rich portion was 120 feet thick and exposed over an area 2,000 feet wide and 3,000 feet long. The deposit was covered by 20 feet of Quaternary gravels. Clay, silt and fine sand make up 30% to 40% of the deposit. This material was stockpiled and the clay was later sold. The property was first developed in the 1920's by J. Weisel Industrial Sand Co. and purchased by Owens-Illinois Glass Co. in 1947. The property was continuously operated from the 1920's through the 1970's and was the principle source of silica sand in Southern California. On site are processing, storage and office facilities. The two pits are about 600 feet by 600 feet and are 100 to 120 feet deep with faces of 80 to 100 feet. As late as 1988, a small operation was working the dumps to extract grit to be used to make sandpaper. Clay extraction is currently in progress. References: Gray, 1961, p. 97-101; Saul and others, (1968), p. 1161; Tucker and Sampson, 1929, p. 504; Tucker and Sampson, 1945, p. 163-164; Riverside County Planning Department documents.	86
228	Smith Silica Quarry (Jones, Hoag Ranch) 0060650867	Corona South T4S R6W SW 1/4 Sec 17	SS	MRZ-3a SS(i-2) p. 49	This prospect lies on the west edge of Bedford Canyon. The sand is in Pliocene unconsolidated sediments. A small amount of material was produced from this quarry as foundry sand prior to 1961. In 1961, Riverside Cement Company bought the quarry for silica sand. The sand is 97% silica with 0.09% to 0.11% iron content. Workings consisted of an open cut 300 feet by 200 feet by 10 feet deep in 1961. Presently Idle, the pit shows a depth of 25 feet to 30 feet on the east and a maximum west face of 50 feet. References: Saul and others, (1968), p. 1126; Tucker and Sampson, 1929, p. 505; Tucker and Sampson, 1945, p. 163; Sampson and Tucker, 1931, p. 443.	84

APPENDIX NO.	NAME/ U.S.B.M. NO.	LOCATION 7½' QUAD	COMMOD-ITY	MRZ ZONE	COMMENTS AND REFERENCES	MAP NO.
229	Temescal Canyon Silica Sand 0060650878	Corona South T4S R6W NE 1/4 Sec 29	SS	MRZ-3a SS(i-4) p. 51	Located south of the Bedford Canyon Motorway, on the north side of McBride Canyon, this property was originally explored in 1956 by the Ottawa Silica Company. The deposit is within arkosic sands of the undifferentiated Vaqueros and Sespe Formations of Eocene to Miocene age and the Silverado Formation of Paleocene age. Prospect pits and small open cuts remain. California Division of Mines and Geology analysis (Saul and others, (1968)): 73.74% SiO_2 12.77 Al_2O_3 1.03% Fe_2O_3 5.25% CaO 3.04% CaO 0.87% L.O.I. 1.22% moisture References: Gray, 1961, p. 103; Saul and others, (1968), p. 1131-1132.	89

Specialty Stone

Dimension Stone

APPENDIX NO.	NAME/ U.S.B.M. NO.	LOCATION 7½' QUAD	COMMOD-ITY	MRZ ZONE	COMMENTS AND REFERENCES	MAP NO.
230	Blue-Gray Granite Quarry 0060650446	Steele Peak T4S R4W NE 1/4 of NE 1/4 Sec 14	Dim Stn	MRZ-4	Located about 3 miles northwest of Perris in low, rounded hills 1/4-mile southwest of the intersection of Seaton Avenue and Rider Street. In 1929 the quarry was producing monument stone (Tucker and Sampson, 1929). The quarry was idle by 1945. There was possibly intermittent activity between 1945 and 1963. The quarry has been long idle. The rock is a light gray, medium- to coarse-grained quartz diorite, part of the Val Verde pluton of the southern California batholith. The surface is irregularly weathered to depths of 5 to 10 feet, and in places the weathered zones extend to the quarry floor. The quarry is about 400 feet long and averages about 100 feet wide. The highest point on the wall, at the southwestern end of the quarry, is about 50 feet. References: Tucker and Sampson, 1929, p. 508; Tucker and Sampson, 1945, p. 166; Saul and others, (1968), p. 1082-1084.	119
231	Delano Black Granite 0060650700	Steele Peak T4S R4W W 1/2 of W 1/4 of SE 1/4 Sec 32 and W 1/2 of NW 1/4 Sec 33	Dim Stn	MRZ-4	Located about 5 miles west of Perris on both sides of Santa Rosa Mine Road at the intersection of Justice Mill Road. A small amount of monument stone was quarried from surface workings north of Santa Rosa Mine Road in about 1930. No production has been reported since. A small cut about 50 feet wide and 12 feet high may have resulted from the 1930's operation. The rock is a massive, hypersthene quartz diorite. On fresh surfaces the rock is black. Although there are large, fresh, unweathered blocks of stone at the surface, much of the rock is deeply weathered. The weathered zones extend possibly 10's or 100's of feet below the surface. This black quartz diorite is one of a group of intrusive bodies in the Gavilan Plateau area. This group or "complex" is a part of the southern California batholith. References: Dudley, 1935, p. 501, 506; Larsen, 1948, p. 46, 47; Saul and others, (1968), p. 1034-1038.	149
232	Hole Ranch Quarries 0060650841	Corona North T3S R6W NW 1/4 of NW 1/4 Sec 22	Dim Stn	MRZ-4	Small quarries located on east and west sides of small hill north of the Riverside Freeway (I-91) and east of Buchanan Street. The stone, a light-colored, medium-grained granodiorite, was probably used to make paving blocks in the early part of the century. The quarry on the east side of the hill is about 60 feet by 25 feet and 30 feet deep. The quarry on the west side of the hill is small. Reference: Saul and others, (1968), map.	19

Specialty Stone

Dimension Stone

APPENDIX NO.	NAME/ U.S.B.M. NO.	LOCATION 7½' QUAD	COMMOD-ITY	MRZ ZONE	COMMENTS AND REFERENCES	MAP NO.
233	Mt. Hole Quarries 0060650837	Corona North T3S R6W N 1/2 Sec 17	Dim Stn	MRZ-4	Dimension stone quarries reported about 3 1/2 miles northeast of Corona (Saul and others, (1968)). Three quarries presumably active in the early part of the century when dimension stone was being produced in the Corona area. The area is underlain by granodiorite rocks of the southern California batholith. Reference: Saul and others, (1968), map.	17
234	Royal Black Granite Quarries	Steele Peak T4S R4W NE 1/4 of SE 1/4 Sec 32	Dim Stn	MRZ-4	Quarries located about 5 miles west of Perris on the south side of Santa Rosa Mine Road along Justice Mill Road. The property was reportedly first quarried for dimension stone in 1936 and was active until 1948. Most of the quarrying during that time was on the hilltop west of Justice Mill Road. Some of this stone was reportedly used as facing on the Los Angeles Times building (Saul and others, (1968)). The quarry was reopened in 1963 at the base of the hill adjacent to Justice Mill Road. Blocks from this quarry were sent to Minnesota for final cutting and polishing. The quarry has been idle for some time. The rock underlying the area is a black, massive, hypersthene quartz diorite. The early quarrying at the top of the utilized large, fresh boulders within the generally weathered rock. The boulders were split and cut to dimension for shipment. The quarry at the base of the hill exposed a large surface of fresh rock. Unfractured blocks at least 20 to 30 feet square are in the quarry face. There are some weathered seams even in this quarry suggesting that the weathering is pervasive and that the fresh rock may not extend far in any direction. The black quartz diorite exposed in the quarries here is part of an intrusive body underlying an area about one mile in length and about 3/4-mile in width. This intrusive is part of the southern California batholith. References: Dudley, 1935, p. 501, 506; Larsen, 1948, p. 46, 47; Saul and others, (1968), p. 1055-1062.	156
235	Rubidoux Hill Quarry ? 0060650542	Riverside West T2S R5W NW 1/4 of NE 1/4 Sec 22	Dim Stn	MRZ-4	The probable location of this old quarry is at the very north end of Mount Rubidoux, along the south side of a small park area. The 50-foot-high wall in the rock face at the south side of the parking lot may be the old quarry. The rock is a gray, coarse-grained granite. The quarry reportedly produced building foundation stone sometime before 1906 (Aubury, 1906). Reference: Aubury, 1906, p. 47.	26

Specialty Stone

Dimension Stone

APPENDIX NO.	NAME/ U.S.B.M. NO.	LOCATION 7½' QUAD	COMMOD-ITY	MRZ ZONE	COMMENTS AND REFERENCES	MAP NO.
236	Sierra Grande Quarry 0060650845	Corona North T3S R6W N 1/2 of SW 1/4 Sec 29	Dim Stn	MRZ-4	Quarry is on the south side of the Atchison, Topeka,and Santa Fe Railroad tracks, about 1 1/2 miles east of Corona. The quarry produced paving stone for Los Angeles streets and monument stone in the early 1900's. The rock is a pink, fine-grained granite, part of the southern California batholith. Most of a small hill was quarried. Reference: Merrill and Waring, 1919, p. 585.	22
237	Temecula Quarries 0060650436	Temecula T8S R2W SE 1/4 of SW 1/4 Sec 30	Dim Stn	MRZ-4	Quarrying mostly of surface boulders, about 3 miles south of Temecula. Quarrying began before 1906 and ended sometime between 1917 and 1929. Light gray granodiorite boulders were split and cut to shape for paving blocks and dimension stone. Area is now in housing. The large boulder mentioned by Aubury (1906) as being split by a single drill hole can still be seen next to a private driveway. References: Aubury, 1906, p. 42-43; Merrill and Waring, 1919, p. 586; Tucker and Sampson, 1929, p. 509.	253
238	Unknown Name Quarry	Fontana T2S R6W NE 1/4 of NW 1/4 Sec 3	Dim Stn	MRZ-4	Reportedly located at the northwest edge of the Jurupa Mountains (MacKevett, 1951). Small quarry reported to be about 50 feet by 20 feet with a 15-foot-high back. Fine-grained granodiorite may have been used for building stone. Reference: MacKevett, 1951, p. 13.	2
239	Unknown Name Quarry	Riverside West T3S R6W SW 1/4 of SE 1/4 of SE 1/4 Sec 2	Dim Stn	MRZ-4	Surface boulders split for dimension stone on top of small hill south of Gramercy Place and northeast of Tyler Street in the City of Riverside. Rock is a dark gray, medium-grained gabbro. Quarry probably active in the early 1900's. Reference: Gray, 1968.	32
240	Unknown Name Granite Quarry	Lake Elsinore T5S R4W SW 1/4 of SW 1/4 Sec 18	Dim Stn	MRZ-4	Located in hills about 4 miles north of Lake Elsinore on the west side of Stovepipe Road. Surface boulders of light gray, medium-grained granodiorite were split for dimension stone for local use, sometime prior to 1954. Reference: Engel and others, 1959, p. 100-101, 136.	175

Specialty Stone

Dimension Stone

APPENDIX NO.	NAME/ U.S.B.M. NO.	LOCATION 7½' QUAD	COMMOD-ITY	MRZ ZONE	COMMENTS AND REFERENCES	MAP NO.
241	Unknown Name Granite Quarry	Lake Elsinore T5S R4W NE 1/4 of SE 1/4 Sec 18	Dim Stn	MRZ-4	Located in hills about 4 miles north of Lake Elsinore on the east side of Bull Canyon Road. A few surface boulders were split for dimension stone for local use as building stone curbstone and lintels. The rock is a light gray, medium-grained granodiorite. Active sometime before 1954. Reference: Engel and others, 1959, p. 100-101, 136.	181
242	Unknown Name Granite Quarry	Lake Elsinore T5S R4W SE 1/4 of NW 1/4 Sec 17	Dim Stn	MRZ-4	Located in hills about 4 1/2 miles north of Lake Elsinore, about one mile east of Bull Canyon Road. Surface boulders were split for dimension stone sometime before 1954. Rock is light gray, medium-grained granodiorite. References: Engel and others, 1959, p. 100-101, 136.	182

Specialty Stone

Riprap

APPENDIX NO.	NAME/ U.S.B.M. NO.	LOCATION 7½' QUAD	COMMOD-ITY	MRZ ZONE	COMMENTS AND REFERENCES	MAP NO.
243	Atkinson Quarry (Ormand Quarry) (see also under Construction Aggregates) 0060650537	Fontana T2S R5W NW 1/4 Sec 9	Rip-rap	MRZ-2a SR(i-2) p. 46	This quarry produced riprap for breakwaters in the 1920's and 1940's. The quarry has produced over 3 million tons of stone since its opening in 1925. It was first owned by the Hauser Construction Company. In about 1944, the quarry was acquired by the Guy F. Atkinson Company. In the 1950's and 1960's the Haven Granite Company used tailings rock as a source of poultry grit. The quarry is now controlled by Paul J. Hubbs Construction Company. Some construction aggregate is produced from the rock blasted down during former quarrying. References: Tucker and Sampson, 1929, p. 509; Tucker and Sampson, 1945, p. 166; Gay, 1957,p. 586; Saul and others, (1968), p. 1046-1049.	9
244	Casa Blanca Quarries 0060650547	Riverside West T3S R5W S 1/2 Sec 10	Rip-rap	MRZ-4	Two old quarries in the City of Riverside, south of Freeway 91. The northern quarry is on the south side Quarry Hill. The southern quarry is on the south side of a hill north of the corner of Dufferin Avenue and Grace Street. The quarries supplied riprap for the San Pedro breakwater around 1900. The rock type in both quarries is a light gray, medium-grained granodiorite. The northern quarry is 100 feet by 100 feet and is about 50 feet deep (now filled with water). The southern quarry has been reclaimed as part of the landscaping of a private residence. Reference: Aubury, 1906, p. 44-45.	34
245	Harlow Quarry (Blarney Stone Quarry (see also under Construction Aggregates) 0060650218	Lake Mathews T4S R6W W 1/2 Sec 15	Rip-rap	MRZ-2a SR(i-3) p. 46	This mine currently produces riprap and construction aggregates. The Paul J. Hubbs Construction Company now operates the mine. At the north end of the property, clay is mined from the Cajalco clay pit for use in making bricks (see section on Clay). The quarry was first operated about 1935 to 1939 by Pantages Construction Company to make railroad ballast. The quarry was idle until 1953 when the J.B. Stringfellow Company and Livingston Rock and Gravel Company produced stone for several flood control projects. The main quarry is about 1,000 feet wide and extends into the hillside about 800 feet. Reference: Saul and others, (1968), p. 1028-1031.	97

Specialty Stone

Riprap

APPENDIX NO.	NAME/ U.S.B.M. NO.	LOCATION 7½' QUAD	COMMOD-ITY	MRZ ZONE	COMMENTS AND REFERENCES	MAP NO.
246	Jameson Quarry 0060650847	Corona South T3S R6W SW 1/4 Sec 29	Rip-rap	MRZ-4	Inactive quarry 1 1/2 miles east of Corona, on the south side of a small hill. The area is now being developed as an industrial site. The quarry began sometime before 1924. During 1939 and 1940, the J.B. Stringfellow Company produced riprap used to face Prado Dam. The quarry has been idle since 1950. Reference: Gray, 1961, p. 87-88.	72
247	Lake Mathews Dam Quarry North	Lake Mathews T4S R6W SW 1/4 of NE 1/4 Sec 1	Rip-rap	MRZ-4	Quarry located just west of the northern dam of Lake Mathews, west of Sierra Avenue. Quartz monzonite rock used for facing of the northern dam of Lake Mathews. Idle since dam was built.	93
248	Lake Mathews Dam Quarry South	Lake Mathews T4S R6W NW 1/4 Sec 12	Rip-rap	MRZ-4	Quarry located a few hundred yards west of Sierra Avenue at north end of the southern dam of Lake Mathews. Probably a source of riprap used to face the southern dam of Lake Mathews. Rock is quartz monzonite with some iron oxide staining.	94
249	Sidebotham Quarries (Phillips) 0060650856	Corona South T4S R6W NW 1/4 of SW 1/4 and W 1/2 of NW 1/4 Sec 5	Rip-rap	MRZ-4	Two quarries located about 2 miles southeast of Corona. Both quarries are just east of the Corona Freeway (I-15), about 1/2-mile apart. The quarries were opened in the mid-1930's to provide riprap and track ballast for the Atchison, Topeka, and Santa Fe Railroad. The southern quarry has been inactive since the 1930's. The northern quarry was reopened by the Silberberger Construction Company in 1962 for about one year. The rock material quarried is a dark greenish-gray, medium-grained granodiorite. It is hard and irregularly jointed. The southern quarry is about 250 feet in diameter with a back wall about 40 feet high. The northern quarry is about 500 feet long with a back wall about 75 feet high. The areas around both quarries is developed into housing. References: Gray, 1961, p. 88-89; Saul and others, (1968), p. 1063-1064.	77
250	Skinner Dam Quarries	Bachelor Mountain T7S R2W NW 1/4 Sec 2	Rip-rap	MRZ-4	Two quarries about 1/8-mile apart on the north side of Skinner Reservoir, at about the 1,600-foot elevation. Coarse-grained granodiorite of the southern California batholith used for facing on Skinner Dam.	250

Specialty Stone

Riprap

APPENDIX NO.	NAME/ U.S.B.M. NO.	LOCATION 7½' QUAD	COMMOD-ITY	MRZ ZONE	COMMENTS AND REFERENCES	MAP NO.
251	Stringfellow Quarry (Bly Brothers and McGilliard, Shannahan) 0060650823	Fontana T2S R6W NW 1/4 and SE 1/4 Sec 1	Rip-rap	MRZ-2a SR(i-1) p. 45	The Stringfellow Quarry is located in the central Jurupa Mountains at the north end of Pyrite Street. The quarry is active and produces riprap and by-product construction aggregates (see Construction Aggregates section). The quarry was first opened about 1900 by the West Riverside Granite Company. In 1905 the Bly Brothers were producing building stone for Los Angeles from the property. Large amounts of riprap were reportedly produced in 1914 when the company was known as Bly Brothers and McGilliard Stone Company. In 1928, roofing material and chicken grit were being produced. Since the 1920's the principal product has been riprap. The quarry is about 800 feet in diameter with a back wall about 170 feet high. An small, older quarry is at the northwestern corner of the property. The rock is a light gray, medium-grained granodiorite - part of a pluton of the Southern California Batholith. References: Aubury, 1906, p. 42-44; Merrill and Waring, 1919, p. 585; Tucker and Sampson, 1929, p. 508; Tucker and Sampson, 1945, p. 166; Mackevett, 1951, p. 13; Gay, 1957, p. 573, 586; Saul and others, (1968), p. 1065-1068.	4
252	Temescal Canyon Rock Quarry (L.S. Hawley Quarry, see also All American Asphalt and Aggregate Co., and CalMat, Corona Quarry) 0060650850	Corona South T3S R6W SW 1/4 Sec 33	Rip-rap	MRZ-4	Two quarries that are now part of the All American Asphalt and Aggregates Company property and the Corona property of the CalMat Company (see Construction Aggregates section). The northern quarry is being mined by All American Asphalt and Aggregates Company for construction aggregates. The southern quarry was opened this year by CalMat Company for the production of construction aggregates. The quarries were first opened in 1957 by the Temescal Rock Products Company to supply stone for a levee on the Santa Ana River. In 1960 Hawley Rock, Inc. produced riprap for flood control channels. In 1963 Pacific Rock and Gravel Company acquired the southern quarry. The quarries produced riprap intermittently from 1960 to 1975, when All American Asphalt and Aggregates Company began production from the northern quarry. The rock is a dark greenish-gray, medium-grained granodiorite. References: Gray, 1961, p. 89-91, 117; Saul and others, (1968), p. 1069-1071.	see 74 and 75

Specialty Stone

Roofing Granules

APPENDIX NO.	NAME/ U.S.B.M. NO.	LOCATION 7½' QUAD	COMMOD-ITY	MRZ ZONE	COMMENTS AND REFERENCES	MAP NO.
253	Temescal Rock Quarry (3M Quarry) 0060650760	Corona South T4S R6W parts of Secs 4, 5, and 9	Roof Gran	MRZ-2a SX(i-1) p. 47	Minnesota Mining and Manufacturing Company has been producing roofing granules from this quarry since 1947. This is one of the major roofing granule plants in California. The quarry was first used in 1888 to supply road material for Los Angeles streets. In 1914 it was owned by the Temescal Rock Company. About 1920, Blue Diamond Materials Company purchased the quarry for the production of construction aggregates. The plant was destroyed by fire in 1927. Quarries have been opened for several thousand feet along the east side of Temescal Wash. The rock being mined is a quartz latite porphyry, called by Gray (1961) the Temescal Wash quartz latite porphyry. Besides roofing granules, a small amount of construction aggregate and fill is produced as a by-product. References: Goodyear, 1888c, p. 506; Merrill and Waring, 1919, p. 586-587; Tucker, 1921, p. 331-332; Tucker, 1924, p. 45; Bradley, 1923, p. 95; Tucker and Sampson, 1929, p. 508, 524; Tucker and Sampson, 1945, p. 166-167; Ingram, 1949, p. 457; Gray, 1961, p. 93-95; Saul and others, (1968), 1091-1094.	80

Specialty Stone

Slate

APPENDIX NO.	NAME/ U.S.B.M. NO.	LOCATION 7½' QUAD	COMMOD-ITY	MRZ ZONE	COMMENTS AND REFERENCES	MAP NO.
254	Unknown Name Slate Quarry	Lake Elsinore T5S R4W NE 1/4 of SE 1/4 Sec 14	Slt	MRZ-4	Located along the west bank of the San Jacinto River, about 6 miles northeast of Lake Elsinore. Several small quarries in metasedimentary rocks equivalent to the Bedford Canyon Formation. Used for local building foundations and walls several years prior to 1954 (Engel and others, 1959). Reference: Engel and others, 1959, p. 101-102, 137.	186
255	Unknown Name Slate Quarry	Lake Elsinore T5S R4W SW 1/4 of SE 1/4 Sec 23	Slt	MRZ-4	Located on the west bank of the San Jacinto River, about 4 1/2 miles northeast of Lake Elsinore. About 100-foot cut in the side of a small canyon in dark gray slaty metasediments. Iron stained fractures common. Cleavage parallel to original bedding - N80°W dipping about 50°N. Slaty material possibly used for flagstone, building stone of roofing granules several years prior to 1954 (Engel and others, 1959). Reference: Engel and others, 1959, p. 103, 138.	193
256	Unknown Name Slate Quarry (?)	Lake Elsinore T5S R4W NW 1/4 of NE 1/4 Sec 26	Slt	MRZ-4	Located on west bank of the San Jacinto River, about 4 1/2 miles northeast of Lake Elsinore. A 20-foot trench of questionable origin in slaty metasediments. Reference: Engel and others, 1959, p. 103, 138.	194
257	Wrench Slate Prospect (?) 0060650507	Lake Elsinore T5S R4W SW 1/4 of SE 1/4 Sec 34	Slt	MRZ-4	Located along the side of a wash about 3 miles east of Lake Elsinore and about 1/20-mile west of Railroad Canyon Reservoir. Small prospect in slightly slaty metasediments. Cleavage parallel to original bedding - N25°W dipping 60°NE. Cut described by Engel and others (1959) as being 20 feet long and 5 feet high not found. Reference: Engel and others, 1959, p. 103, 138.	200

APPENDIX NO.	NAME/ U.S.B.M. NO.	LOCATION 7½' QUAD	COMMOD-ITY	MRZ ZONE	COMMENTS AND REFERENCES	MAP NO.
258	Black Rock Prospects (North Black Rocks, South Black Rocks) 0060650553 0060651119	Lake Mathews T4S R5W Sec 18,19	Sn	MRZ-4	The Black Rock prospects are located southwest of the Cajalco Tin mine (appendix no. 259, Map no. 92). The area is notable for the prominent black knobs which stand out in relief. The area is also one of northeast striking, 30° to 65° east-dipping tourmaline-quartz veins and tourmaline-quartz breccia pipes. Country rock is quartz monzonite. Veins are discontinuous and range from 2 to a reported 30 feet in width. The area was prospected by the Black Rocks Tin Syndicate, the American Tin Corporation, and by Page and Thayer (1945). The property was explored from 1927 to early 1930's by several shallow shafts, declines and prospect pits. No workings were located for this study except numerous prospect pits. In 1929 average assays from North Black Rock were 0.03% to 0.05% tin. Page and Thayer's assays were equally low: few higher than 0.08% tin, with 0.18% the highest grade. Samples for this study showed no tin and 0.06 oz/ton silver. References: Saul and others, (1968), p. 1149-1150, 1158-1160; Tucker and Sampson, 1929, p. 495-497; Sampson, 1935, p. 516-517; Tucker and Sampson, 1945, p. 151-152; Page and Thayer, 1945; Bedford and Johnson, 1946, p. 10; Gray, 1957, p. 643.	98
259	Cajalco Tin Mine (Temescal Tin Mine) 0060650977	Lake Mathews T4S R6W Sec 2 ,3, 10, 11	Sn	MRZ-3a (h-2) p. 26	The Cajalco tin mine area was first developed around 1860. A 95-foot shaft was sunk by the Phelps-Dodge Corp. The San Jacinto Tin Mining Co. resumed exploration in 1868, after the Civil War. The property was sold in 1890 to the San Jacinto Estate, Ltd., an English company. After considerable development (6 1/2 miles of tunnels, a mill, and a smelter) the property was sold to the San Jacinto Land Company. In 1927, the mine was sold to the Temescal Syndicate and reorganized as the American Tin Corporation in 1928. American Tin subsequently reorganized as the Temescal Corporation in 1930 and again as Tinco Company in 1943. Total tin production (in 1869 and 1891 to 1892) was 125 to 145 tons. The deposits are in tourmaline and tourmaline-quartz replacement veins and breccia "pipes" in quartz monzonite, older quartz latites, and metasediments of the area. The important veins are restricted to the quartz monzonite and trend northeast. They are discontinuous, the longest is less than 1000 feet, and vary from in width from inches to 15 to 20 feet. Average width of observed veins was 1 to 2 feet. The Cajalco vein was about 6 feet wide and was followed to a depth of 690 feet and not bottomed. The veins are zoned: finely grained tourmaline in the center grading out into mottled rock where tourmaline and quartz have successively replaced the country rock. Alteration consists of tourmalinization, silicification and some local saussuritization. Alteration is not limited to the Cajalco mine area but is widespread	92

APPENDIX NO.	NAME/ U.S.B.M. NO.	LOCATION 7½' QUAD	COMMOD-ITY	MRZ ZONE	COMMENTS AND REFERENCES	MAP NO.

throughout the district, an area of over 15 sq miles, including the Black Rock area (appendix no. 258, map no. 98). The only appreciable tin values (more than 0.10% tin) were found in the vicinity of the Cajalco mine and then only in the Cajalco vein itself. Vein minerals are black tourmaline and quartz. Epidote is observed as vein material and as replacement in country rock. Page and Thayer (1945) reported muscovite, bastnaesite, dumortierite, and cassiterite in hand specimen. Also reported as vein minerals were minor amounts of arsenopyrite, galena, and sphalerite. None of these reported minerals were observed in this study. Minor amounts of pyrite, chalcopyrite, limonite and copper oxides were observed. A single specimen of dumortierite was collected east of the mine area. No cassiterite was observed in the course of this study. Page and Thayer concluded an exhaustive study of the Cajalco Tin area in 1945 (Page and Thayer, 1945). They found that the average grade of vein material was 0.03% to 0.05% tin. They examined the tin values in concentrates by assay, in screened fractions by microscopy and by spectrographic analysis. The differences between the tin values of the concentrates and the microscopically examined samples and the values determined by spectrographic analysis lead them to conclude that: 1) the tin is chemically combined with tourmaline, or 2) the tin is so fine-grained and intergrown with the tourmaline that it cannot be separated. Assays for this study were 2 ppm tin, 0.01% copper, 0.07 to 0.21 oz/ton silver and 0.001 to 0.003 oz/ton gold. The major workings at the Cajalco mine are on the Cajalco vein: a shaft, a decline (to 540'), a raise to the surface, and 5,800 feet of drifts and crosscuts. Numerous other shafts and adits, with drifts and crosscuts, explore the larger veins in the district. Prospect pits and trenches have been dug on nearly every other tourmaline vein in the area. Most underground workings are caved or otherwise inaccessible. Production total is calculated at 292,322 pounds of tin (Page and Thayer, 1945).

References: Goodyear, 1888c, p. 506; Crossman, 1890; Hanks, 1884, p. 120-122; Benedict, 1890, p. 450-453; Fairbanks, 1893, p. 111-113; Rolker, 1895, p. 537; Fairbanks, 1893, p. 39-42; Merrill and Waring, 1919, p. 547-550; Tucker, 1924, p. 46; West, 1928, p. 131-132; Tucker and Sampson, 1929, p. 497-499; Sampson, 1935, p. 517-518; Segerstrom, 1941, p. 533-534, 543, 550-551; Tucker and Sampson, 1945, p. 153-154; Page and Thayer, 1945; Bedford and Johnson, 1946; Larsen, 1948, p. 132-133; Larsen, 1951, p. 48; Pampeyan, 1952; Gray, 1957, p. 641-644; Irving, 1935; Saul and others, (1968), p. 1146, 1147, 1161-1165.

APPENDIX NO.	NAME/ U.S.B.M. NO.	LOCATION 7½' QUAD	COMMOD-ITY	MRZ ZONE	COMMENTS AND REFERENCES	MAP NO.
260	Chief of the Hills 0060650509	Lake Elsinore T5S R4W NE 1/4 Sec 4 NW 1/2 Sec 3	Sn	MRZ-4	Located on the east side of the high point of the ridge including hill 1962, about 1 mile west of Railroad Canyon Dam and about 2 airline miles east of Lake Elsinore. These workings are in slate, quartzite, and metaconglomerate of the Bedford Canyon Formation. Foliation and bedding strike N5°-30°W and dip 80°-85°NE. These rocks are intruded by five granitic dikes parallel to the foliation. Tin reportedly occurs as reddish-brown crystals lining cavities in minutely crystalline tourmaline associated with the granitic dikes; tin assays of 0.30 to 2.21% are reported from rock replaced by tourmaline (Tucker and Sampson, 1929). Segerstrom (1941) reports 7% tin. Discontinuous quartz veins 2 to 3 inches in width and exhibiting comb structure occur along the margin of a metaconglomerate. These rocks are locally stained with iron and manganese(?) oxides. The area reportedly was prospected in the late 1920's; five claims were located in December, 1926. The property was idle by 1929 and there is no report of subsequent activity. The granitic, tin-bearing dikes reportedly are prospected by shallow trenches and a 100-foot vertical shaft with crosscuts driven 20 feet east and 10 feet west at the bottom. The west crosscut was driven in rock that reportedly assayed 0.31 to 1.22% tin (Tucker and Sampson, 1929, p. 496). References: Engel and others, 1959, p. 77, 126; Larsen, 1948, p. 133, and 1951, p. 49; Saul and others, (1968), p. 1163-1164; Sampson, 1935, p. 516; Segerstrom, 1941, p. 551; Tucker and Sampson, 1929, p. 496; Tucker and Sampson, 1945, p. 152.	209

APPENDIX NO.	NAME/ U.S.B.M. NO.	LOCATION 7½' QUAD	COMMOD-ITY	MRZ ZONE	COMMENTS AND REFERENCES	MAP NO.
261	Holmes Ranch 0060650859	Lake Mathews T4S R6W NW 1/4 Sec 12	Sn	MRZ-4	Area prospected at the same time as the activity at the Cajalco Tin mine (appendix no. 259, map no. 92) to the west. The property is one of discontinuous tourmaline-quartz veins in quartz-monzonite striking N20°E and dipping mostly 50° to 80° to the northwest. The main vein crops out on a prominent ridge and ranges from 3 to 6 feet in width. No cassiterite was observed. Assays by Page and Thayer (1945) found only traces of tin. No workings were observed for this study. Two shafts (not located) constructed in the area were not sunk on tourmaline veins and were probably sunk in connection with dam construction. A sample of dumortierite as float was found at this location. References: Saul and others, (1968), p. 1153.	96
262	Unknown Name Prospect	Lake Elsinore T5S R4W S 1/2 Sec 22 N 1/4 Sec 27	Sn	MRZ-4	Located at an elevation of 1,620 feet, about 3/4-mile southeast of Highway 74, about 3 1/2 airline miles northeast of Lake Elsinore. The area is partly covered by single family residences. The area reportedly was prospected for tin in the mid 1930's. A pegmatite dike trends northeasterly through quartz diorite near the contact with schists and slates of the Bedford Canyon Formation. Traces of topaz and tourmaline reportedly were exposed in a shallow cut, but tin-bearing minerals reportedly were not observed in 1954 (Engel and others, 1959). A shallow open cut is the only reported development; there has not been any production. References: Larsen, 1948, p. 133; Larsen, 1951, p. 49; Engel and others, 1959, p. 77, 127; Saul and others, (1968), p. 1169.	190

APPENDIX NO.	NAME/ U.S.B.M. NO.	LOCATION 7½' QUAD	COMMOD-ITY	MRZ ZONE	COMMENTS AND REFERENCES	MAP NO.
263	Unknown Name Prospect	Lake Elsinore T6S R4W NW 1/4 Sec 9	Sn? Au?	MRZ-4	Located at an elevation of about 1,440 feet, in a low hill south of the road, south of the southwest corner of the city landfill, 1 mile east of Lake Elsinore. Workings consist of an adit driven southward into the north flank of a hill. The adit undoubtedly connects with a 30-foot deep, 8-foot by 8-foot shaft on top of and near the east end of the hill. The shaft is about 50 feet south of the adit portal. A 5-foot by 8-foot prospect pit is located on the north side of the hill, about midway between the adit and the shaft. A west-northwest trending, 40-foot long, 4-foot wide, 5-foot deep exploration trench is located about 40 feet southwest of the shaft. An open cut is located about 20 feet northeast of the shaft collar. The adit is in San Marcos gabbro that comprises the footwall of a fault zone that strikes N13°-14°E and dips 60°SE. The hanging wall rock is not well exposed in the adit. The east wall of the adit is sheared gabbro. Metasedimentary and/or metavolcanic rocks exposed along the east base of the hill comprise the hanging wall block. The shallow pit between the adit and shaft reveals a westerly trending contact between gabbro to the north and a fine-grained to aphanitic crystalline rock (felsite) to the south. The rock is light gray on fresh surfaces and rusty-brown to gray-brown on weathered surfaces. This rock is comprised mostly of albite and quartz, and possibly a zeolite alteration mineral (determined by whole-rock X-ray diffraction). An assay of a composite sample of the felsite, collected at several different locations, indicates essentially no silver or gold (silver: 0.01 oz/ton; gold: 0.001 oz/ton). ICP analysis of this rock (30 elements) did not indicate any significant enrichment. Production from this property is unknown. The prospect has been idle for many years.	207

APPENDIX B

INDEX OF MINES AND PROSPECTS

INDEX OF MINES AND PROSPECTS

NAME	COMMODITY	U.S.B.M.#	MAP#	APPENDIX#
Acme (see Old Dominion Mine)				
Alberhill Coal and Clay Company	Kaol Clay, Clay, Coal	0060650944	169	2, 43
Alberhill Shale/Clay Mine	Comm Clay		174	3
Alice	Au	0060650427	233	124
All American Asphalt and Aggregates Co. (see also Temescal Canyon Rock Quarry)	Conc Agg		74	92
American Encaustic Tiling Company (see California Land and Mineral Company)				
Argonaut Group	Au	0060650518	213	125
Arlington Tunnel	Au	0060650551	120	126
Atkinson Quarry (Ormand Quarry)	Riprap, Conc Agg	0060650537	9	93, 243
Atlas Clay Pit (see Corona Clay Pit)		0060650872		
Beal-McClellan (Black Eagle and Newport, Brum and Newport, East Group, Elsinore: East Group and West Group)	Mn, Ag	0060650016	192	221
Bedford Canyon Deposit (see Corona Clay/Sand Deposit)				
Beehive	Cu, Au		236	114
Best Ranch	Lmst	0060650501	197	217
Big Chief (Freeman-Nonhof, Ware Deposit, White Gypsum Group)	Gyp	0060651108	59	206
Binkley's and Tyler's Diggings	Au	0060650508 0060650519	214	127
Black Eagle and Newport (see Beal-McClellan)				

NAME	COMMODITY	U.S.B.M.#	MAP#	APPENDIX#
Black Rocks Prospects (South Black Rocks, North Black Rocks)	Sn	0060651119 0060650553	98	258
Blarney Stone Quarry (see Harlow Quarry)		0060650861		
Blom Mine (see Perris Mining Co. Deposit)				
Blue Goose	Au, Ag	0060650889	235	128
Blue-Gray Granite Quarry	Dim Stn	0060650446	119	230
Bly Brothers and McGilliard (see Stringfellow Quarry)				
Bob Cat No.1 (see Purple Hope Mine)				
Borrow Pit	Base Agg		13	48
Borrow Pit	Base Agg		15	49
Borrow Pit	Base Agg		18	50
Borrow Pit	Base Agg		23	51
Borrow Pit	Base Agg		24	52
Borrow Pit(s)	Base Agg		30	53
Borrow Pit	Base Agg		31	54
Borrow Pit	Base Agg		35	55
Borrow Pit	Base Agg		36	56
Borrow Pit	Base Agg		37	57
Borrow Pit	Base Agg		36	56
Borrow Pit	Base Agg		38	58
Borrow Pit	Base Agg		134	59
Borrow Pit	Base Agg		135	60
Borrow Pit	Base Agg		136	61
Borrow Pit	Base Agg		137	62
Borrow Pit	Base Agg		178	63
Borrow Pit(s)	Base Agg		203	64
Borrow Pit	Base Agg		218	65

NAME	COMMODITY	U.S.B.M.#	MAP#	APPENDIX#
Borrow Pit	Base Agg		219	66
Borrow Pit	Base Agg		226	67
Borrow Pit	Base Agg		245	68
Borrow Pit	Base Agg		246	69
Borrow Pit	Base Agg		247	70
Borrow Pit	Base agg		251	71
Borrow Pit	Base Agg		252	72
Brady Prospect	Au	0060650511	208	129
Brown Star Claims (see Middlesworth Clay Deposit)				
Brum and Newport (see Beal-McClellan)				
Bundy Canyon Road Pit	Base Agg		221	73
Bundy-Murrieta Deposit	Feld, Si	0060650424	230	119
C & C Consolidated	Au, Ag	0060650002	158	130
C.L. Pharris Co., Dawson Canyon Pit	Conc Agg	0060650700	108	94
C.L. Pharris Co., Maitri Pit	Conc Agg		112	95
Cajalco Tin Mine (Temescal Tin Mine)	Sn	0060650977	92	259
Cajalco Pit	Kaol Clay	0060650866	95	4
California Land and Mineral Company (American Encaustic Tiling Company)	Feld, Si	0060650431	243	120
CalMat, Corona Quarry (L.S. Hawley Quarry, see also Temescal Canyon Rock Quarry)	Conc Agg		75	96
Capitol Dome	Gyp		66	207
Casa Blanca Quarries	Riprap	0060650547	34	244
Castillo's Prospect	Coal	0060651103	88	44
Chandler's Palos Verdes, Corona Pit	Conc Agg		113	97

NAME	COMMODITY	U.S.B.M.#	MAP#	APPENDIX#
Chandler's Palos Verdes, Glen Ivy Pit	Conc Agg		109	98
Chief of the Hills	Sn	0060650509	209	260
Chocolate Drop	Comm Clay	0060650869	81	5
Christensen Pit	Base Agg		215	74
Coldwater Canyon Pit (see R.J. Noble Company)				
Collins Copper Prospect	Cu	0060650855	79	115
Colorado-Justice Claims	Au, Ag	0060650467	151	131
Conduit Clay Placer	Comm Clay	0060650893	40	6
Coplin Granite Pit	Base Agg	0060650235	21	75
Corona (Peggy)	Au	0060650468	152	132
Corona Clay/Sand Deposit (Bedford Canyon Deposit)	Kaol Clay, SS	0060650863	82	7, 224
Corona Clay Pit (includes Atlas Clay Pit)	Kaol Clay	0060650942	103	8
Corona Lead-Zinc Mine	Pb, Zn	0060650922	67	213
Corona Placer (Lord)	Kaol Clay	0060650923	64	9
Corona Rock Co.	Conc Agg	0060650838	73	99
Corona Silica Sand Deposit (see Owens-Illinois Glass Company)				
Coronita Ranch Sand	SS	0060651113	85	225
Corosil Mine (see South Clay Pit)		0060651001		
Crestmore Quarry (Riverside Cement Company)	Conc Agg, Lmst	0060650240	10	100, 218
Crowell Mine (see Mountain Group)				
Dawson Canyon Pit (see C.L. Pharris, Dawson Canyon Pit)	Conc Agg	0060650700		

NAME	COMMODITY	U.S.B.M.#	MAP#	APPENDIX#
De Guerre Mines (see also Pacific Clay Products, Inc.)	Kaol Clay	0060650815	170	10
Delano Black Granite	Dim Stn	0060651116	149	231
Dominguez Clay/Shale Deposit	Comm Clay	0060650945	39	11
Dr. Musick	Au	0060650454	126	133
Eagle Canyon Clay Deposit	Kaol Clay		68	12
Eagle Canyon Gypsum (Frazer)	Gyp	0060650920	69	208
East Group (see Beal-McClellan)				
Electric Copper and Gold	Cu, Au, Ag	0060650524	241	116
Elsinore: East Group and West Group (see Beal-McClellan)				
Elsinore Clay Company (see Morton Clay Deposit)				
Elsinore Peak	Au		240	134
Elsinore Ready Mix, Inc., McVicker Canyon Pit	Conc Agg	0060650969	171	101
EMSCO (see Harrington Clay Pit)				
Erenreich Gold Mines (see Mountain Group)				
Evans Shafts	Kaol Clay	0060650503	196	13
Findley Feldspar Placer	Kaol Clay	0060650895	43	14
Fire Clay Group	Comm Clay	0060650908	47	15
Fontana Paving Company, Corona Plant	Conc Agg	0060650450	78	102
Foster Sand and Gravel Pit (Werner Corp.)	Conc Agg		165	103
Frazer (see Eagle Canyon Gypsum)				

NAME	COMMODITY	U.S.B.M.#	MAP#	APPENDIX#
Freeman-Nonhof (See Big Chief)				
Gavilan Mine	Au	0060650207	131	135
Glen Avon (Mathews, Mira Loma)	Lmst	0060650826	3	219
Glen Ivy Pit (see Chandler's Palos Verdes, Glen Ivy Pit)				
Golden Chariot	Au, Ag	0060650463	140	136
Golden Charlotte (see Golden Chariot)				
Golden Nugget	Au	0060650459	130	137
Gold Prince (see Goodhope)				
Golton Group (Mineral Chief)	Au	0060650492	180	138
Goodhope (see Good Hope)				
Good Hope (Goodhope, Gold Prince, San Jacinto)	Au	0060650205	183	139
Grapevine Clay Mine	Comm Clay	0060650905	50	16
Hagador Canyon Gypsum Deposit	Gyp	0060650927	61	209
Harlow Quarry (Blarney Stone Quarry)	Riprap, Conc Agg	0060650218	97	104, 245
Harrington Clay Pit (EMSCO)	Kaol Clay	0060650871	104	17
Hoag Mine	Au	0060650552	123	140
Hoag Ranch (See Jones Clay Deposit and Smith Silica Quarry)	Kaol Clay, SS			
Hoffman (see Jones Clay Deposit)				
Hoist Pit	Kaol Clay	0060650812	179	18
Hole Ranch Quarries	Dim Stn	0060650841	19	232

NAME	COMMODITY	U.S.B.M.#	MAP#	APPENDIX#
Holmes Ranch	Sn	0060650859	96	261
Home Gardens Prospect	Dumr	0060650939	76	118
Ida Leona Mine	Au	0060650208	132	141
Indian Rose Queen (Indian Rose Quartz Queen)	Au	0060650469	142	142
Indian Rose Quartz Queen (see Indian Rose Queen)				
J.F. and T. Sand Pit	Conc Agg		111	105
Jackson and Havens	SS	0060650918	62	226
Jameson Quarry	Riprap	0060650847	72	246
Jensen Quarry North	Base Agg	0060650535	7	76
Jensen Quarry South (Snow-Rock Quarry, Sno-Top Rock Quarry)	Lmst	0060650535	8	220
Jones (see Smith Silica Quarry)	SS			
Jones Clay Deposit (Hoffman, Hoag Ranch)	Kaol Clay	0060650870	87	19, 45
Jumbo Mine	Au	0060650461	141	143
Justice		0060650467		
Kroonen Clay Deposit	Kaol Clay	0060650909	53	20
L.S. Hawley Quarry (see CalMat, Corona Quarry and Temescal Canyon Rock Quarry)				
La Plomo (see Top-of-the-World)				
Lake Mathews Dam Quarry North	Riprap		93	247
Lake Mathews Dam Quarry South	Riprap		94	248
Lake View Prospect	Au	0060650512	205	144
Lee Prospects	Au	0060650817	217	145
Leon	Au, Ag	0060650206	232	146
Liston Clay Pit	Kaol Clay		102	21

NAME	COMMODITY	U.S.B.M.#	MAP#	APPENDIX#
Little Maggie (Maggie)	Au	0060650470	143	147
Lord (see Corona Placer)		0060650925		
Lucas Canyon Claims (see Yvonne)				
Lucky Boy (Walker)	Au	0060650422	229	148
Lucky Strike (Ophir)	Au, Ag	0060650493	189	149
Maggie (see Little Maggie)		0060650470		
Main Street Gypsum Deposit	Gyp		65	210
Mammoth	Fe	0060650822	238	212
Mammoth Group	Au	0060650421	228	150
Markham Road Pit	Base Agg		124	77
Mathews Quarry (see Glen Avon)				
McClintock Clay Pit	Kaol Clay	0060650904	49	22
McGilliard/Shannahan (see Stringfellow Quarry)				
McKnight Clay Deposit	Kaol Clay	0060650913	54	23, 46
McVicar Pit (see Susie Placer)				
McVicker Canyon Pit (see Elsinore Ready Mix Inc., McVicker Canyon Pit)				
Menifee Mine	Au, Ag	0060650420	227	151
Middlesworth Clay Deposit (Brown Star Claims)	Kaol Clay	0060650919	63	24
Mina Rosalia (see Santa Rosa Mine)				
Mineral Chief (see Golton Group)				
Mira Loma Pit (see Triangle Rock Products, Inc., Mira Loma Pit)				
Mira Loma (see Glen Avon)				

NAME	COMMODITY	U.S.B.M.#	MAP#	APPENDIX#
Missing Link (see Virginia Shay)				
Mobil Sand Company Pit	Conc Agg	0060650495	101	106
Morris-Washington Prospects	Au, Ag	0060650455	133	152
Morton Clay Deposit (Elsinore Clay Company)	Kaol Clay	0060650502	195	25
Mountain Group (Crowell Mine, Erenreich Gold Mines)	Sb	0060650441	41	214
Mt. Hole Quarries	Dim Stn	0060650837	17	233
Murphy Clay Pit (Tropico Pit)	Kaol Clay	0060650882	105	26
Musick	Au	0060650496	188	153
Nettleton	Si	0060650521	220	121
Northern Belle (see Santa Rosa Mine)				
Oak Park Clay Prospect	Kaol Clay	0060650565	166	27
Old Dominion Mine (Ortega, Acme)	Pb, Ag, Zn, As, Mn, Au		172	215
Old City Quarry	Base Agg	0060650539	27	78
Old Mina Rosalia (see Santa Rosa Mine)				
Ophir (see Lucky Strike)				
Ormand Quarry (See Atkinson Quarry)		0060650537		
Ortega (see Old Dominion Mine)				
Owens	Au	0060650488	184	154
Owens-Illinois Glass Company (Corona Silica Sand Deposit)	SS, Comm Clay	0060650868	86	28, 227
Owl Rock Products, Prado Pit (Prado Plant)	Conc Agg	0060650973	14	107
Pacific Clay Products Inc., De Guerre Mines	Kaol Clay		167	29

NAME	COMMODITY	U.S.B.M.#	MAP#	APPENDIX#
Palisades Group	Pb, Ag, Cu, Au	0060650510	212	216
Park Claim (see Liston Clay Pit)				
Peggy (see Corona)				
Perris Mining Company Deposit (Blom Mine)	Feld, Si	0060650423	231	122
Peterson's Claim	Kaol Clay	0060650879	90	30
Phillips (see Sidebotham Quarries)				
Prado Plant (see Owl Rock Products, Prado Pit)				
Prospect Mountain	Au, Ag		116	155
Purple Hope Mine (Bob Cat No.1)	Au	0060650810	176	156
R.J. Noble Company, Coldwater Canyon Pit	Conc Agg		110	108
Railroad Canyon Road Pit	Base Agg		216	79
Red Bird No. 1	Au	0060650809	177	157
Riverside County Gravel Pits	Base Agg		16	80
Riverside County Gravel Pits	Base Agg		28	81
Riverside County Gravel Pits	Base Agg		33	82
Riverside County Pit	Base Agg		204	83
Riverside County Pit(s)	Base Agg		222	84
Riverside County Pit	Base Agg		224	85
Riverside County Pit	Base Agg		249	86
Riverside Sand Company	Base Agg	0060650834	29	87
Romoland Group	Au	0060650417	223	158
Rosalia (see Santa Rosa Mine)				

NAME	COMMODITY	U.S.B.M.#	MAP#	APPENDIX#
Royal Black Granite Quarries	Dim Stn		156	234
Rubidoux Hill Quarry?	Dim Stn	0060650542	26	235
San Antonio Mine	Au	0060650466	155	159
San Jacinto (see Good Hope)				
Santa Ana River Rock, Eagle Valley Quarry	Conc Agg		91	109
Santa Fe Mine	Au	0060650465	138	160
Santa Rosa Mine (Rosalia, Northern Belle, Old Mina Rosalia, Mina Rosalia)	Au, Ag, Cu	0060650462	139	161
Santiago Peak	Au,Ag		164	162
Service Rock Co. Pits	Conc Agg	0060650534	11	110
Shannahan (see Stringfellow Quarry)				
Shay (see Virginia Shay)				
Shining Star	As,Au	0060650516	202	1
Sidebotham Quarries (Phillips)	Riprap	0060650856	77	249
Sierra Grande Quarry	Dim Stn	0060650845	22	236
Sievert Clay Prospect	Kaol Clay	0060650819	239	31
Silver Shine	Cu	0060650820	237	117
Skinner Dam Quarries	Riprap		250	250
Sky Ranch Clay Mine, East Pit	Comm Clay	0060650903	46	32
Sky Ranch Clay Mine, West Pit	Comm Clay		45	33
Smith Silica Quarry (Jones, Hoag Ranch)	SS	0060650867	84	228
Snow-Rock Quarry, (see Jensen Quarry South)		0060651110		

NAME	COMMODITY	U.S.B.M.#	MAP#	APPENDIX#
Sno-Top Rock Quarry (see Jensen Quarry South)				
South Clay Pit (Corosil Mine)	Kaol Clay	0060651001	107	34
Stanford Mine	Au	0060650484	161	163
Steele (see Top-of-the-World)				
Stone & Alexander Quarry	Feld	0060650540	25	123
Stringfellow Quarry (Bly Brothers and McGilliard, Shannahan)	Riprap, Conc Agg	0060650823	4	111, 251
Susie Placer (McVicar Pit)	Kaol Clay	0060650907	48	35
Switzer Clay Deposit	Kaol Clay	0060650910	44	36
Temecula Quarries	Dim Stn	0060650436	253	237
Temescal Canyon Rock Quarry (L.S. Hawley Quarry, see also All American Asphalt and Aggregate and CalMat, Corona Quarry)	Riprap	0060650850	74, 75	252
Temescal Canyon Silica Sand	SS	0060650878	89	229
Temescal Clay Mine (Temescal Land and Water Co. Clay Pit)	Kaol Clay	0060650881	106	37
Temescal Rock Quarry (3M Quarry)	Roof Gran	0060650760	80	253
Temescal Tin Mine (see Cajalco Tin Mine)		0060650977		
3M Quarry (see Temescal Rock Quarry)				
Thomas Clay Deposit	Comm Clay	0060650894	42	38
Top-of-the-World (La Plomo, Victor, Victor-La Plomo, Steele)	Au	0060650472	154	164
Transit Mixed Concrete Company, Corona Pit	Conc Agg	0060650848	20	112

NAME	COMMODITY	U.S.B.M.#	MAP#	APPENDIX#
Triangle Rock Products, Inc., Mira Loma Pit	Conc Agg	0060650828	1	113
Tropico Pit (See Murphy Clay Pit)		0060651123		
Twin Buttes No. 1	Au	0060650399	225	165
Tyler's Diggings (See Binkley and Tyler's Diggings)		0060650519		
Unknown Name Clay Prospect	Kaol Clay		51	39
Unknown Name Clay Prospect	Comm Clay		83	40
Unknown Name Clay Prospect	Kaol Clay		173	41
Unknown Name Coal Prospect	Coal		60	47
Unknown Name Granite Quarry	Dim Stn		175	240
Unknown Name Granite Quarry	Dim Stn		181	241
Unknown Name Granite Quarry	Dim Stn		182	242
Unknown Name Gravel Pit	Base Agg		12	88
Unknown Name Gravel Pit	Base Agg		248	89
Unknown Name Placers	Au		187	166
Unknown Name Prospect(s)	Au		5	167
Unknown Name Prospect	Au		6	168
Unknown Name Prospect	Au?, Sn?		52	169
Unknown Name Prospect	Au?, Sn?		55	170
Unknown Name Prospect	Au?		56	171
Unknown Name Prospect	Au?		57	172
Unknown Name Prospect	Au		70	173
Unknown Name Prospect	Au		71	174
Unknown Name Prospect	Au, Ag		99	175

NAME	COMMODITY	U.S.B.M.#	MAP#	APPENDIX#
Unknown Name Prospect	Au		100	176
Unknown Name Prospect	Au, Ag		114	177
Unknown Name Prospect	Au, Ag		115	178
Unknown Name Prospect	Au, Ag		117	179
Unknown Name Prospect	Au, Ag		118	180
Unknown Name Prospect	Au, Ag		121	181
Unknown Name Prospect	Au, Ag		122	182
Unknown Name Prospect	Au, Ag		125	183
Unknown Name Prospect	Au, Ag		127	184
Unknown Name Prospect	Au		128	185
Unknown Name Prospect	Au		129	186
Unknown Name Prospect	Au		144	187
Unknown Name Prospect	Au		146	188
Unknown Name Prospect	Au		147	189
Unknown Name Prospect	Au		150	190
Unknown Name Prospect	Au		153	191
Unknown Name Prospect	Au		159	192
Unknown Name Prospect	Au		160	193
Unknown Name Prospect	Au		162	194
Unknown Name Prospect	Au		163	195
Unknown Name Prospect	Au		168	196
Unknown Name Prospect	Au		185	197
Unknown Name Prospect	Sn		190	262
Unknown Name Prospect	Au		191	198
Unknown Name Prospect	Mn?		198	222
Unknown Name Prospect	Mn		199	223
Unknown Name Prospect(s)	Au?, Sn?		206	199
Unknown Name Prospect	Sn?, Au?		207	263
Unknown Name Prospect	Au		210	200
Unknown Name Prospect	Au?		211	201

NAME	COMMODITY	U.S.B.M.#	MAP#	APPENDIX#
Unknown Name Prospect	Au		242	202
Unknown Name Quarry	Dim Stn		2	238
Unknown Name Quarry	Dim Stn		32	239
Unknown Name Quarry	Base Agg		145	90
Unknown Name Quarry	Base Agg		148	91
Unknown Name Slate Quarry	Slt		186	254
Unknown Name Slate Quarry	Slt		193	255
Unknown Name Slate Quarry(?)	Slt		194	256
Victor (see Top-of-the-World)				
Victor-La Plomo (see Top-of-the-World)				
Virginia (see Virginia Shay)		0060650471		
Virginia Shay (Missing Link, Shay, Virginia Shay)	Au		157	203
Walker (see Lucky Boy)				
Ware Deposit (see Big Chief)				
Werner Corporation (see Foster Sand and Gravel Pit)				
White Gypsum Group (Freeman-Nonhof, Big Chief, Ware Deposit)	Gyp	0060650915	58	211
Wildomar Kaolin Deposit	Kaol Clay	0060650433	244	42
Wrench Prospect	Au	0060650505	201	204
Wrench Slate Prospect(?)	Slt	0060650507	200	257
Yvonne (Lucas Canyon Claims)	Au		234	205

APPENDIX C

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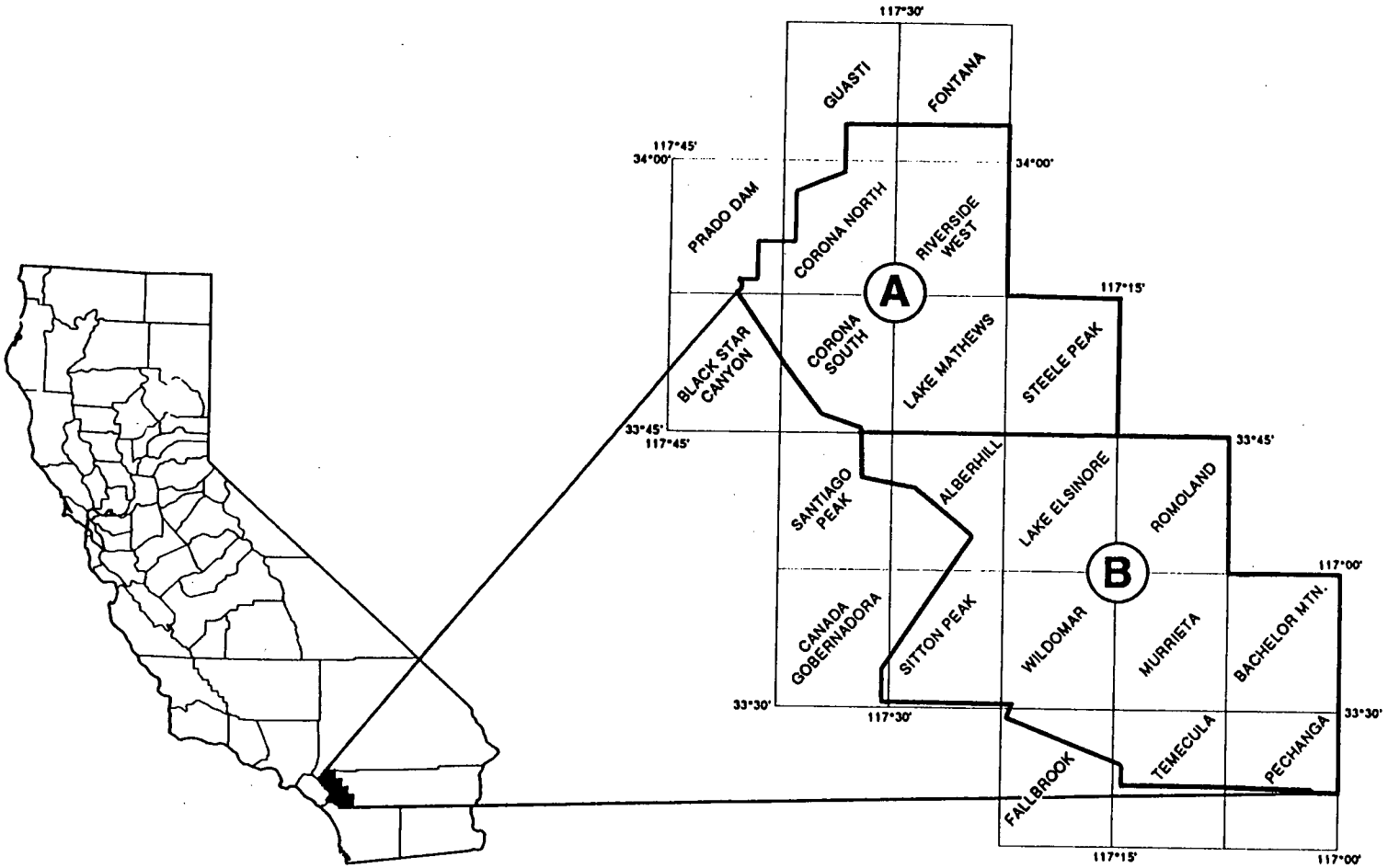


Figure 1. Location and index map of 7.5-minute quadrangles for the Temescal Valley area. The area has been subdivided into a northern area, A, and a southern area, B, which are shown on separate plates accompanying this report.