Appendix K

Special Report 255

MINERAL LAND CLASSIFICATION OF THE TEICHERT SHIFLER PROPERTY, YOLO COUNTY, CALIFORNIA FOR PORTLAND CEMENT CONCRETE AGGREGATE

2021

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Special Report 255

MINERAL LAND CLASSIFICATION OF THE TEICHERT SHIFLER PROPERTY, YOLO COUNTY, CALIFORNIA FOR PORTLAND CEMENT CONCRETE AGGREGATE

By

Greg Marquis (PG 9608)

2021

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TABLE OF CONTENTS

FIGURES

EXECUTIVE SUMMARY

In response to a petition submitted by Teichert Materials under the provisions of the Surface Mining and Reclamation Act of 1975 (SMARA; Public Resources Code § 2712 et seq.), the State Geologist has investigated and subsequently reclassified the area proposed for mining within the Shifler Property (herein referred to as the project area), Yolo County, as Mineral Resource Zone 2 (MRZ-2) for Portland cement concrete (PCC) aggregate.

Sand, gravel, and crushed rock are “construction materials.” These materials, collectively referred to as aggregate, provide bulk and strength to PCC, asphaltic concrete, Class II Base, and other aggregate commodities such as subbase, drain rock, and fill. Because aggregate is a low unit-value, high bulk-weight commodity, it must be obtained from nearby sources to minimize economic and environmental costs associated with transportation. If nearby sources do not exist, transportation costs can quickly exceed the value of the aggregate. As transport distances increase, so do construction costs, fuel consumption, greenhouse gas emissions, air pollution, traffic congestion, and road maintenance costs.

To ensure that mineral materials will be available when needed and do not become inaccessible as a result of inadequate information during the land-use decision making process, the State Geologist identifies and classifies lands containing significant mineral deposits. The classification of these lands is published by the California Geological Survey (CGS) in Mineral Land Classification reports. These reports contain the assignment of MRZ classifications (MRZ-1, MRZ-2, MRZ-3, or MRZ-4) to areas based on geologic factors alone without regard for current land uses. Areas classified MRZ-2 contain significant mineral resources.

Petitions may be brought before the State Mining and Geology Board (SMGB) by any individual or organization to classify mineral lands that are claimed to contain significant mineral deposits. Petitions are preliminarily reviewed by the State Geologist to determine if the deposit meets the threshold value and other criteria required to qualify as MRZ-2. The threshold value for construction materials adjusted to 2020 dollars is $22 million.

Teichert Materials submitted a petition dated September 30, 2020 to the SMGB for classification of the Shifler Property, located approximately three miles west of the town of Woodland in Yolo County, just south of Cache Creek (Figure 1). The property consists of two parcels totaling 442 acres. The project area comprises 277 acres. The petitioner requested that the State Geologist reclassify the project area as MRZ-2 for PCC aggregate.

The project area is reclassified MRZ-2 in this report (Figure 2). The project area was most recently classified in CGS Special Report (SR) 245 in 2018. Portions of the project area were classified in SR 245 as not having significant mineral resources based on an analysis of surficial geologic mapping. The petition contains drill logs that show the presence of construction aggregate at mineable depths throughout the project area. The petition also references a third-party laboratory that concluded the project area aggregate was suitable for use in PCC based on petrographic analysis. In addition to evidence provided in the petition, adjacent properties—also located off-channel from Cache Creek—are being or have been mined for PCC aggregate. The value of the aggregate resource in the project area exceeds the threshold for a significant deposit of construction materials for the purpose of classification.

INTRODUCTION

The Teichert Shifler Property is a proposed aggregate mine located approximately three miles west of the City of Woodland in Yolo County, just south of Cache Creek (Figure 1). The property consists of two parcels totaling 442 acres. Approximately 277 acres are proposed for mining (herein referred to as the project area).

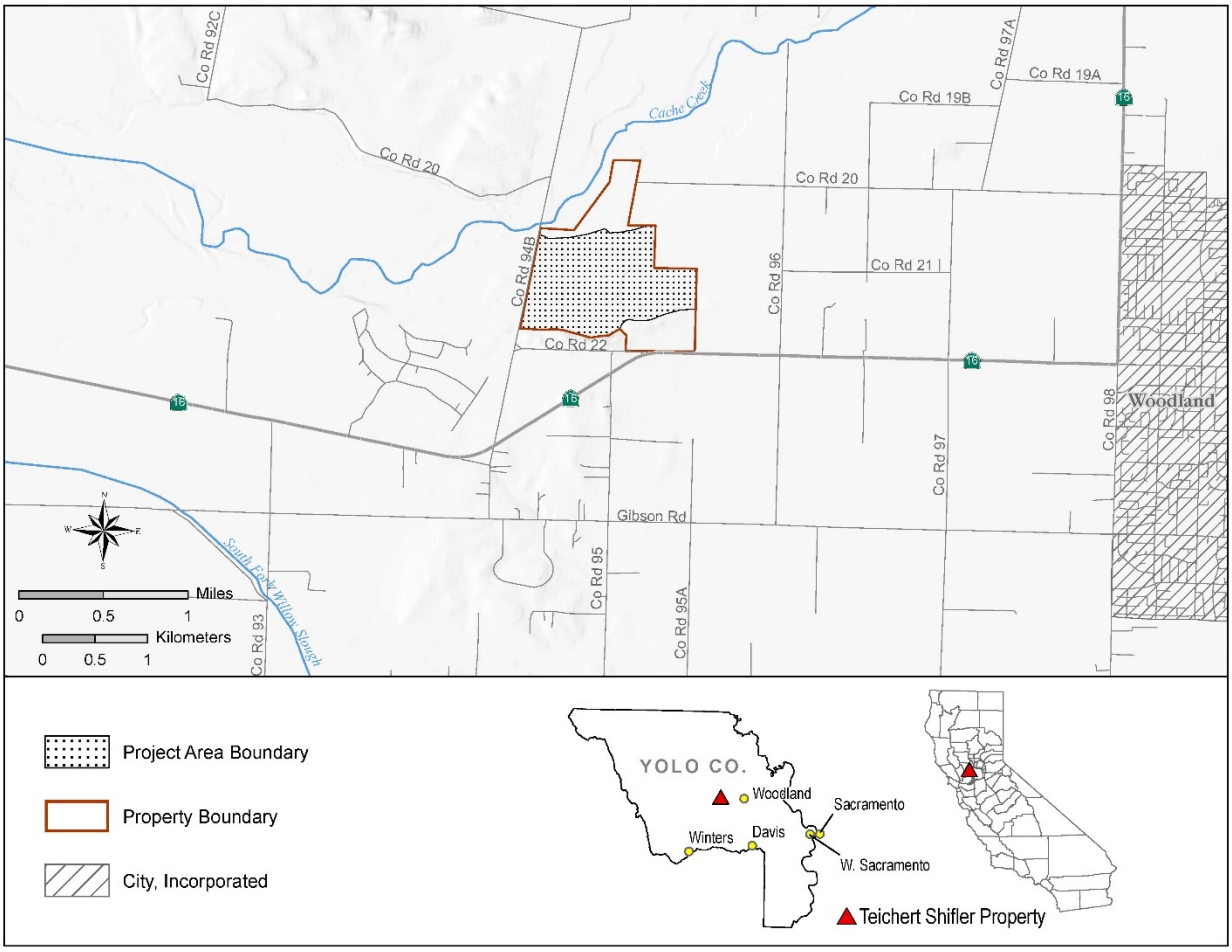

Figure 1. Teichert Shifler Property Vicinity Map

Teichert Materials submitted a classification petition for the Shifler Property to the State Mining and Geology Board (SMGB) dated September 30, 2020. The petition requested that the project area be reclassified as Mineral Resource Zone 2 (MRZ-2) for Portland cement concrete (PCC) aggregate resources under the provisions of the Surface Mining and Reclamation Act (SMARA). In accordance with the SMGB's *Guidelines for Classification and Designation of Mineral Lands* (2000), the SMGB then transmitted the petition to the State Geologist for preliminary evaluation. The State Geologist determined that the project area contains a resource of PCC aggregate that exceeds the threshold for a significant deposit of construction materials for the purpose of classification (Attachment A). After reviewing the State Geologist's preliminary evaluation, the SMGB accepted the petition on January 21, 2021.

The project area was most recently classified in the California Geological Survey (CGS) Special Report (SR) 245 based on previous classification and an analysis of surficial geologic mapping

(O'Neal and Gius, 2018). Approximately 90 acres of the northern portion of the project area were classified as MRZ-2 for concrete grade aggregate. Approximately 190 acres were classified as MRZ-3 and 1.5 acres as MRZ-1.

MINERAL LAND CLASSIFICATION

The Surface Mining and Reclamation Act of 1975

SMARA requires the State Geologist to classify land based on the presence, absence, or likely occurrence of significant mineral deposits in certain areas of the state that are subject to urban expansion, or other land uses that are incompatible with mining. The areas to be classified for mineral resources are set forth by the SMGB based on recommendations from the State Geologist and public input, and by the SMGB's acceptance of petitions for classification of specific properties. Petitions may be brought before the SMGB by any individual or organization to classify mineral lands that are claimed to contain significant mineral deposits.

The SMGB, upon receipt of the classification information, transmits the information to the appropriate lead agencies for incorporation into their general plans and for use in their land-use planning processes. The classification of these lands is published by CGS in Mineral Land Classification reports.

The primary goal of mineral land classification is to ensure that the mineral resource potential of the land is recognized and considered before local land-use decisions are made that could preclude development of the mineral resource. The availability of mineral resources is vital to California's economy. However, for most mineral commodities, economic deposits are rare, isolated occurrences. In addition, access to land for purposes of mineral exploration and mine development has become increasingly difficult because California is faced with growing land-use competition. As a consequence, local planning agencies are confronted with more complex land-use decisions. If California is to continue supplying raw materials for its construction industry, it is essential that areas containing significant mineral resources be identified so that this information can be incorporated into land-use planning decisions.

Mineral Resource Zone Categories

As set forth in Section 2761(b) of SMARA, the State Geologist shall classify land solely on the basis of geologic factors and without regard to existing land use. Areas subject to mineral land classification studies are divided by the State Geologist into various MRZ categories that reflect varying degrees of mineral resource potential as described below:

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

MRZ-2: Areas where adequate information indicates that significant mineral resources are present, or where it is judged that a high likelihood for their presence exists. Land included in MRZ-2 is of prime importance because it contains known economic mineral deposits.

MRZ-3: Areas containing known mineral occurrences of undetermined mineral resource significance. Further exploration within these areas could result in the reclassification of specific localities into the MRZ-2 category.

MRZ-4: Areas where available geologic information is inadequate for assignment to any other MRZ category. Further exploration within these areas could result in the reclassification of land into the MRZ-1, MRZ-2, or MRZ-3 categories.

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 SMGB. Threshold values are intended to indicate in a general way the approximate minimum size of a mineral deposit that will be considered significant for classification and/or designation. The threshold value criteria vary for different minerals depending on their uniqueness and commodity-type category. The SMGB determined threshold value of the first marketable product in 1998 dollars to be $12.5 million for a construction aggregate deposit. In order to adjust the threshold value to account for inflation, this value is multiplied by an inflation factor from the U.S. Department of Labor Bureau of Labor Statistics' (California Department of Industrial Relations, Division of Labor Statistics website, 2020) estimated Consumer Price Index. The rounded threshold value in 2020 dollars is $22 million.

OVERVIEW OF CONSTRUCTION AGGREGATE

Sand, gravel, and crushed stone are "construction materials." These commodities, collectively referred to as aggregate, provide the bulk and strength to PCC, asphaltic concrete (AC, commonly called "black top"), plaster, and stucco. Aggregate provides approximately 60-75 percent of the volume of PCC (Portland Cement Association, 2021). Aggregate is also used as road base, subbase, railroad ballast, and fill.

The building and paving industries consume large quantities of aggregate and future demand for this commodity is expected to increase throughout California. The U.S. Geological Survey estimates that 46 percent of all sand and gravel produced in the U.S. is used in concrete (U.S. Geological Survey, 2021). PCC aggregate is indispensable to the building industry as a construction material.

Of the many grades of aggregate used, PCC aggregate must meet some of the most rigid engineering standards. Aggregate used in PCC must meet specifications to prevent premature deterioration of the concrete. These specifications set standards for the permissible amounts of deleterious substances and cover engineering requirements for size gradation, soundness and abrasion resistance. Laboratory tests of aggregate are used to scientifically evaluate the suitability of materials for use in concrete. Minimum standards for specific tests have been adopted by many government agencies such as the California Department of Transportation.

Because aggregate is a low unit-value, high bulk-weight commodity, it should be obtained from nearby sources to minimize the dollar cost to the aggregate consumer and other environmental and economic costs associated with transportation. If nearby sources do not exist, then transportation costs can quickly exceed the base line value of the aggregate. As transport distances increase, so do construction costs, fuel consumption, greenhouse gas (GHG) emissions, air pollution, traffic congestion, and road maintenance costs.

Factors Affecting Aggregate Deposit Quality

The two major factors that affect the quality of an aggregate deposit are the rock type and the degree of weathering of the deposit. Rock type determines the hardness, durability, and potential chemical reactivity of the rock when mixed with cement to make concrete. In alluvial sand and gravel deposits, rock type is variable and reflects the rocks present in the drainage basin of the stream or river. In crushed stone deposits, rock type is typically less variable, although in some types of deposits such as sandstones or volcanics, there may be significant variability of rock type within a deposit. Rock type may also influence aggregate shape. For example, some metamorphic rocks such as slates tend to break into thin platy fragments that are unsuitable for many aggregate uses while many volcanic and granitic rocks break into blocky fragments more suited to a wide variety of aggregate uses. Deposit type also affects aggregate shape. For example, in alluvial sand and gravel deposits the natural abrasive action of the stream rounds the edges of rock particles in contrast to the sharp edges of particles from crushed stone deposits.

Weathering is the in-place physical or chemical decay of rock materials at or near the earth's surface. Weathering commonly decreases the physical strength of the rock and may make the material suitable only for uses in which high strength and durability are not specified. Weathering may also alter the chemical composition of the aggregate making it less suitable for some aggregate uses. If weathering is severe, the material may not be suitable for use as construction aggregate. Typically, the older a deposit is, the more likely it is to have been weathered, and the severity of weathering commonly increases with increasing age of the deposit.

CLASSIFICATION OF THE PROPOSED TEICHERT SHIFLER PROPERTY

Geologic Summary

The project area is located near the western edge in the Great Valley Geomorphic Province. The Province consists of a sequence of marine and non-marine sediments that range in age from Jurassic to Holocene.

The project area, just south of Cache Creek, is underlain by quaternary alluvial deposits from the Coast Ranges to the west. The alluvium derives mainly from the Franciscan Formation and Great Valley Sequence (EIP Associates and others, 1995). Lithified sandstones and conglomerates from the Great Valley Sequence are an important source of abrasion-resistant gravels (EIP Associates and others, 1995). Alluvial deposits within the project area are unconsolidated and include gravels, sands, silts and clays. The same deposits are being or have been mined at sites adjacent to the west and northeast of the project area. The Teichert Materials Woodland Facility (processing plant) is also located adjacent to the north of the project area.

South of the project area, but within the Shifler Property is the contact with Tertiary Tehama Formation, based on the geologic map from Helley and Harwood (1985). This contact is evident as a bluff that rises 15-30 feet above the project level. The Tehama Formation in this area is generally a fine-grained alluvial deposit and is not considered economic for aggregate mining (Unsworth, 2021).

Material Quality

Boring logs and petrographic analysis results provided by the petitioner allow for a better understanding of the deposit quality within the project area.

Boring logs consist of 27 holes drilled to approximately 70 to 130 feet below ground surface. Overburden (soil) averages approximately 10 feet deep. Below the overburden, boring logs indicate the presence of sand and gravel deposits throughout the project area. Lenses of sand and gravel were observed at depths to approximately 100 feet. Teichert Materials also conducted materials testing, including sieve analysis, Los Angeles Rattler abrasion testing, and other measures that indicated an economic deposit of PCC aggregate (Unsworth, 2021).

Petrographic analysis was performed by a third-party laboratory on coarse and fine materials within the project area. The laboratory concluded that the rock types present were suitable for PCC aggregate, despite containing some deleterious rock for PCC, including chert.

Based on boring logs and the associated materials testing data, petrographic analysis, and the presence of aggregate mines adjacent to the site, CGS staff concludes the material present within the project area could meet the specifications for a variety of construction aggregate products including PCC aggregate.

Threshold Value

The Teichert Shifler Petition states that up to 35.5 million tons of aggregate would be mined in the project area based on the area, proposed pit depth, and waste factors derived from boring logs. The petition also states that the assumed average value of aggregate in the Sacramento area is $12/ton. The total resource value for the project area, based on assumptions in the petition, is $426 million. CGS staff independently estimated the resource within the project area and concur that it exceeds the threshold value of $22 million (2020 dollars) for a significant deposit of construction materials for the purpose of classification.

Property Evaluation

A field investigation of the project area by CGS staff on March 16, 2021, along with an evaluation of the subsurface information and materials test data provided by the petitioner, indicates the following:

1. Drill logs provided by the petitioner show the occurrence of sand and gravel resources at mineable depths within the project area.
2. Analysis provided by the petitioner indicates that much of the material within the project area meets quality specifications for PCC aggregate.
3. The deposit volume provided by the petitioner indicates the area contains PCC aggregate resources in excess of the threshold value of $22 million (2020 dollars) required for classification as MRZ-2.

CONCLUSIONS

In accordance with the mandates of the SMARA, the staff of CGS, under the direction of the State Geologist, has evaluated the Proposed Teichert Shifler Property, and concludes that significant PCC aggregate resources are present within the project area. These resources meet the suitability and threshold criteria established by the SMGB for inclusion into the MRZ-2 category for PCC aggregate. The project area is reclassified MRZ-2 for PCC aggregate (Figure 2).

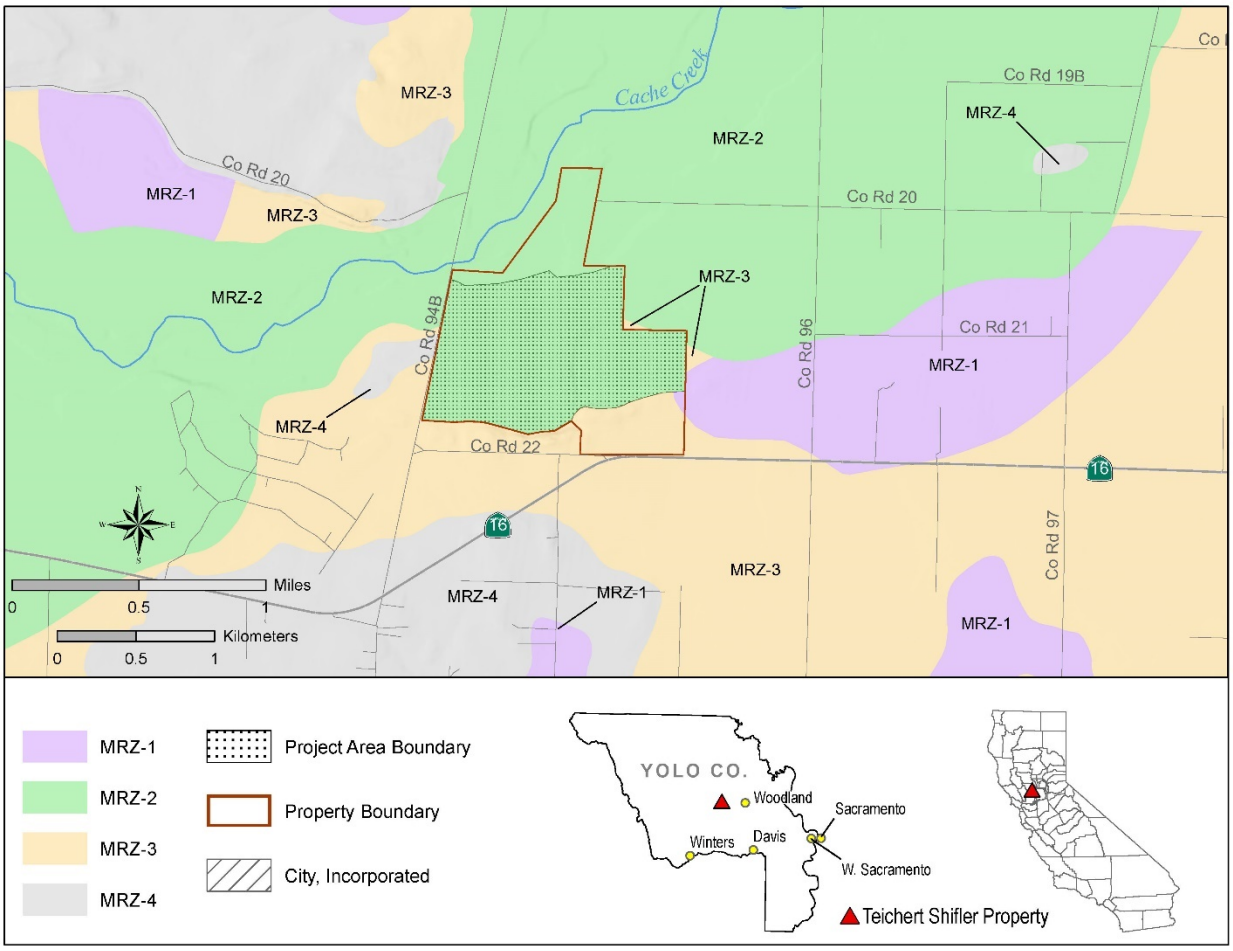

Figure 2. Teichert Shifler Property Petition Mineral Resource Zone Map

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ATTACHMENT A—PETITION MEMO FROM THE STATE GEOLOGIST TO THE STATE MINING AND GEOLOGY BOARD

California
Department of Conservation
California Geological Survey

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David Shabazian, Director

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MEMORANDUM

DATE: January 4, 2021

TO: Jeffrey Schmidt, Executive Office
State Mining and Geology Board

FROM: Steven R. Bohlen
Acting State Geologist DS SB

SUBJECT: PETITION FOR MINERAL LAND CLASSIFICATION – PROPOSED SHIFLER PROPERTY, YOLO, COUNTY

Teichert Materials submitted a petition dated September 30, 2020 to the State Mining and Geology Board (SMGB) for Mineral Land Classification of the Shifler Property, located approximately 3 miles west of the town of Woodland in Yolo County (Figure 1). The property consists of two parcels totaling 442 acres. Approximately 277 acres are proposed for mining (herein referred to as the project area). Approximately 90 acres of the northern portion of the project area were classified as MRZ-2 for concrete-grade aggregate in the California Geological Survey, Special Report 245, Mineral Land Classification: Concrete Aggregate in the Greater Sacramento Area Production-Consumption Region (M. O'Neal and F. Gius, 2018). Approximately 1.5 acres of the eastern portion of the project area were classified MRZ-1. The remainder of the project area was classified MRZ-3. The petitioner has requested that the State Geologist reclassify the entire project area as MRZ-2 for Portland cement concrete (PCC) aggregate.

The petition was reviewed by California Geological Survey geologist Greg Marquis using the revised "Guidelines for Classification and Designation of Mineral Lands" adopted by the SMGB in 2000. The following determinations were made during this preliminary review:

1) Drill logs provided by the petitioner show the occurrence of sand and gravel resources at mineable depths within the project area.

2) Analysis provided by the petitioner indicates that much of the material within the project area meets quality specifications for PCC aggregate.

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3) The deposit volume provided by the petitioner indicates the area contains PCC aggregate resources in excess of the threshold value of $20,000,000 (2020 dollars) required for classification as MRZ-2.

The petitioner has submitted a check for $5,000 for the preliminary review and petition application fee. If the SMGB accepts this petition, the petitioner will be asked to submit $15,500 which is the estimated cost to complete the classification study.

Based on the information presented by the petitioner and summarized above, I recommend that the SMGB accepts the Proposed Shifler Surface Mine Site Petition.