UNITED STATES DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

PHOSPHATIC ROCK LOCALITIES IN CALIFORNIA

by

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This report is preliminary and has not been reviewed for conformity with U.S. Geological Survey editorial standards and stratigraphic nomenclature.
Introduction

California, a leading agricultural state, needs an ever increasing amount of phosphorus, an essential element for plant growth, to improve crop yields. Current requirements for phosphorus are met by imports or as by-products from other industry, such as phosphoric acid from Searles Lake brines.

Marine phosphatic-rocks are distributed throughout the world with a stratigraphic range of Pre-Cambrian to Quaternary age. Marine phosphatic-rocks in California are presently known in sedimentary sequences that range from Ordovician to Quaternary; however, no significant economic deposits have yet been developed. Current geologic information indicates the highest potential is in the widespread phosphatic-rocks in formations of Miocene age. Stratigraphic units in which the principal deposits occur are the Santos Shale Member of the Temblor Formation (Lower Miocene) in the Temblor Range; Sandholdt Member of the Monterey Formation (Middle Miocene) in the Santa Lucia and La Panza Ranges; and phosphatic members of the Santa Margarita Formation (Upper Miocene) in the Sierra Madre and San Rafael Mountains.

This preliminary map was compiled as a part of the U.S. Geological Survey's program to evaluate the phosphate resources of the United States. This map was prepared to summarize known localities and provide planning for future onsite field studies; to identify phosphate-bearing lands relative to federal leasing programs; and to encourage field examination and reporting of additional phosphate information by other researchers. The map shows the location of reported occurrences of phosphatic rocks at a scale of 1:500,000. Locality points are shown by triangle for surface rocks and circle for subsurface rocks. The companion text provides essential basic information on stratigraphic unit, age, brief remarks, and references cited. Location is by county, quadrangle, and township and range related to H.B. and M. [Humbolt base line and meridian]; M.D.B. and M. [Mount Diablo base line and meridian]; and S.B.B. and M. [San Bernardino base line and meridian]. In unsurveyed areas projected township sections are marked by an asterisk.
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Localities

ALAMEDA COUNTY

A-1  Grizzly Peak Boulevard, W. side. SW1/4 sec. 5, T. 1 S., R. 3 W. (MDB&M)
Quadrangle: Oakland East
Formation: Claremont Shale  Age: Middle Miocene (Luisian)
Remarks: Phosphatic nodules sparsely distributed in shale.
Reference: 1. Dickert, 1971, p. 256, no. 8

Quadrangle: Hayward
Formation: Claremont Shale  Age: Middle Miocene (Early Luisian)
Remarks: Abundant phosphate pellets and nodules in sandstone lenses within the shale.
References: 1. Robinson, 1956
2. Aarons, 1958
3. Dickert, 1971, p. 256, no. 10

A-3  Eden Creek, SE bank. SE1/4 sec. 31, T. 2 S., R. 1 W. (MDB&M)
Quadrangle: Hayward
Formation: Claremont Shale  Age: Middle Miocene (Early Luisian)
Remarks: Sparse phosphate nodules in upper part of the formation.
Reference: 1. Dickert, 1971, p. 256, no. 11

A-4  Hollis Canyon, NE cor. sec. 32, T. 2 S., R. 1 W. (MDB&M)
Quadrangle: Dublin
Formation: Hambre Sandstone (?)  Age: Late Miocene (Mohnian (?)
Reference: 1. Hill, 1979, p. 67 and pl. 4

A-5  Dublin Canyon. SW1/4 sec. 4, T. 3 S., R. 1 W. (MDB&M)
Quadrangle: Dublin
Formation: Hambre Sandstone, Briones  Age: Late Miocene (Mohnian (?)

A-6  Devaney Canyon. NE1/4 sec. 10, T. 3 S., R. 1 W. (MDB&M)
Quadrangle: Dublin
Formation: Hambre Sandstone (?)  Age: Late Miocene (Mohnian (?)
2. Hill, 1979, p. 66
A-7 Old Morrison Canyon Road, N side. SW1/4 sec. 23, T. 4 S., R. 1 W. (MDB&M)
Quadrangle: Niles
Formation: Claremont Shale Age: Middle Miocene (Early Luisian or older ?)
Remarks: Phosphate nodules in chert. These nodules formed within diatomite. Nodules rare within Tice Shale, Oursan Sandstone, and positive phosphate test on base of Hambre Sandstone. Chemical analysis on phosphate nodule from Claremont by Shapiro method indicates 29-33% P2O5 [stratigraphic position on Plate 2, Hill, 1979, loc. 5-3-1].
2. Hill, 1979, p. 62

BUTTE COUNTY
B-1 sec. 33, T. 20 N., R. 1 W. (MDB&M)
Quadrangle: Llano Seco
Formation: Kione Age: Late Cretaceous
Remarks: Scattered phosphatic material in shale. Only surface outcrop at Marysville Buttes. Kione Formation about 490 m thick in subsurface; top about 600 m below surface. Mobil Oil Co. Llano Seco No. 1 well.
References: 1. Thomson, 1962, p. 27
2. Gower and Madsen, 1964, p. D81, no. 3

CONTRA COSTA COUNTY
CC-1 Pinole Valley Road, N. side. Sec. 31, T. 2 N., R. 3 W. (MDB&M)
Quadrangle: Briones Valley
Formation: Oursan Sandstone Age: Middle Miocene
Remarks: Scattered phosphate pellets near base of formation.

Quadrangle: Briones Valley
Formation: Claremont Shale Age: Middle Miocene (Late Luisian)
Remarks: A few layers of pellets in abundant concentrations in laminated shales. Similar beds on SW slope of Oursan Ridge, 1,000 ft. W. of Bear Creek Road and 2,000 ft. S. of fire trail.
Reference: 1. Dickert, 1971, p. 256, no. 6

FRESNO COUNTY
F-1 Chaney Ranch Canyon. SW1/4 sec. 19, T. 14 S., R. 12 E. (MDB&M)
Quadrangle: Chouen Ranch
Formation: Kreyenhagen Shale Age: Eocene (Narizian)
Remarks: Scattered phosphate pellets in soft mudstone in lower part of the formation.
References: 1. Payne, 1951, p. 20
2. Gower and Madsen, 1964, p. D81, no. 11
3. Dickert, 1971, p. 261, no. 48
F-2 Escarpado Canyon. NW 1/4 sec. 7, T. 15 S., R. 12 E. (MDB&M)
Quadrangle: Choumet Ranch
Formation: Moreno, lower members Age: Late Cretaceous and Paleocene (?)
Remarks: Nodules of apatitized wood leucophosphite in lower part of the formation. Also phosphate disseminated in mudstone of the formation.
References: 1. Payne, 1951
2. Gulbransen and others, 1963
4. Dickert, 1971, p. 261, no. 49

F-3 E. flank of Monocline Ridge. SW 1/4 NE 1/4 sec. 10, T. 16 S., R. 13 E. (MDB&M)
Quadrangle: Monocline Ridge
Formation: Temblor Age: Early Miocene
Remarks: Phosphatic pellets scattered through a zone of 9 m in thickness. Seaboard Oil Co. Welsh No. 1 well.
References: 1. Garrison, 1959
2. Dickert, 1971, p. 261, no. 50

F-4 Coalinga oil field. NE 1/4 SE 1/4 sec. 10, T. 19 S., R. 15 E. (MDB&M)
Quadrangle: Domengine Ranch
Formation: Jacalitos (?) Age: Pliocene
Remarks: Phosphatic sandstone with pebbles of phosphate 1-3 cm thick near base. Shell Oil Co. No. 166-10 well.
Reference: 1. Dickert, 1971, p. 265, no. 76

F-5 Guijarral Hills oil field. E 1/2 SW 1/4 sec. 28, T. 20 S., R. 16 E. (MDB&M)
Quadrangle: Guijarral Hills
Formation: Monterey, McLure Shale Age: Late Miocene Member
References: 1. Goudkoff, 1934
2. Dickert, 1971, p. 267, no. 92

F-6 Coalinga oil field. SW 1/4 SE 1/4 sec. 4, T. 21 S., R. 15 E. (MDB&M)
Quadrangle: Coalinga
Formation: Monterey, McLure Shale Age: Late Miocene Member
References: 1. Goudkoff, 1934
2. Dickert, 1971, p. 267, no. 91

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F-7 Gujjaral Hills oil field. NE1/4 NE1/4 sec. 3, T. 21 S., R. 16 E. (MDB&M)
Quadrangle: Gujjaral Hills
Formation: Monterey, McLure Shale    Age: Late Miocene
Member
Remarks: Well core includes 45 m of coarse sandstone containing pyritized phosphate pellets in basal part of the McLure Shale. Standard Oil Co. of Calif. No. 81-3H well.
3. Dickert, 1971, p. 267, no. 93

F-8 Kettleman Hills oil field. NW1/4 NW1/4 sec. 24, T. 21 S., R. 16 E. (MDB&M)
Quadrangle: Avenal
Formation: Monterey, McLure Shale    Age: Late Miocene
Member
Remarks: Phosphatic pellets in brown shale. N. Kettleman Oil and Gas Lillis-Welch, No. 1 well.
References: 1. Goudkoff, 1934
2. Woodring and others, 1940, p. 126
3. Dickert, 1971, p. 267, no. 94

F-9 Kettleman Hills oil field. SW1/4 SE1/4 sec. 20, T. 21 S., R. 17 E. (MDB&M)
Quadrangle: Avenal
Formation: Kreyenhagen Shale    Age: Eocene (Narizian)
References: 1. Woodring and others, 1940, p. 147

F-10 Canaos Creek. NW1/4 SW1/4 sec. 33, T. 22 S., R. 16 E. (MDB&M)
Quadrangle: The Dark Hole
Formation: Monterey, McLure Shale    Age: Late Miocene
Member
Remarks: Sparse collophane pellets in glauconitic mudstone, fine-grained sandstone, and pebble conglomerate at the base of the McLure Shale.
References: 1. Stewart, 1946

INYO COUNTY
In-1 6 miles E. of Big Pine on the Big Pine-Waucoba Road. 
NE1/4 NW1/4 sec. 13, T. 9 S., R. 34 E. (MDB&M)
Quadrangle: Waucoba Mountain
Formation: Unnamed    Age: Pleistocene
Remarks: The phosphate occurs in the Pleistocene sediments that occur near the base of the White Mountains.
References: 1. Tucker, 1926, p. 520
In-2  SE1/4 sec. 3, T. 26 N., R. 3 E. (SBB&M) 36° 24' 56" N., 116° 37' 54" W. [3.21 Km N. 35° 30' W. of Pyramid Peak]

Quadrangle:  Ryan 15'
Formation:  Ely Springs Dolomite  Age:  Late Ordovician (Ashgillian)
Remarks:  X-ray diffractograms, excellent of carbonate-fluorapatite. Age determination on conodonts by Anita G. Epstein. Dark-gray irregular laminae of phosphorite in medium dark gray, very fine to coarse grained bioclastic dolomite. Sample from middle of Ely Springs Dolomite—marker bed at top of lower member, here 80.8 m above base.
Reference:  1. J. F. McAllister, 1978, written commun., field no. JFM 75-4-22E

In-3  NW1/4 sec. 12, T. 26 N., R. 3 E. (SBB&M) 36° 24' 44" N., 116° 36' 25" W. [2.27 Km N. 9° 40' E. of Pyramid Peak]

Quadrangle:  Ryan 15'
Formation:  Ely Springs Dolomite  Age:  Late (?) Ordovician
Reference:  1. J. F. McAllister, 1978, written commun.; field no. JFM 77-4-21A

In-4  NW1/4 sec. 12, T. 26 N., R. 3 E. (SBB&M) 36° 24' 44" N., 116° 36' 19" W. [2.32 Km N. 12° 40' E. of Pyramid Peak]

Quadrangle:  Ryan 15'
Formation:  Ely Springs Dolomite  Age:  Late Ordovician—Ashgillian
Remarks:  X-ray diffractograms, excellent of carbonate-fluorapatite. Age determination on conodonts by Anita G. Epstein. Dark-gray (weathered light-gray) laminae of phosphorite in medium dark gray, very fine to medium grained dolomite. Sample from middle of Ely Springs Dolomite—marker bed at top of lower member, here 102.7 m above base.
Reference:  1. J. F. McAllister, 1978, written commun.; field no. JFM 77-4-21B

Kern County

K-1  Paso Creek oil field.  SE1/4 NE1/4 sec. 36, T. 25 S., R. 26 E. (MDB&M)

Quadrangle:  Deepwell Ranch
Formation:  Round Mountain Silt  Age:  Middle Miocene (Devilwater Shale)
K-2 Lost Hills oil field. SE1/4 SE1/4 sec.11, T. 26 S., R. 20 E. (MDB&M)
Quadrangle: Antelope Plain
Formation: Monterey, McLure Shale  Age: Late Miocene
Member
Remarks: Phosphate pellets in brown shale. Mobil Oil Co. Williamson No. 33-11 well.
References: 1. Goudkoff, 1934
2. Dickert, 1971, p. 269, no. 107

K-3 Still Canyon. SW1/4 sec. 22, T. 26 S., R. 17 E. (MDB&M)
Quadrangle: Orchard Peak
Formation: Monterey  Age: Late Miocene
Remarks: On the E. side of the canyon, phosphatic laminae and a few large pellets in organic mudstone. Lower in the section, 18 m to the SW on the E. side of the canyon, phosphatic shale.

K-4 Bitterwater Creek. SW1/4 sec. 22, T. 27 S., R. 18 E. (MDB&M)
Quadrangle: Packwood Creek
Formation: Monterey, Devilwater Shale  Age: Middle Miocene (Luisian) Member
Remarks: Phosphate nodules in lower part of Devilwater Shale Member of Monterey. Foraminifera from the Devilwater Shale near this locality were assigned to the Luisian, probably Siphogenerina nuciformis zone, by Key, 1955, p. 89.
References: 1. Key, 1955
2. Dickert, 1971, p. 273, no. 134

K-5 Belridge oil field. SW1/4 SW1/4 sec. 26, T. 27 S., R. 20 E. (MDB&M)
Quadrangle: Blackwells Corner
Formation: Temblor (?)  Age: Early Miocene
Remarks: Pyritized pellets in sandy clay matrix of probable Temblor. Other well logs, this area, show phosphatic shale approximately equivalent to Santos Shale Member of the Temblor Formation at Chico-Martinez Creek area. Belridge No. 15 well.
References: 1. Galliher, 1931, p. 258
2. Gower and Madsen, 1964, p. D82, no. 37
3. Dickert, 1971, p. 272, no. 133

K-6 North Belridge oil field. Wells in SE1/4 T. 27 S., R. 20 E. (MDB&M)
Quadrangle: Blackwells Corner
Formation: Monterey, McLure Shale  Age: Late Miocene Member
Remarks: Pyritized pelletal phosphate in lower 100 m of brown shale.
References: 1. Goudkoff, 1931
2. Dickert, 1971, p. 272, no. 128

K-7 Enas oil field, 2 miles E. of Little Creek, 15 miles N. of Bakersfield. Well in sec. 21, T. 27 S., R. 27 E. (MDB&M)
Quadrangle: North of Oldalde
Formation: Etchegoin  Age: Pliocene
Remarks: Black phosphatic nodules at base of formation.
Reference: 1. Weddle, 1959, p. 43

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K-8  Mt. Poso oil field. SEL/4 NW1/4 sec. 9, T. 27 S., R. 28 E. (MDB&M)
Quadrangle: Knob Hill
Formation: Round Mountain Silt (?) Age: Middle Miocene
Remarks: 15 m of pellet-bearing sandy siltstone. Shell Oil Co. Vedder No. 36 well. Diepenbrock, 1933, p. 14 "interbedded brownish silty sands with phosphatic pellets in a lower shale member of the Santa Margarita".
References: 1. Diepenbrock, 1933, p. 14
3. Dickert, 1971, p. 272, no. 130

K-9  Media Agua Creek, N. side. SEL/4 sec. 15, T. 28 S., R. 19 E. (MDB&M)
Quadrangle: Las Yeguas Ranch
Formation: Temblor, Santos Shale Age: Early Miocene Member
Remarks: Phosphate pellet beds in Santos Shale.
Chico-Martinez Trench no. 4A in SEL/4 SW1/4 sec. 15, T. 28 S., R. 19 E.
Chico-Martinez Trench no. 4B in SEL/4 SEL/4 sec. 16, T. 28 S., R. 19 E.
References: 1. Dickert, 1971, p. 275, no. 148
2. Dibblee, 1977

K-10 Santos Creek, S. side, 1,000 ft. N. and 400 ft. E. of SW cor. sec. 30, T. 28 S., R. 20 E. (MDB&M)
Quadrangle: Carneros Rocks
Formation: Temblor, Santos Shale Age: Early Miocene Member
Remarks: .5 m of pelletal mudstone in gypsiferous Santos Shale.
References: 1. Dickert, 1971, p. 275, no. 149
2. Dibblee, 1977

K-11 Carneros Creek. SW1/4 SW1/4 sec. 32, T. 28 S., R. 20 E. (MDB&M)
Quadrangle: Carneros Rocks
Formation: Temblor, Santos Shale Age: Early Miocene Member
Remarks: Pelletal and pebble phosphate beds in mudstones of the Santos Shale.
References: 1. Dickert, 1971, p. 275, no. 150
2. Dibblee, 1977

K-12 Rio Bravo oil field. Sec. 28, T. 28 S., R. 25 E. (MDB&M)
Quadrangle: Rio Bravo
Formation: Fruitvale Shale Age: Late Miocene (Mohnian)
Remarks: Scattered phosphatic lenses in Fruitvale Shale. Superior Oil Co. Rudnick No. 4 well.
References: 1. Kasline, 1941, p. 9
2. Gower and Madsen, 1964, p. D82, no. 36
K-13 Premier oil field. NW1/4 SEL1/4 sec. 9, T. 28 S., R. 27 E. (MDB&M)
Quadrangle: North of Oildale
Formation: Etchegoin Age: Pliocene
Remarks: Black phosphatic nodules in basal Etchegoin. Standard Oil Co. of Calif. No. 5-5A well.
References: 1. Weddle, 1959, p. 43
2. Dickert, 1971, p. 272, no. 131

K-14 Kern Front area of Kern River oil field. NW1/4 NE1/4 sec. 15, T. 28 S., R. 27 E. (MDB&M)
Quadrangle: Oildale
Formation: Etchegoin Age: Pliocene
Remarks: Black phosphatic pellets and nodules and charcoal fragments in basal transitional beds of Etchegoin. Standard Oil Co. of Calif. No. 7-1 well.
References: 1. Edwards, 1943
2. Dickert, 1971, p. 272, no. 132

K-15 SEL1/4 NEL1/4 sec. 5, T. 29 S., R. 20 E. (MDB&M)
Quadrangle: Carneros Rocks
Formation: Temblor, Santos Shale Age: Early Miocene Member
Remarks: Phosphate pellets and pebbles in mudstone. Chico-Martinez Trench no. 3.
2. Dickert, 1971, p. 275, no. 151
3. Dibblee, 1977

K-16 Chico Martinez Creek bed, S. side. 1,600 ft. S. and 1,700 ft. E. of NW cor. sec. 9, T. 29 S., R. 20 E. (MDB&M)
Quadrangle: Carneros Rocks
Formation: Temblor, Santos Shale Age: Early Miocene Member
Remarks: An excellent exposure of a 10 m sequence of phosphate pellets and pebbles in near-vertical beds of the Santos Shale and Agua Sandstone. Sample no. 152 from upper Santos Shale. On the S. side of the creek in the approximate center of sec. 10, phosphatic shale in Devilwater Silt (M. Bramlette in Woodring and others, 1940).
References: 1. Woodring and others, 1940
3. Gower and Madsen, 1964, p. D82, no. 34
4. Dickert, 1971, p. 275, no. 152
5. Dibblee, 1977

K-17 NW1/4 SEL1/4 sec. 9, T. 29 S., R. 20 E. (MDB&M)
Quadrangle: Carneros Rocks
Formation: Temblor, Santos Shale Age: Early Miocene Member
Remarks: Phosphatic pellets in mudstone. Chico-Martinez Trench no. 1
2. Dibblee, 1977
K-18  Chico-Martinez Creek area. NW1/4 NW1/4 sec. 15 and NE1/4 NE1/4 sec. 16, T. 29 S., R. 20 E. (MDB&M)
   Quadrangle: Carneros Rocks
   Formation: Temblor, Santos Shale  Age: Early Miocene
   Member
   References: 1. Woodring and others, 1940, p. 125
               4. Dickert, 1971, p. 275, no. 153
               5. Dibblee, 1977

K-19  SW1/4 SW1/4 sec. 14, T. 29 S., R. 20 E. (MDB&M)
   Quadrangle: Carneros Rocks
   Formation: Temblor, Santos Shale  Age: Early Miocene
   Member
   Remarks: Phosphatic pellets in mudstone. Chico-Martinez Trench no. 5.
               2. Dibblee, 1977

K-20  Rosedale oil field. NW1/4 NW1/4 sec. 22, T. 29 S., R. 26 E. (MDB&M)
   Quadrangle: Rosedale
   Formation: Fruitvale Shale  Age: Late Miocene (Mohnian)
   Remarks: Phosphatic lenses at Luisian-Mohnian boundary in the lower Fruitvale Shale. Exxon-Kern County Land Co. C (22-32) No. 3 well (formerly Humble Oil and Gas Co.)
   References: 1. Albright, 1954
               2. Dickert, 1971, p. 275, no. 154

   Quadrangle: West Elk Hills
   Formation: Temblor, Santos Shale  Age: Early Miocene
   Member
   Remarks: Dark gray, silty, calcareous, phosphatic shale; occasionally glauconitic. NPR-1 Unit No. 555-30R well.
   References: 1. Adkison, 1973, p. 12, 15, 16, 17, 21, 23, 24, and 26
               2. Maher, Carter, and Lantz, 1975

   Quadrangle: Santiago Creek
   Formation: San Emigdio  Age: Oligocene (Refugian)
   Remarks: Disseminated phosphate in glauconitic mudstone of the San Emigdio. Richfield Oil Co. Ramsey No. 1 well.
   References: 1. Dickert, 1971, p. 278, no. 171
K-23  Devils Kitchen. 600 ft. N., 1,000 ft. W. of SE cor.
   T. 10 N., R. 21 W. (SBB&M)
Quadrangle: Pleito Hills
Formation: San Emigdio            Age: Oligocene (Refugian)
Remarks: Disseminated phosphate in glauconitic mudstone of the San
         Emigdio. Richfield Oil Co. No. DK-19A well.
References: 1. Dickert, 1971, p. 278, no. 172
             2. Nilsen, Dibblee, and Addicott, 1973

K-24  *SE1/4 SW1/4 sec. 28, T. 28 S., R. 39 E. (MDB&M)
Quadrangle: Garlock
Formation: Goler                Age: Paleocene
Remarks: Apatite concretions occur within lateritic paleosol which
         formed by in situ weathering of Paleozoic metasediments.
         Paleosol is directly overlain by non-marine sedimentary rocks
         of Paleocene Goler Formation.
References: 1. Dibblee, 1976, p. 98
             2. B. F. Cox, 1979, written commun.; loc. no. C-51-5

K-25  Fruitvale oil field. NW1/4 SW1/4 sec. 17, T. 29 S., R. 27 E. (MDB&M)
Quadrangle: Oildale
Formation: Etchegoin            Age: Pliocene
Remarks: Etchegoin is unconformable on the Chanac. The contact is
         marked by pebbles, grit, phosphatic nodules, and possibly
         filled borings. Union Oil Co. of Calif. No. KCL 25-17 well.
References: 1. Diepenbrock, 1933, p. 12
             2. Hluza, 1965, pl. 4

KINGS COUNTY
Ki-1  Kettleman Hills oil field. NE1/4 NW1/4 sec. 3, T. 22 S., R. 17 E.
      (MDB&M)
Quadrangle: La Cima
Formation: Temblor, Santos Shale        Age: Early Miocene
Member
Remarks: Very abundant phosphatic pellets over 30 m in the lower third
         of the brown shale unit and pellets at 7 other depths within
         the brown shale. Standard Oil Co. of Calif. No. 41-3-P well.
References: 1. Galliher, 1931
             2. Woodring, Stewart, and Richards, 1940
             3. Dickert, 1971, p. 267, no. 95

Ki-2  Reef Ridge, E. Garza Creek. 500 ft. N. and 700 ft. E. of SW cor.
      sec. 2, T. 23 S., R. 16 E. (MDB&M)
Quadrangle: Garza Peak
Formation: Monterey, McLure Shale       Age: Late Miocene
Member
Remarks: Sparse phosphate pellets in glauconitic clay, shale, and sand-
         stone near base of the McLure Shale.
Reference: 1. Dickert, 1971, p. 268, no. 100

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Ki-3  Reef Ridge, W. of Big Tar Canyon Road. SW1/4 SE1/4 sec. 7, T. 23 S.,
R. 17 E. (MDB&M)
Quadrangle: Garza Peak
Formation: Monterey, McLure Shale  Age: Late Miocene
Member
Remarks: Phosphate pellets in lower part of the McLure Shale.
References: 1. Henny, 1930, p. 404
2. Galliher, 1931, p. 258
3. Woodring and others, 1940, p. 126
4. Galloway, 1943, p. 492
5. Gower and Madsen, 1964, p. D82, no. 28

Ki-4  Sulphur Spring Gap. On SW side of Reef Ridge, 150 ft. below the
ridgetop. SE1/4 SW1/4 sec. 26, T. 23 S., R. 17 E. (MDB&M)
Quadrangle: Kettleman Plain
Formation: Monterey  Age: Late Miocene
Remarks: 30 cm layer of phosphatic pebble conglomerate at base of
formation.
Reference: 1. Dickert, 1971, p. 268, no. 102

Ki-5  Kettleman Hills oil field. NE1/4 SE1/4 sec. 30, T. 23 S., R. 19 E.
(MDB&M)
Quadrangle: Los Viejos
Formation: Monterey, McLure Shale  Age: Late Miocene
Member
Remarks: Up to 7 layers of phosphatic pellets above and below prominent
bentonite bed. Petroleum Securities Co. Burbank No. 1 well.
References: 1. Goudkoff, 1934
2. Dickert, 1971, p. 269, no. 103

Ki-6  Tent Hills. 1,400 ft. due W. of SW cor. sec. 16, T. 24 S., R. 17 E.
(MDB&M)
Quadrangle: Tent Hills
Formation: Monterey (?)  Age: Late (?) Miocene
Remarks: Phosphate pellets in glauconite bed at unconformable base of
probable Monterey Formation in erosion remnants overlying
Cretaceous shale.
Reference: 1. Dickert, 1971, p. 269, no. 104

Ki-7  Pyramid Hills oil field. NW1/4 SE1/4 sec. 28, T. 24 S., R. 18 E.
(MDB&M)
Quadrangle: Pyramid Hills
Formation: Temblor  Age: Early Miocene
Remarks: Phosphatic pellets within Temblor claystone. Nelson B. Cramer
No. Dotty 1 well.
References: 1. Curtin, 1955, p. 28
2. Gower and Madsen, 1964, p. D82, no. 29
3. Dickert, 1971, p. 269, no. 105

Quadrangle:  Avenal Gap
Formation:  Monterey, McLure Shale  Age:  Late Miocene Member
Remarks:  Pyritized phosphate pellets occur at intervals throughout 300 m of "sporbo shale" McLure Shale. Ohio Oil Co. Smith No. 1 well.
References:  1.  Goudkoff, 1934
2.  Woodring, Stewart, and Richards, 1940
3.  Dickert, 1971, p. 269, no. 106

LAKE COUNTY

L-1  NE1/4 SE1/4 sec. 30, T. 14 N., R. 5 W. (MDB&M)

Quadrangle:  Wilbur Springs SW
Formation:  Great Valley Sequence  Age:  Early Cretaceous
Remarks:  Slightly phosphatic thin bedded mudstone with interbedded graded fine-grained sandstone. Sample from basal part of Great Valley Sequence.
References:  1. R. J. McLaughlin, 1978, written commun.; loc. no. MG 78-31

LOS ANGELES COUNTY

LA-1  Oak Canyon oil field. SW1/4 NW1/4 sec. 32, T. 5 N., R. 17 W. (SBB&M)

Quadrangle:  Val Verde
Formation:  Modelo  Age:  Late Miocene (Mohnian)
References:  1. Ybarra and Stockton, 1958
2.  Dickert, 1971, p. 282, no. 207

LA-2  Del Valle oil field. Center SE1/4 sec. 16, T. 4 N., R. 17 W. (SBB&M)

Quadrangle:  Val Verde
Formation:  Modelo  Age:  Late Miocene (Mohnian)
Remarks:  Phosphatic material in sedimentary rocks near base of Mohnian. Union Oil Co. Lincoln No. 15 well.
References:  1. Nelson, 1952, p. 60
2.  Gower and Madsen, 1964, p. D83, no. 54

LA-3  NW1/4 NE1/4 sec. 17, T. 3 N., R. 16 W. (SBB&M)

Quadrangle:  Oat Mountain
Formation:  Modelo  Age:  Late Miocene (Mohnian)
Remarks:  Thin lenses and small nodules of nearly white phosphatic material occur at several stratigraphic levels in the Modelo Formation exposed in Towsley and Rice Canyons.
References:  1. Winterer and Durham, 1962, p. 287

LA-4  Dry Canyon. NE1/4 NW1/4 sec. 35, T. 1 N., R. 17 W. (SBB&M)

Quadrangle:  Calabasas
Formation:  Modelo  Age:  Late Miocene (Mohnian)
Remarks:  Phosphatic shale in the basal Modelo.
References:  1.  Kleinpell, 1938, p. 47
2.  Gower and Madsen, 1964, p. D83, no. 56
3.  Dickert, 1971, p. 283, no. 211

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LA-5  Topanga Canyon Road, NE side. NE1/4 SW1/4 sec. 31, T. 1 N., R. 16 W. (SBB&M)
Quadrangle: Topanga  
Formation: Monterey  
Age: Late Miocene (Mohnian)  
Remarks: Thick section of phosphatic shale in Monterey.  
References: 1. Kleinpell, 1938, p. 127 (type Mohnian)  
2. Dickert, 1971, p. 283, no. 212

LA-6  Stone Canyon reservoir, W. wall. NW1/4 T. 1 S., R. 15 W. (SBB&M)
Quadrangle: Beverly Hills  
Formation: Monterey  
Age: Late Miocene (Mohnian)  
Remarks: Pelletal phosphate in the basal part of the Monterey.  
References: 1. Hoots, 1930, p. 105-106  
2. Gower and Madsen, 1964, p. D83, no. 57  
3. Dickert, 1971, p. 283, no. 213

LA-7  Beverley Glen Pass. SW1/4 SW1/4 sec. 34, T. 1 N., R. 15 W. (SBB&M)
Quadrangle: Beverly Hills  
Formation: Monterey  
Age: Late Miocene (Mohnian)  
Remarks: 75 m section of phosphatic shale in Monterey near base of Mohnian.  
References: 1. Bramlette, 1946, pl. 2, Beverley Glen Pass section  
2. Dickert, 1971, p. 283, no. 214

LA-8  Covina test hole no. 10 (Shelton map no. 6). 1,360 ft. S., 540 ft. W. of NE cor. sec. 12, T. 1 S., R. 10 W. (SBB&M)
Quadrangle: San Dimas  
Formation: Puente  
Age: Late Miocene (Mohnian)  
Remarks: Phosphatic nodules in sandy siltstones of the upper Topanga or lower Puente formations at Luisian-Mohnian transition.  
References: 1. Shelton, 1946  
2. Dickert, 1971, p. 283, no. 215

LA-9  Covina test hole no. 5 (Shelton map no. 2). 2,560' W., 1,380' S. of NE cor. sec. 7, T. 1 S., R. 9 W. (SBB&M)
Quadrangle: San Dimas  
Formation: Puente  
Age: Late Miocene (Mohnian)  
Remarks: Phosphatic nodules in sandy siltstones of the upper Topanga or lower Puente formations at Luisian-Mohnian transition.  
References: 1. Shelton, 1946  
2. Dickert, 1971, p. 283, no. 217

LA-10  Covina test hole no. 9 (Shelton map no. 5). 2,600' E., 520' N. of SW cor. sec. 5, T. 1 S., R. 9 W. (SBB&M)
Quadrangle: San Dimas  
Formation: Puente  
Age: Late Miocene (Mohnian)  
Remarks: Phosphatic nodules in sandy siltstone of the upper Topanga or lower Puente formations at Luisian-Mohnian transition.  
References: 1. Shelton, 1946  
2. Dickert, 1971, p. 283, no. 216
Formation: Vaqueros
Age: Early Miocene
Remarks: Black phosphatic pellets in Vaqueros.
References: 1. Campbell, Blackerby, Yerkes, and Schoellhamer, 1970
2. Dickert, 1971, p. 284, no. 218

Quadrangle: Point Dume
Formation: Monterey
Age: Late Miocene (Mohnian)
Remarks: Phosphatic nodules in Monterey.
2. Dickert, 1971, p. 284, no. 219

LA-13 Inglewood oil field. SW1/4 SW1/4 sec. 16, T. 2 S., R. 14 W. (SBB&M)
Quadrangle: Inglewood
Formation: Puente
Age: Late Miocene (Mohnian)
References: 1. Wissler, 1943, p. 227
2. Dickert, 1971, p. 284, no. 220

LA-14 Playa del Rey oil field. SW1/4 NE1/4 sec. 34, T. 2 S., R. 15 W. (SBB&M)
Quadrangle: Venice
Formation: Puente
Age: Late Miocene (Mohnian)
References: 1. Hoots, and others, 1935
2. Metzner, 1943
3. Hodges, 1944, p. 6
5. Dickert, 1971, p. 284, no. 221

LA-15 Potrero oil field, Inglewood. SW1/4 NW1/4 sec. 28, T. 2 S., R. 14 W. (SBB&M)
Quadrangle: Inglewood
Formation: Puente
Age: Late Miocene (Mohnian)
Remarks: Dark phosphatic nodular shale of Puente (Monterey). Mobil Oil Co. Community No. 54 well.
References: 1. Crowder, 1958
2. Dickert, 1971, p. 284, no. 222

LA-16 El Segundo oil field. NW1/4 NE1/4 sec. 18, T. 3 S., R. 14 W. (SBB&M)
Quadrangle: Venice
Formation: Monterey
Age: Late Miocene (Mohnian)
Remarks: Nodular phosphatic shale in basal 30-60 m of Monterey. Block Oil Co. Block No. 18 well.
References: 1. Reese, 1943
2. Wissler, 1943
3. Dickert, 1971, p. 284, no. 223
LA-17 Torrance oil field. Center sec. 15, T. 4 S., R. 14 W. (SBB&M)
Quadrangle: Torrance
Formation: Puente Age: Late Miocene (Mohnian)
Remarks: Nodular bituminous phosphatic shale with bentonite laminae in "Division E" of the Puente (Monterey).
References: 1. Davis, 1943, p. 299
2. Wissler, 1943, p. 227
4. Dickert, 1971, p. 284, no. 225

LA-18 Malaga Cove, 200 ft. SW of the mouth of Malaga Canyon.
T. 4 S., R. 15 W. (SBB&M)
Quadrangle: Redondo Beach
Formation: Monterey, Altamira Shale Age: Late Miocene (Mohnian) Member
Remarks: Excellent exposure of 60 m section of phosphatic shale in the upper part of the Altamira Shale Member and in the Valmonte Diatomite Member of the Monterey.
References: 1. Woodring and others, 1946, p. 20, loc. #10 and p. 34

LA-19 Agua Negra Canyon. 500 ft. NE of Palos Verdes Drive North.
SW1/4 T. 4 S., R. 14 W. (SBB&M)
Quadrangle: Torrance
Formation: Monterey, Valmonte Age: Late Miocene (Mohnian) Diatomite Member
Remarks: Phosphatic and diatomaceous shale in lower part of Valmonte Diatomite.
References: 1. Woodring and others, 1946

LA-20 Lomita Quarry. T. 4 S., R. 14 W. (SBB&M)
Quadrangle: Torrance
Formation: Lomita Marl Age: Pleistocene
Remarks: Phosphate nodules in Lomita Marl.
References: 1. Tucker, 1927, p. 328
2. Dietz and others, 1942, p. 831
3. Rogers, 1944, p. 421
4. Emery and Dietz, 1950, p. 12
5. Gower and Madsen, 1964, p. D83, no. 61

LA-21 Palos Verdes Point, southside. T. 5 S., R. 15 W. (SBB&M)
Quadrangle: Redondo Beach
Formation: Monterey, Valmonte Age: Late Miocene (Mohnian) Diatomite and Altamira Shale Member
Remarks: Section of upper part of Altamira Shale Member and Valmonte Diatomite Member in sea cliff on south side of Palos Verdes Point. Approximately 10 m of phosphatic shale; 9 m in basal Valmonte Diatomite Member.
LA-22 Lunada Bay at mouth of Agua Amarga Canyon. T. 5 S., R. 15 W. (SBB&M)
Quadrangle: Redondo Beach
Formation: Monterey, Altamira Age: Late Miocene (Mohnian)
Shale Member
Remarks: 45 m section of phosphatic and bituminous shale in the upper part of the Altamira Shale.
References: 1. Woodring and others, 1946, p. 21 and 29
3. Dickert, 1971, p. 285, no. 228

LA-23 Altamira Canyon, Middle Fork. T. 5 S., R. 14 W. (SBB&M)
Quadrangle: Torrance
Formation: Monterey, Altamira Age: Late Miocene (Mohnian)
Shale Member
Remarks: A section of 80 m of phosphatic shale and limestone for the upper and middle part of the Altamira Shale.

Quadrangle: Torrance
Formation: Monterey, Altamira Age: Late Miocene (Mohnian)
Shale Member
Remarks: A section of 30 m of phosphatic shale and limestone for the upper part of the Altamira Shale.
References: 1. Woodring, Bramlette, and Kew, 1946, p. 31

LA-25 San Pedro, S. side of Second St., 100 ft. W. of Pacific Ave.
T. 5 S., R. 14 W. (SBB&M)
Quadrangle: San Pedro
Formation: Lomita Marl Age: Pleistocene
Remarks: Limy phosphatic nodules scattered in the lower 15 m of the Lomita Marl.
References: 1. Woodring and others, 1946; 1954

LA-26 Point Fermin. Paseo del Mar, N. side, at the projected extension of Fortieth St. T. 5 S., R. 14 W. (SBB&M)
Quadrangle: San Pedro
Formation: Monterey, Altamira Age: Late Miocene (Mohnian)
Shale Member
Remarks: Thin layers of phosphatic Altamira Shale within blue-schist sandstone.
References: 1. Woodring and others, 1946, loc. 17
2. Dickert, 1971, p. 285, no. 231

LA-27 Wilmington oil field. Center sec. 34, T. 4 S., R. 13 W. (SBB&M)
Quadrangle: Long Beach
Formation: Puente Age: Late Miocene (Mohnian)
Remarks: Nodular bituminous phosphatic shale in "Division E" of the Puente.
References: 1. Wissler, 1943, p. 210, 221, 227
LA-28 Wilson Cove, San Clemente Island
Quadrangle: San Clemente Island North
Formation: Monterey Age: Middle Miocene (Luisian)
Remarks: Phosphatized Foraminifera.
References: 1. Olmsted, 1958, p. 65
2. Gower and Madsen, 1964, p. D83, no. 64
3. Vedder and Moore, 1976, p. 111

LA-29 Playa del Rey oil field. Center SEL/4 sec. 27, T. 2 S., R. 15 W.
(SBB&M)
Quadrangle: Venice
Formation: Puente Age: Late Miocene (Mohnian)
Remarks: Nodular bituminous phosphatic shale in "Division E" of the Puente.
References: 1. Wissler, 1943, p. 221, 227

LA-30 El Segundo oil field. SEL/4 SEL/4 sec. 12, T. 3 S., R. 15 W. (SBB&M)
Quadrangle: Venice
Formation: Puente Age: Late Miocene (Mohnian)
Remarks: Nodular bituminous phosphatic shale in "Division E" of the Puente.
Reference: 1. Wissler, 1943, p. 221, 227

LA-31 Inglewood oil field. Center NW1/4 sec. 8, T. 2 S., R. 14 W. (SBB&M)
Quadrangle: Hollywood
Formation: Puente Age: Late Miocene (Mohnian)
Remarks: Nodular bituminous phosphatic shale in "Division E" of the Puente.
Reference: 1. Wissler, 1943, p. 221, 228

MARIN COUNTY
MA-1 West side of Drakes Bay, N. of the lifeboat station. T. 2 N., R. 10 W.
(MDB&M)
Quadrangle: Drakes Bay
Formation: Drakes Bay Formation Age: Early Pliocene
Remarks: Phosphatic concretions and bone fragments in basal coarse-grained glauconitic sandstone.
2. Dickert, 1971, p. 255, no. 3

MA-2 Double Point, N. point. Sec. 7, T. 1 N., R. 8 W. (MDB&M)
Quadrangle: Double Point
Formation: Monterey Age: Middle Miocene (Luisian)
Remarks: Leached nodular phosphatic shale in well core. Standard Oil of California (Lockhart) Tevis No. 1 well.
2. Galloway, 1977, p. 26
MENDOCINO COUNTY
Mn-1 3,000 ft. N. of the mouth of Galloway Creek. SW 1/4 sec. 29, T. 12 N., R. 16 W. (MDB&M)
Quadrangle: Saunders Reef
Formation: Skooner Gulch  Age: Early Miocene (Zemorrian)
Remarks: Phosphatic nodules in glauconitic sandstone in the upper part of the Skooner Gulch.
References: 1. Addicott, 1967
2. Dickert, 1971, p. 255, no. 2

Quadrangle: Saunders Reef
Formation: Skooner Gulch  Age: Early Miocene (Zemorrian)
Remarks: Near the top of the formation is a very thick fine-grained glauconitic sandstone which contains phosphatic nodules, shark teeth, marine mammal remains, and fish vertebrae.

MERCED COUNTY
Mer-1 Laguna Seca. SE 1/4 sec. 13, T. 12 S., R. 10 E. (MDB&M)
Quadrangle: Charleston School
Formation: Moreno and Unalde  Age: Late Cretaceous & Paleocene
Remarks: Phosphatic concretions in the Tierra Loma Member of the Moreno Formation and in the Unalde Formation.

MONTEREY COUNTY
Mo-1 Old Monterey Airport Road, N. of entrance to Santa Catalina School, 650 ft. S. of Highway 1, T. 15 S., R. 1 E. (MDB&M)
Quadrangle: Seaside
Formation: Monterey, Hames Member  Age: Late Miocene (Early Mohnian)
Remarks: Thin (5-10 cm) beds of abundant pellets in opaline porcelanite.
References: 1. Dickert, 1971, p. 261, no. 51
2. Brabb, Bowen, and Hart, 1962

Mo-2 E. side of Protrero Canyon. 1,050 ft. due W. of SW cor. sec. 22, T. 16 S., R. 1 E. (MDB&M)
Quadrangle: Seaside
Formation: Monterey, Laureles  Age: Middle Miocene (Luisian (?)) Sandstone Member
Remarks: Three thin (1-10 cm) layers of phosphatic pellets in siliceous mudstone within the Laureles Sandstone.
Reference: 1. Dickert, 1971, p. 262, no. 56

Mo-3 *SE 1/4 projected sec. 24, T. 16 S., R. 1 E. (MDB&M)
Quadrangle: Seaside
Formation: Monterey, Hames Member  Age: Late Miocene (Early Mohnian)
Remarks: Phosphate pellet beds as much as 0.3 m thick in siliceous shales.
2. Graham, 1976, p. 383
3. Cassell, 1949
Mo-4 SE 1/4 sec. 33, T. 16 S., R. 1 E. (MDB&M)
Quadrangle: Mr. Carmel
Formation: Monterey, Laureles
Sandstone Member
Age: Middle Miocene (Luisian)
Remarks: Laureles Sandstone includes a horizon characterized by nodular phosphorite and phosphatized bone fragments.

Mo-5 Western rim of Robinson Canyon. 100 ft. S. and 350 ft. E. of NW cor. sec. 36, T. 16 S., R. 1 E. (MDB&M)
Quadrangle: Seaside
Formation: Monterey, Laureles
Sandstone Member
Age: Middle Miocene (Luisian)
Remarks: A few thin beds of phosphatized debris (shell fragments, fish vertebrae, pellets) in fine grained sandstone of the Laureles Sandstone Member. Sample loc. 57 just above shale-conglomerate contact.
References: 1. Dickert, 1971, p. 262, no. 57
2. Graham, 1976, p. 383

Mo-6 SE 1/4 NW 1/4 sec. 16, T. 16 S., R. 2 E. (MDB&M)
Quadrangle: Seaside
Formation: Monterey Shale, Hames
Member
Age: Late Miocene (Mohnian)
Remarks: Phosphate-pellet beds in siliceous shales exposed in roadcuts.

Mo-7 Carmel Valley Road. 200 ft. SE of mouth of Meadows Canyon. SW 1/4 sec. 19, T. 16 S., R. 2 E. (MDB&M)
Quadrangle: Seaside
Formation: Monterey, Hames Member
Age: Late Miocene (Early Mohnian)
Remarks: The most westerly of many exposures of pelletite beds in the Monterey where the Carmel Valley Road cuts this unit.
References: 1. Dickert, 1970, p. 262, no. 53
2. Graham, 1976, p. 383

Mo-8 Meadows Canyon. Several exposures on road leading from Carmel Valley Rd. N. to Coyote Gulch. 1,100 ft. N., 275 ft. E. of SW cor. sec. 19, T. 16 S., R. 2 E. (MDB&M)
Quadrangle: Seaside
Formation: Monterey, Hames Member
Age: Late Miocene (Early Mohnian)
Remarks: Two 10 cm beds of abundant pellets in sandy Monterey.
References: 1. Dickert, 1971, p. 261, no. 52
2. Graham, 1976, p. 383

Mo-9 W. side of Juan de Matte Canyon. 6,300 ft. N., 5,800 ft. E. of SW cor. sec. 29, T. 16 S., R. 2 E. (MDB&M)
Quadrangle: Seaside
Formation: Monterey, Hames Member
Age: Late Miocene (Early Mohnian)
Remarks: Abundant pellets 20 m above granodiorite basement.
Reference: 1. Dickert, 1971, p. 262, no. 54
Mo-10 Carmel Valley Road. 100 ft. SE of benchmark 195, T. 16 S., R. 2 E. (MDB&M)

Quadrangle: Seaside
Formation: Monterey, Hames Member  Age: Late Miocene (Late Mohnian)
Remarks: Two pelletite beds, 30 and 8 cm thick. A quarter mile SE of this exposure, a 32 cm layer of phosphatic conglomerate.

References: 1. Rogers, 1944, p. 411
2. Dickert, 1971, p. 262, no. 55
3. Graham, 1976, p. 383, LSJU loc. #567
4. Younse, 1980, section 332, pls. 3 and 5

Mo-11 San Jose Creek Road, N. side. NE1/4 NE1/4 sec. 4, T. 17 S., R. 1 E. (MDB&M)

Quadrangle: Mt. Carmel
Formation: Monterey, Laureles  Age: Middle Miocene (Luisian)
Sandstone Member
Remarks: Phosphate pellets and pebbles in the Laureles Sandstone Member.

References: 1. Dickert, 1971, p. 262, no. 58
2. Graham, 1976, p. 350

Mo-12 San Jose Creek Road, N. side. NE1/4 sec. 10, T. 17 S., R. 1 E. (MDB&M)

Quadrangle: Mt. Carmel
Formation: Monterey, Laureles  Age: Middle Miocene (Luisian)
Sandstone Member
Remarks: Phosphatic conglomerate (pellets, pebbles, and phosphatized organic debris) in Laureles Sandstone Member.

References: 1. Dickert, 1971, p. 262, no. 59
2. Graham, 1976, p. 350

Mo-13 Tularcitos Valley. One quarter mile NE of Tularcitos Guard Station, T. 17 S., R. 2 E. (MDB&M)

Quadrangle: Carmel Valley
Formation: Monterey, Sandholdt Member  Age: Middle Miocene (Late Relizian)
Remarks: Phosphate pellet layer, 1 m thick, at depositional base of Monterey. Dickert loc. 60A.55 mile W. of Chupines Ranch, N. side of Carmel Valley road; phosphatic shale, 1.5 m above pellet layer.

References: 1. Neel, 1963
2. Dickert, 1971, p. 263, no. 60

Mo-14 N. side of Carmel Valley Road, 2,800' E., 1,000' S. of Tularcitos Guard Sta. T. 17 S., R. 2 E. (MDB&M)

Quadrangle: Carmel Valley
Formation: Monterey, Hames Member  Age: Late Miocene (Early Mohnian)
Remarks: 12 m exposure of Monterey Shale porcellanite and mudstone includes 7 pellet-bearing layers, from 5-18 cm thick at Louisian-Mohnian boundary.

References: 1. Dickert, 1971, p. 263, no. 61
2. Graham, 1976, p. 257
Mo-15 N. side, Carmel Valley Road. 1.5 miles W. of Tularcitos Ranch, T. 17 S., R. 3 E. (MDB&M)
Quadrangle: Carmel Valley
Formation: Monterey, Sandholdt Age: Middle Miocene (Late Member Relizian)
Remarks: A 30 cm bed of pellet-bearing mudstone in gray diatomaceous shale of the Sandholdt.
References: 1. Dickert, 1971, p. 263, no. 62
2. Graham, 1976, p. 257

Mo-16 Tularcitos Creek Road, N. side. 3 miles E. of Tularcitos Ranch. 2,800 ft. NW of benchmark 1153, T. 17 S., R. 3 E. (MDB&M)
Quadrangle: Rana Creek
Formation: Monterey, Hames Member Age: Late Miocene (Mohnian)
Remarks: Three 5-15 cm phosphate-pellet beds in thin-bedded slightly phosphatic siliceous shale at base of Hames.
2. Wiedman, 1964, no. 2, p. 39
3. Dickert, 1971, p. 263, no. 63 and p. 51

Mo-17 Tularcitos Ridge. SW1/4 NW1/4 sec. 35, T. 17 S., R. 3 E. (MDB&M)
Quadrangle: Rana Creek
Formation: Monterey, Hames Member Age: Late Miocene (Mohnian)
Remarks: Leached pelletal phosphate beds near base of Hames.
References: 1. Wiedman, 1964, no. 1, p. 39
2. Dickert, 1971, p. 263, nos. 64 and 65

Mo-18 Jamesburg Road. SW1/4 NE1/4 sec. 6, T. 18 S., R. 4 E. (MDB&M)
Quadrangle: Rana Creek
Formation: Monterey, Hames Member Age: Late Miocene (Mohnian)
Remarks: Leached phosphatic pellets near base of Hames.
References: 1. Wiedman, 1964, no. 3, p. 39
2. Dickert, 1971, p. 263, no. 66

Mo-19 SW side of Palsma Creek at SW cor. sec. 31, T. 18 S., R. 5 E. (MDB&M)
Quadrangle: Sycamore Flat
Formation: Monterey, Sandholdt Age: Middle Miocene (Luisian)
Remarks: Phosphatic laminae in organic mudstone.
References: 1. Durham, 1970
2. Dickert, 1971, p. 263, no. 68

Mo-20 Church Creek. SW1/4 sec. 13, T. 19 S., R. 3 E. (MDB&M)
Quadrangle: Chews Ridge
Formation: Church Creek Age: Eocene (Refugian)
Remarks: Ferruginous phosphatic mudstone.
References: 1. Dickinson, 1956; 1965, p. 28, 37, 38
2. Brabb, Bukry, and Pierce, 1971
3. Dickert, 1971, p. 264, no. 71
4. Graham, 1976
Mo-21  Sec. 12, T. 19 S., R. 4 E. (MDB&M)
Quadrangle: Sycamore Flat
Formation: Monterey, Sandholdt Member  Age: Middle Miocene (Luisian)
Remarks: Pellet phosphate at fossil loc. Mf 971.

Mo-22  Arroyo Seco Road, S. side. *NW1/4 SE1/4 sec. 36, T. 19 S., R. 4 E. (MDB&M)
Quadrangle: Junipero Serra Peak
Formation: Monterey, Sandholdt Member  Age: Lower Miocene (Saucesian or Early Relizian)
Remarks: A 15 m thick sequence of phosphatic shale and sandy mudstone.
Reference: 1. Dickert, 1971, p. 264, no. 72-1

Mo-23  SW side of Paloma Creek in SW1/4 sec. 6, T. 19 S., R. 5 E. (MDB&M)
Quadrangle: Sycamore Flat
Formation: Monterey, Sandholdt Member  Age: Middle Miocene (Luisian)
Remarks: Phosphatic nodules in laminae in basal part of Sandholdt.
References: 1. Dickert, 1971, p. 264, no. 69
2. Durham, 1970

Mo-24  1,400' west of SE cor. sec. 8, T. 19 S., R. 5 E. (MDB&M)
Quadrangle: Sycamore Flat
Formation: Monterey, Hames Member  Age: Late Miocene (Early Mohnian)
Remarks: A few thin phosphate pellet beds crop out in porcelaneous rocks on the ridgetop.

Mo-25  450 ft. W. of SE cor. sec. 21, T. 19 S., R. 5 E. (MDB&M) and roadcuts along Arroyo Seco Road.
Quadrangle: Sycamore Flat
Formation: Monterey  Age: Late Miocene (Early Mohnian)
Remarks: Phosphate pellet beds in the Monterey.
References: 1. Gower and Madsen, 1964, p. D81, no. 18

Mo-26  N. side of Jamesburg Road and 300 ft. W. of Sand Creek. NE1/4 SW1/4 sec. 21, T. 19 S., R. 5 E. (MDB&M)
Quadrangle: Sycamore Flat
Formation: Monterey  Age: Late Miocene (Early Mohnian)
Remarks: An 8 cm bed of coarse pellets and phosphate pebble fragments in porcelaneous shale in which phosphate nodules are sparsely dispersed over a 30 m section.
Reference: 1. Dickert, 1971, p. 264, no. 70

Mo-27  Arroyo Seco Road, N. side. *NW1/4 SW1/4 sec. 31, T. 19 S., R. 5 E. (MDB&M)
Quadrangle: Junipero Serra Peak
Formation: Monterey, Sandholdt Member  Age: Middle Miocene (Saucesian or Early Relizian)
Remarks: Phosphatic zone in Sandholdt exposed in roadcut at loc. Mf 1020.
Mo-28 E. side, Monroe Canyon. SE1/4 SW1/4 sec. 28, T. 19 S., R. 7 E. (MDB&M)
Quadrangle: Thompson Canyon
Formation: Santa Margarita Age: Late Miocene (Mohnian)
Remarks: Phosphatic oolites (4%) in basal sandstone of formation.
References: 1. Weidman, 1958, p. 112 (sample 315-S-55)
2. Dickert, 1971, p. 264, no. 74

Mo-29 NW1/4 NE1/4 sec. 33, T. 19 S., R. 7 E. (MDB&M)
Quadrangle: Thompson Canyon
Formation: Santa Margarita Age: Late Miocene (Mohnian)
Remarks: Basal few feet of the Santa Margarita Formation consists of pebble conglomerate and pebbly sandstone containing several pholad-bored pebbles and considerable phosphatic silt in the form of pellets, oolites, and internal fossil molds.
Reference: 1. Weidman, 1958, p. 110 (sample 315-S-44)

Mo-30 Center sec. 23, T. 19 S., R. 8 E. (MDB&M)
Quadrangle: Pinalito Canyon
Formation: Pancho Rico Age: Pliocene
Remarks: Phosphatic sandstone containing 15% phosphate pellets.
Reference: 1. Weidman, 1958, p. 121, col. no. 1

Mo-31 SE1/4 SW1/4 sec. 26, T. 19 S., R. 8 E. (MDB&M)
Quadrangle: San Lucas
Formation: Pancho Rico Age: Pliocene
Remarks: Phosphatic fossil fragments.
Reference: 1. Weidman, 1958, p. 121, col. no. 2

Mo-32 San Lorenzo Creek. SW1/4 sec. 28, T. 19 S., R. 9 E. (MDB&M)
Quadrangle: San Lucas
Formation: Pancho Rico Age: Pliocene
Remarks: Phosphate pellets (10-20%) in sands near the top of the formation.
References: 1. Dickert, 1971, p. 264, no. 75
2. Weidman, 1958, p. 121, col. no. 6; p. 126 (sample 315-S-62)

Mo-33 SW1/4 SW1/4 sec. 29, T. 19 S., R. 9 E. (MDB&M)
Quadrangle: San Lucas
Formation: Pancho Rico Age: Pliocene
Remarks: Phosphate pellets near top of formation.
Reference: 1. Weidman, 1958, p. 121, col. no. 5

Mo-34 Vaqueros Creek. NW1/4 NW1/4 sec. 4, T. 20 S., R. 6 E. (MDB&M)
Quadrangle: Reliz Canyon
Formation: Monterey, Sandholdt Member Age: Middle Miocene (Late Luisian)
Remarks: Pellet phosphate beds 10-15 cm thick in the Sandholdt.
References: 1. Reed, 1927
2. Gower and Madsen, 1964, p. D81, no. 20
Mo-35 Reliz Canyon, W. side. SW1/4 NW1/4 sec. 14, T. 20 S., R. 6 E. (MDB&M)
Quadrangle: Reliz Canyon
Formation: Monterey, Sandholdt Member  Age: Middle Miocene (Late Luisian)
Remarks: Hard massive pelleted layers 5-60 cm thick in mudstones and shales at top of Sandholdt.
References: 1. Kleinpell, 1938 (sample loc. shown in frontispiece)
2. Dickert, 1971, p. 265, no. 77
3. Durham, 1974; 1963, p. Q17
4. Graham, 1976

Mo-36 Reliz Canyon. SW1/4 NW1/4 sec. 13, T. 20 S., R. 6 E. (MDB&M)
Quadrangle: Reliz Canyon
Formation: Monterey, Sandholdt Member  Age: Middle Miocene (Late Luisian)
Remarks: Phosphatic pellet beds in mudstone near Mf 1488.
References: 1. Gower and Madsen, 1964, p. D81, no. 21
2. Smith, 1968

Mo-37 Reliz Canyon. NE1/4 SE1/4 sec. 26, T. 20 S., R. 6 E. (MDB&M)
Quadrangle: Reliz Canyon
Formation: Vaqueros  Age: Early Miocene (Early Saucesian (?))
Remarks: Pellets in fine-grained sandstone near top of F member (of Thorup, 1942) of Vaqueros.
References: 1. Thorup, 1943, p. 466
2. Gower and Madsen, 1964, p. D81, no. 19
3. Dickert, 1971, p. 265, no. 79

Mo-38 NE1/4 NW1/4 sec. 14, T. 20 S., R. 7 E. (MDB&M)
Quadrangle: Thompson Canyon
Formation: Pancho Rico  Age: Pliocene
Remarks: Sample 315-S-68 from U.C. fossil loc. A-4923, contains a few percent phosphatic granules and very small pebbles.
Reference: 1. Weidman, 1958, p. 130-31 (sample 315-S-68)

Mo-39 Wildhorse Canyon, N. side. NW1/4 sec. 9, T. 20 S., R. 9 E. (MDB&M)
Quadrangle: San Lucas
Formation: Pancho Rico  Age: Pliocene
Remarks: Pelletal phosphate and phosphatized organic debris.
2. Dickert, 1971, p. 265, no. 78

Mo-40 Wildhorse Canyon, S. side. NW1/4 sec. 16, T. 20 S., R. 9 E. (MDB&M)
Quadrangle: San Lucas
Formation: Pancho Rico  Age: Pliocene
Remarks: Pelletal phosphate near top of formation.
Reference: 1. Weidman, 1958, p. 121, col. no. 9

Mo-41 SE1/4 NE1/4 sec. 27, T. 20 S., R. 9 E. (MDB&M)
Quadrangle: Nattrass Valley
Formation: Pancho Rico  Age: Pliocene
Remarks: Pebbly phosphatic sandstone with interbedded diatomite.
Reference: 1. Weidman, 1958, p. 121, col. no. 11
Mo-42  *SW1/4 SW1/4 sec. 9, T. 21 S., R. 5 E. (MDB&M)
Quadrange: Cone Peak
Formation: Monterey, Sandholdt Member  Age: Middle Miocene (Saucesian-
Remarks: Nodular phosphorite and glauconite.

Mo-43  Rattlesnake Creek.  *SE1/4 NEl/4 sec. 16, T. 21 S. R. 5 E. (MDB&M)
Quadrange: Cone Peak
Formation: Monterey, Hames Member  Age: Late Miocene (Early Mohnian)
Remarks: Pellet-bearing white sandstone beds, .3-1 m thick, in opaline
cherts. Locality GES 3-18, Stanford Univ. summer field geology
class, 1958.
Reference: 1. Dickert, 1971, p. 265, no. 81

Mo-44  Rattlesnake Creek.  *SW1/4 NEl/4 sec. 22, T. 21 S., R. 5 E. (MDB&M)
Quadrange: Cone Peak
Formation: Monterey, Hames Member  Age: Late Miocene (Early Mohnian)
Remarks: Phosphate nodules in laminated porcelanite. Locality SAT 5-1,
Stanford Univ. summer field-geology class, 1958.
Reference: 1. Dickert, 1971, p. 265, no. 82

Mo-45  Mission Creek.  1/2 mile W. in SW1/4 SW1/4 sec. 24, T. 21 S., R. 6 E.
Quadrange: Bear Canyon
Formation: Monterey, Sandholdt Member  Age: Middle Miocene (Luisian)
Remarks: Thickly bedded pelletites and pellet-bearing sandstones over a
25 m thickness which represents the entire Sandholdt in this
area.
References: 1. Dickert, 1971, p. 266, no. 85
2. Durham, 1974, loc. Mf 1493

Mo-46  NW1/4 sec. 25, T. 21 S., R. 6 E. (MDB&M)
Quadrange: Bear Canyon
Formation: Monterey, Sandholdt Member  Age: Middle Miocene (Luisian)
Remarks: Very thin, phosphatic bank-top sequence of phosphatic pelletal
sandstones.

Mo-47  Forest Creek.  5,300' E. and 2,900' N. of benchmark 1268.
Quadrange: Bear Canyon
Formation: Monterey  Age: Middle Miocene (Luisian)
Remarks: Phosphatic pellets and fossil molds in white, very fine-grained
glauconitic sandstone at gradational boundary between Hames
and Sandholdt Members of Monterey Formation. Near Mf 1494
Reference: 1. Dickert, 1971, p. 266, no. 84
Mo-48 Bear Canyon. 1,600 ft. N. and 600 ft. W. of benchmark 1268, NW1/4 SW1/4 sec. 28, T. 21 S., R. 6 E. (MDB&M)

Quadrangle: Bear Canyon
Formation: Santa Margarita Age: Late Miocene (Mohnian)
Remarks: Sandstone and conglomerate with phosphate pellets and pebbles at contact between Monterey and Santa Margarita formations. Locality DWE 9-25, Stanford University summer field-geology class, 1958.
Reference: 1. Dickert, 1971, p. 266, no. 83

Mo-49 Pine Canyon Road. NEl/4 NEl/4 sec. 8, T. 21 S., R. 7 E. (MDB&M)

Quadrangle: Cosio Knob
Formation: Monterey, Sandholdt Member Age: Middle Miocene (Relizian or Luisian)
Remarks: Minor phosphate pellets in calcareous shale of the Sandholdt Member.
References: 1. Weidman, 1958, p. 75 (sample 315-S-315)
2. Dickert, 1971, p. 266, no. 86

Mo-50 SE1/4 sec. 9, T. 21 S., R. 7 E. (MDB&M)

Quadrangle: Cosio Knob
Formation: Monterey, Hames Member Age: Middle Miocene (Luisian)
Remarks: Phosphate pellets in the Hames.

Mo-51 Cosio Knob, S. slope. SE1/4 NW1/4 sec. 29, T. 21 S., R. 7 E. (MDB&M)

Quadrangle: Cosio Knob
Formation: Monterey, Sandholdt Member Age: Middle Miocene (Relizian or Early Luisian)
Remarks: 20 cm layer of pellet-bearing sandstone in siliceous mudstone. Sample 315-S-17 contained 30 percent carbonate and 20 percent phosphatic oolites.
References: 1. Weidman, 1958, p. 76 (sample 315-S-17)
3. Dickert, 1971, p. 266, no. 87

Mo-52 SE1/4 sec. 29, T. 21 S., R. 7 E. (MDB&M)

Quadrangle: Cosio Knob
Formation: Monterey, Sandholdt Member Age: Middle Miocene (Relizian or Early Luisian)
Remarks: Argillaceous limestone contains a 15 cm bed of phosphatic sandstone consisting of arkosic sand grains and phosphatic oolites in a matrix of siliceous mudstone.
References: 1. Weidman, 1958, p. 92 (sample 315-S-38)
2. Durham, 1964

Mo-53 On E. line of sec. 15, T. 21 S., R. 9 E. (MDB&M)

Quadrangle: San Ardo
Formation: Pancho Rico Age: Pliocene
Remarks: Phosphate pellets and phosphatized organic debris in siltstones in the basal part of the formation.
References: 1. Bramlette and Daviess, 1944
2. Weidman, 1958, p. 121, col. 12

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Mo-54 Espinosa Canyon Road, W. side. *NE 1/4 NW 1/4 of projected sec. 30, T. 21 S., R. 9 E. (MDB & M)

Quadrangle: Espinosa Canyon
Formation: Monterey, Sandholdt Member
Age: Middle Miocene (Relizian or Early Luisian)
References:
2. Dickert, 1971, p. 266, no. 89

Mo-55 NW 1/4 NE 1/4 sec. 32, T. 21 S., R. 9 E. (MDB&M)
Quadrangle: Espinosa Canyon
Formation: Monterey, Sandholdt Member
Age: Middle Miocene (Relizian or Early Luisian)
Remarks: Phosphate pellet beds in the Sandholdt.
References:
2. Gower and Madsen, 1964, p.D82, no. 25

Mo-56 NE 1/4 NE 1/4 sec. 16, T. 21 S., R. 10 E. (MDB&M)
Quadrangle: San Ardo
Formation: Pancho Rico
Age: Pliocene
Remarks: Phosphate pellets and phosphatized organic debris in basal part of formation.

Mo-57 NE 1/4 NW 1/4 sec. 23, T. 22 S., R. 6 E. (MDB&M)
Quadrangle: Bear Canyon
Formation: Santa Margarita (?) Age: Late (?) Miocene (Mohnian?)
Remarks: Phosphatic nodules in basal sandstone on basement.
Reference: 1. Graham, 1976, loc. 4-500

Mo-58 Pole Canyon. NE 1/4 SW 1/4 sec. 1, T. 22 S., R. 7 E. (MDB&M)
Quadrangle: Cosio Knob
Formation: Santa Margarita
Age: Late Miocene (Mohnian)
Remarks: Polished phosphatic oolites observed in several sandstone samples. They constitute less than 1 percent of the samples, except for one pebbly sample (315-S-51) which contains about 25 percent light brown phosphatic oolites.
References:
1. Weidman, 1958, p. 108 (sample 315-S-51)
2. Durham, 1964
3. Dickert, 1971, p. 266, no. 88

Mo-59 NW 1/4 sec. 31, T. 22 S., R. 7 E. (MDB&M)
Quadrangle: Alder Peak
Formation: Monterey, Sandholdt Member
Age: Middle Miocene (Lower Luisian)
Remarks: Glaucinite-phosphorite conglomerate in basal Sandholdt.
References:
1. Graham, 1976, loc.no. 27-15, 16

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Mo-60 Paris Valley, NE 1/4 SW 1/4 sec. 12, T. 22 S., R. 9 E. (MDB&M)
Quadrangle: San Ardo
Formation: Santa Margarita Age: Late Miocene (Mohnian)
Remarks: Phosphatic pellet-bearing fine-grained sandstone.
References: 1. Dickert, 1971, p.268, no.96

Mo-61 Sec. 5, T. 22 S., R. 10 E. (MDB&M)
Quadrangle: San Ardo
Formation: Pancho Rico Age: Pliocene
Remarks: Phosphate pellets and phosphatic mollusk shells in Pancho Rico.
References: 1. Hughes, 1963, p.94-95
2. Gower and Madsen, 1964, p.D82, no.26

Mo-62 Salinas River, 4 miles SE San Ardo. 3,500 ft. S. and 1,500 ft. E. of NW cor. sec. 33, T. 22 S., R. 10 E. (MDB&M)
Quadrangle: Hames Valley
Formation: Pancho Rico Age: Pliocene
Remarks: Several friable silty fine-grained sandstone layers (40-60 cm thick) which include 5-75% pellets and phosphatized organic debris.
Reference: 1. Dickert, 1971, p.268, no. 97

Mo-63 Tule Canyon, SW 1/4 NE 1/4 sec. 22, T. 23 S., R. 8 E. (MDB&M)
Quadrangle: Williams Hill
Formation: Monterey, Sandholdt Member Age: Middle Miocene (Luisian)
Remarks: Phosphatic pellets in calcareous shales of the Sandholdt.
References: 1. Gower and Madsen, 1964, p. D82, no. 27
2. Durham, 1965
3. Dickert, 1971, p.268, no. 98

Mo-64 *NE 1/4 sec. 6, T. 24 S., R. 8 E. (MDB&M)
Quadrangle: Jolon
Formation: Monterey, Sandholdt Member Age: Middle Miocene (Relizian)
Reference: 1. Graham, 1976, loc. no. 15-6 through 11

Mo-65 *Center NE 1/4 sec. 17, T. 24 S., R. 9 E. (MDB&M)
Quadrangle: Bryson
Formation: Pancho Rico Age: Pliocene
Remarks: D. L. Durham loc. 694010 -- near M 4191

Mo-66 Road cut on Interlake Itoad. NE 1/4 NE 1/4 sec. 19, T. 24 S., R. 9 E. (MDB&M)
Quadrangle: Bryson
Formation: Monterey, Sandholdt Member Age: Early Miocene (Saucesian)
Remarks: Near Mf 902 and Mf 903 (U. Saucesian and Saucesian).

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Mo-67 San Antonio River. SW 1/4 NE 1/4 sec. 32, T. 24 S., R. 11 E. (MDB&M)
Quadrangle: Bradley
Formation: Monterey, Sandholdt Member  Age: Middle Miocene (Late Relizian or Luisian)
Remarks: Phosphatic shale in Sandholdt Member. Nacimiento No. 1 well.
References: 1. Durham, 1968, loc. no. 4
2. Dickert, 1971, p.270, no.111

Mo-68 E. side of Tomasini Canyon. 3,850 ft. N., 1,950 ft. E. of SW cor. sec. 29, T. 16 S., R. 2 E. (MDB&M)
Quadrangle: Seaside
Formation: Monterey  Age: Late Miocene (Early Mohnian)
Remarks: Phosphatic pelletal bed 20 cm thick and persistent for at least 20 m.
References: 1. Galliher, 1931, p.266
2. Rogers, 1944, p.411

Mo-69 N. side Arroyo Seco Road, 2,000' E. of bridge. *NE 1/4 SW 1/4 sec. 31, T. 19 S., R. 5 E. (MDB&M)
Quadrangle: Junipero Serra Peak
Formation: Monterey, Sandholdt Member  Age: Middle Miocene (Saucesian or Early Relizian)
Remarks: Phosphatic zone in Sandholdt Member.

Mo-70 SE 1/4 NE 1/4 sec. 14, T. 20 S., R. 6 E. (MDB&M)
Quadrangle: Reliz Canyon
Formation: Monterey, Sandholdt Member  Age: Middle Miocene (Late Luisian)
Remarks: Zone in upper part of Sandholdt Member containing beds of pelletal phosphate.
References: 1. Smith, 1968, p.1788

ORANGE COUNTY
Or-1 Riohfield oil field. Center SE 1/4 sec. 31, T. 3 S., R. 9 W. (SBB&M)
Quadrangle: Orange
Formation: Puente, lower member  Age: Late Miocene (Mohnian)
References: 1. Wissler, 1943
2. Dickert, 1971, p.284, no.224
Or-2 Huntington Beach oil field. NE 1/4 NW 1/4 sec. 10, T. 6 S., R. 11 W. (SBB&M)
Quadrangle: Seal Beach
Formation: Puente, lower member Age: Late Miocene (Mohnian)
References: 1. Wissler, 1943
2. Dickert, 1971, p.286, no. 233

Quadrangle: Newport Beach
Formation: Monterey Age: Late Miocene (Mohnian)
Remarks: Phosphatic nodules in the Monterey formation and large phosphatic nodules in marine conglomerate overlying the Monterey at Newport Bay.
References: 1. Emery and Dietz, 1950, p.12
2. Gower and Madsen, 1964, p.D83, no.66
3. Dickert, 1971, p.286, no.234

SAN BENITO COUNTY
SBt-1 Little Rabbit Valley, SW side of road. 200 ft. N. and 900 ft. E. of *SW cor. sec. 18, T. 17 S., R. 9 E. (MDB&M)
Quadrangle: Topo Valley
Formation: Monterey Age: Middle Miocene (Luisian)
Remarks: Disseminated phosphate in calcareous and siliceous shales of the Monterey.

SAN BERNARDINO COUNTY
SBd-1 NE cor. sec. 35, T. 25 S., R. 43 E. (MDB&M)
Quadrangle: Searles Lake
Formation: Searles Lake evaporites Age: Late Quaternary
References: 1. Bixler and Saywer, 1957
2. Smith and Haines, 1964
3. Smith, 1979

SBd-2 In San Juan Tunnel, 2,000 feet from the east portal. Secs. 21 and 22, T. 3 S., R. 8 W. (SBB&M)
Quadrangle: Prado Dam
Formation: Puente, Yorba Member Age: Late Miocene
Remarks: Rocks of the Yorba Member exposed 600 m from the east portal of the tunnel consist of 70% dark-gray siltstone in beds as much as 30 cm thick and 30% light-grey to white fine- to medium-grained, feldspathic sandstone in thin stringers and beds. The siltstone contains zones of brown phosphatic nodules.
2. Gower and Madsen, 1964, p.D83, no.65
SAN DIEGO COUNTY
SD-1 Mesa E. of Otay. Sec. 13, T. 18 S., R. 2 W. (SBB&M)
Quadrangle: Imperial Beach
Formation: San Diego  Age: Pliocene
Remarks: White phosphatic calcareous bed, probably in the San Diego Formation, with an analysis of less than 2% of phosphoric acid.
References: 1. Merrill, 1916, p.717

SD-2 SW 1/4 sec. 13, T. 14 S., R. 4 W. (SBB&M)
Quadrangle: Del Mar
Formation: Lindavista  Age: Late Pliocene or Early Pliocene
Remarks: Pea-to marble-sized, reddish-brown nodules are a constituent of the Lindavista terrace deposits. Nodules collected by Weber (1964) assayed 0.13% phosphoric anhydride. The nodules contain a substantial proportion of iron. Kennedy refers to these as pellets with an av. diam. of 0.5-1.0 cm. He found the pellets throughout the western San Diego coastal area.
References: 1. Emery, 1950, p.213-221
3. Kennedy, 1975, plate 1A

SAN FRANCISCO COUNTY
Quadrangle: San Francisco North
Formation: Franciscan  Age: Early Cretaceous
Remarks: Phosphatic nodules in highly sheared graywacke and black shale.
2. Dickert, 1971, p.256, no. 9
3. Schlocker, 1974, p.20, sample SF-101

SAN JOAQUIN COUNTY
SJ-1 McDonald Island gas field. *SW 1/4 SE 1/4 sec. 19, T. 2 N., R. 5 E. (MDB&M)
Quadrangle: Terminous
Formations: Martinez shale  Age: Paleocene
Capay shale  Eocene
Remarks: Phosphatic nodules in shales. McDonald Island Farms No. 2 well.
References: 1. Knox, 1943, p.590
2. Gower & Madsen, 1964, p.D81, no. 5
3. Dickert, 1971, p.255, no. 4
SAN LUIS OBISPO COUNTY

SL-1 Pebblestone Shut-in. SE 1/4 sec. 33, T. 25 S., R. 9 E. (MDB&M)
Quadrangle: Pebblestone Shut-in
Formation: Monterey, Sandholdt Member  
Age: Middle Miocene
Remarks: Phosphate nodules in organic soft shale. Stanford Univ. locality M-106

SL-2 Nacimiento Dam Road, E. side. NE 1/4 SW 1/4 sec. 3, T. 25 S., R. 10 E. (MDB&M)
Quadrangle: Tierra Redonda Mountain
Formation: Monterey, Sandholdt Member  
Age: Middle Miocene
Remarks: Calcareous phosphatic shale. (Early Luisian)
References: 1. Durham, 1968a  
2. Dickert, 1971, p.270, no.112

SL-3 Bee Rock Canyon. N. 1/2 sec. 6, T. 25 S., R. 10 E. (MDB&M)
Quadrangle: Tierra Redonda Mountain
Formation: Monterey, Sandholdt Member  
Age: Middle Miocene
Remarks: Friable mudstone with phosphatic laminae and sparse pellets. Mf 901 Late Relizian to Early Luisian (Mf 901 is in NE 1/4 NE 1/4 sec. 9)
2. Dickert, 1971, p.270, no.113

SL-4 Nacimiento Dam Road, W. side. SW 1/4 sec. 10, T. 25 S., R. 10 E. (MDB&M)
Quadrangle: Tierra Redonda Mountain
Formation: Monterey, Sandholdt Member  
Age: Middle Miocene
Remarks: Phosphatic shale. (Early Luisian)
References: 1. Durham, 1968a  
2. Dickert, 1971, p.270, no.114

Quadrangle: Orchard Park
Formation: Monterey  
Age: Middle Miocene (probably Luisian)
Remarks: Phosphatic pellets and pebbles dispersed at intervals over 30 m of a soft clayey mudstone near the base of the Monterey.

SL-6 Polonio Pass, E. side. NW 1/4 SW 1/4 sec. 24, T. 25 S., R. 16 E. (MDB&M)
Quadrangle: Orchard Peak
Formation: Monterey  
Age: Middle Miocene (probably Luisian)
Remarks: 12 cm nodular phosphate bed in shale.
2. Dickert, 1971, p.269, no. 109
SL-7 Lime Mountain, roadcut about 1/2 mile E., NW 1/4 sec. 15, T. 26 S., R. 9 E. (MDB&M)

Quadrangle: Lime Mountain
Formation: Monterey
Age: Middle Miocene (probably Luisian)
Remarks: Phosphatic laminae in organic shale.

SL-8 Adelaida, 1/2 mile N. on Paso Robles Road, NW 1/4 sec. 25, T. 26 S., R. 10 E. (MDB&M)

Quadrangle: Adelaida
Formation: Monterey, Sandholdt Member
Age: Middle Miocene (Relizian)
Remarks: Phosphatic mudstone.

SL-9 Peachy Canyon, SW 1/4 sec. 35, T. 26 S., R. 11 E. (MDB&M)

Quadrangle: York Mountain
Formation: Monterey, Sandholdt Member
Age: Middle Miocene (Early Luisian)
Remarks: Phosphatic laminae in calcareous organic shale.
Mf 897 and Mf 898 near this locality.

SL-10 Adelaida, 2 miles S. on Willow Creek Road, at boundary between sec. 36, T. 26 S. and sec. 1, T. 27 S., R. 10 E. (MDB&M)

Quadrangle: York Mountain
Formation: Monterey, Sandholdt Member
Age: Middle Miocene (Luisian)
Remarks: Phosphatic laminae in mudstone.
Reference: 1. Dickert, 1971, p. 271, no. 119

SL-11 Dover Canyon, SE 1/4 sec. 12, T. 27 S., R. 10 E. (MDB&M)

Quadrangle: York Mountain
Formation: Monterey, Sandholdt Member
Age: Middle Miocene (Relizian)
Remarks: Sparse pelletal phosphate in dolomitic limestone. Some of these pellets have cores of glauconite. Locality at or very near LSJU. Loc. 679 (Relizian).

SL-12 Willow Creek Road, E. side, at bend due E. of boundary between secs. 8 and 17, T. 27 S., R. 10 E. (MDB&M)

Quadrangle: York Mountain
Formation: Monterey, Sandholdt Member
Age: Middle Miocene (Early Relizian)
Remarks: Dark brown, waxy phosphatic mudstone.

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SL-13  Willow Creek Road, NE side. *NW 1/4 NE 1/4 sec. 21, T.27 S., R.11 E. (MDB&M)
Quadrangle:  York Mountain
Formation: Monterey, Sandholdt Member  Age: Early Miocene
(Saucesian)
Remarks:  A small (.6 m) exposure of soft pellet-bearing mudstone.
.8 mile to the NW, on NE side of road, a 3 m exposure of phosphatic shale in Sandholdt. Locality about 1/2
1/2 mile NW of Mf 1442 (Saucesian).

Quadrangle:  Paso Robles
Formation: Monterey, Hames Member  Age: Middle Miocene (Luisian)
Remarks:  Phosphatic mudstone and shale at intervals throughout a
60 m section.
2. Dickert, 1971, p.270, no.117

SL-15  Peachy Canyon Road, at boundary between sec. 36, T. 26 S., R. 11 E. and sec. 31, T. 26 S., R. 12 E. (MDB&M)
Quadrangle:  Paso Robles
Formation: Monterey, Hames Member  Age: Middle Miocene (Luisian)
Remarks:  Single layer, 7 cm thick, of abundant phosphatic pellets
in organic shale.
2. Dickert, 1971, p.271, no.121

SL-16  Cayucos Road (Highway 41), NW side, half way between bench marks
924 and 929. *NE 1/4 sec. 24, T. 27 S., R. 11 E. (MDB&M)
Quadrangle:  Templeton
Formation: Monterey, Sandholdt Member  Age: Early Miocene
(Saucesian)
Remarks:  Soft phosphatic shale near Mf 1446 (Saucesian)

SL-17  Atascadero, 1 mile NW of junction between highways 101 and
466, on W. side of highway 101. *Center NE 1/4 sec. 16, T. 28 S., R. 12 E. (MDB&M)
Quadrangle:  Atascadero
Formation: Monterey, Hames Member  Age: Middle Miocene (Luisian)
Remarks:  A few thin (5-7 cm) beds of near-black phosphatic pellets
in abundant concentration separated by large thicknesses
of Monterey porcelainite.
References:  1. Dickert, 1971, p.272, no. 126
2. Durham, 1974, p.95
3. Hart, 1976

SL-18  SE 1/4 NW 1/4 sec. 21, T. 28 S., R. 12 E. (MDB&M)
Quadrangle:  Atascadero
Formation: Monterey, Sandholdt Member  Age: Early Miocene (Saucesian)
Remarks:  Phosphorite in basal Sandholdt.
References:  1. Graham, 1976, loc. no. 23-7 through 11
2. Hart, 1976
SL-19 Simmler Road, S. side. NE 1/4 NE 1/4 sec. 16, T. 28 S., R. 14 E. (MDB&M)
Quadrangle: Wilson Corner
Formation: Monterey
Age: Middle Miocene (Late Luisian)
Remarks: 25 cm of pellets in abundant concentration in porcelaneous shale of the Monterey.

SL-20 NW 1/4 NW 1/4 sec. 15, T. 28 S., R. 14 E. (MDB&M)
Quadrangle: Wilson Corner
Formation: Monterey
Age: Middle Miocene (Late Luisian)
Remarks: H. D. Gower section R.

SL-21 NW 1/4 SW 1/4 sec. 14, T. 28 S., R. 14 E. (MDB&M)
Quadrangle: Wilson Corner
Formation: Monterey
Age: Middle Miocene (Late Luisian)
Remarks: H. D. Gower section S.

SL-22 Huerhuero Creek, 1 mile E. of E. Branch. NW 1/4 sec. 21, T. 28 S., R. 14 E. (MDB&M)
Quadrangle: Wilson Corner
Formation: Monterey
Age: Middle Miocene (Late Luisian)
Remarks: Float includes 10 cm blocks of phosphorite in blocks of porcelaneous Monterey.

SL-23 Simmler Road. 500 ft. S., due W. of benchmark 1622. NE 1/4
NE 1/4 sec. 23, T. 28 S., R. 14 E. (MDB&M)
Quadrangle: Wilson Corner
Formation: Monterey
Age: Middle Miocene (Late Luisian)
Remarks: Hard phosphorite layers to 30 cm in porcelaneous mudstone.

SL-24 Quailwater Creek, S. of Simmler Road. SE 1/4 NW 1/4 sec. 24, T. 28 S., R. 14 E. (MDB&M)
Quadrangle: Wilson Corner
Formation: Monterey
Age: Middle Miocene (Late Luisian)
Remarks: An excellent 30 m section of soft organic calcareous phosphatic shale of the Sandholdt Member overlain by 10 layers of pelletal phosphorite in porcelanite of the Hames Member. Sample no. 138-1 15 m below top of pelletal-bearing sequence and no. 138-2 15 m below no. 138-1. H. D. Gower section Q.
SL-25 NE 1/4 NW 1/4 sec. 19, T. 28 S., R. 15 E. (MDB&M)

Quadrangle: Wilson Corner
Formation: Monterey  Age: Middle Miocene
Remarks: Wilson Corner Trench C. (Late Luisian)
References: 1. Reed, 1927, p.195
2. Klienpell, 1938, p. 121-122
3. Bramlette, 1946, pl. 2
4. Graham, 1976, p. 96

SL-26 NE 1/4 NE 1/4 sec. 19, T. 28 S., R. 15 E. (MDB&M)

Quadrangle: Wilson Corner
Formation: Monterey  Age: Middle Miocene
Remarks: Wilson Corner Trench P. (Late Luisian)
References: 1. Reed, 1927, p. 195
2. Kleinpell, 1938, p. 121-122
3. Bramlette, 1946, pl. 2
4. Graham, 1976, p. 96

SL-27 Indian Creek, Roadcut on N. side of Simmler Road. SW 1/4 sec. 20, T. 28 S., R. 15 E. (MDB&M)

Quadrangle: Wilson Corner
Formation: Monterey  Age: Middle Miocene (Late Luisian)
Remarks: Five pelletal phosphorite layers 5-30 cm thick in porcelanite in the upper part of the Monterey For­mation. The pellet facies is well exposed in outcrops and in 10 trenches in the vicinity of Indian Creek N. of Simmler Road. Wilson Corner Trench E.
References: 1. Reed, 1927, p. 195
2. Kleinpell, 1938, p. 121-122
3. Bramlette, 1946, pl. 2
4. Gower and Madsen, 1964, p. D82, no. 32
5. Dickert, 1971, p. 273, no. 139

SL-28 NW 1/4 SE 1/4 sec. 20, T. 28 S., R. 15 E. (MDB&M)

Quadrangle: Wilson Corner
Formation: Monterey  Age: Middle Miocene (Late Luisian)
Remarks: Wilson Corner Trench F.
References: 1. Reed, 1927, p. 195
2. Kleinpell, 1938, p. 121-122
3. Bramlette, 1946, pl. 2
4. Graham, 1976, p. 96

SL-29 SW 1/4 SE 1/4 sec. 20, T. 28 S., R. 15 E. (MDB&M)

Quadrangle: Wilson Corner
Formation: Monterey  Age: Middle Miocene (Late Luisian)
Remarks: Wilson Corner Trench G.
References: 1. Reed, 1927, p. 195
2. Kleinpell, 1938, p. 121-122
3. Bramlette, 1946, pl. 2
4. Graham, 1976, p. 96
SL-30 NW 1/4 SW 1/4 sec. 20, T. 28 S., R. 15 E. (MDB&M)
Quadrangle: Wilson Corner
Formation: Monterey
Age: Middle Miocene (Late Luisian)
Remarks: Wilson Corner Trench H.
References: 1. Reed, 1927, p. 195
2. Kleinpell, 1938, p. 121-122
3. Bramlette, 1946, pl. 2
4. Graham, 1976, p. 96

SL-31 SE 1/4 SE 1/4 sec. 20, T. 28 S., R. 15 E. (MDB&M)
Quadrangle: Wilson Corner
Formation: Monterey
Age: Middle Miocene (Late Luisian)
Remarks: Wilson Corner Trench I.
References: 1. Reed, 1927, p. 195
2. Kleinpell, 1938, p. 121-122
3. Bramlette, 1946, pl. 2
4. Graham, 1976, p. 96

SL-32 SW 1/4 SE 1/4 sec. 20, T. 28 S., R. 15 E. (MDB&M)
Quadrangle: Wilson Corner
Formation: Monterey
Age: Middle Miocene (Late Luisian)
Remarks: Wilson Corner Trench M.
References: 1. Reed, 1927, p. 195
2. Kleinpell, 1938, p. 121-122
3. Bramlette, 1946, pl. 2
4. Smith, 1968, p. 1788
5. Graham, 1976, p. 96

SL-33 NW 1/4 SE 1/4 sec. 28, T. 28 S., R. 15 E. (MDB&M)
Quadrangle: Camatta Ranch
Formation: Monterey
Age: Middle Miocene (Late Luisian)
Remarks: Wilson Corner Trench K.
References: 1. Reed, 1927, p. 195
2. Kleinpell, 1938, p. 121-122
3. Bramlette, 1946, pl. 2
4. Graham, 1976, p. 96

SL-34 Simmler Road, 400 ft. S. in SW 1/4 sec. 27, T. 28 S., R. 15 E. (MDB&M)
Quadrangle: Camatta Ranch
Formation: Monterey
Age: Middle Miocene (Late Luisian)
Remarks: A few thin layers of pelletal phosphate in porcelaneous shales of the Monterey.
SL-35 Fernandez Creek, N. side. NE 1/4 sec. 35, T. 28 S., R. 15 E. (MDB&M)

Quadrangle: Camatta Ranch
Formation: Monterey
Age: Middle Miocene
(Late Luisian)
Remarks: A 25 m exposure of phosphatic shale overlain by pelletite layers to 25 cm thickness in porcelainite of the Monterey. H. D. Gower section SC in NW 1/4 SW 1/4 sec. 36, T. 28 S., R. 15 E.
References: 1. Dickert, 1971, p. 274, no. 141

SL-36 Simmler Road, N. side, 1 mile W. of Camatta Creek. NW 1/4 sec. 6, T. 29 S., R. 16 E. (MDB&M)

Quadrangle: Camatta Ranch
Formation: Monterey
Age: Middle Miocene
(Late Luisian)
Remarks: Thin pelletal phosphorite layer near contact between Monterey and Santa Margarita formations where contact crosses Simmler Road.

SL-37 Navajo Creek. 3,000 ft. E. of benchmark 1495. Sec. 35, T. 28 S., R. 16 E. (MDB&M)

Quadrangle: La Panza Ranch
Formation: Monterey
Age: Middle Miocene
(Luisian)
Remarks: Thin layers of hard pelletal mudstone in Monterey near contact with overlying Santa Margarita Formation.

SL-38 Navajo Creek, 1 mile W. on NW side of Simmler Road. 2,600 ft. N. and 1,400 ft. W. of SE cor. sec. 10, T. 29 S., R. 16 E. (MDB&M)

Quadrangle: La Panza Ranch
Formation: Santa Margarita
Age: Late Miocene (Mohnian)
Remarks: Phosphate pellets in shale member of Santa Margarita.
Reference: 1. Dickert, 1971, p. 274, no. 144


Quadrangle: La Panza Ranch
Formation: Santa Margarita
Age: Late Miocene (Mohnian)
Remarks: A good 18 m exposure of phosphate-bearing shale unit within Santa Margarita, which includes two pelletite layers and several pelletal mudstone and sandstone layers in shale and sandy siltstone.
References: 1. Gower and Madsen, 1964, p. D82, no. 31
2. Dickert, 1971, p. 274, no. 145

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SL-40  San Juan Creek, W. side. SW 1/4 sec. 27, T. 29 S., R. 17 E. (MDB&M)

Quadrangle: La Panza  
Formation: Monterey  
Age: Middle Miocene (Late Luisian)

Remarks: Near the contact between the Monterey and Santa Margarita formations where contact crosses the creek bed, a thin (8 cm) layer of phosphate pellets. A 3 m bed of calcareous pelletal sandstone, 2.5 m lower in the section, and, 4 m lower, 1.5 m of phosphatic shale.

Reference: 1. Dickert, 1971, p. 274, no. 146

SL-41  Old Canyon, S. slope. NW 1/4 sec. 1, T. 30 S., R. 17 E. (MDB&M)

Quadrangle: California Valley  
Formation: Monterey  
Age: Middle Miocene (Luisian)

Remarks: Pelletal mudstone in Monterey near contact with Santa Margarita Formation.

Reference: 1. Dickert, 1971, p. 274, no. 147

SL-42  Arroyo Grande Creek road, S. side. SW 1/4 sec. 27, T. 31 S., R. 14 E. (MDB&M)

Quadrangle: Tar Spring Ridge  
Formation: Monterey  
Age: Middle Miocene (Luisian)

Remarks: Phosphatic shale near top of Monterey near Luisian-Mohnian boundary.

References: 1. Hall and Surdam, 1967  
2. Dickert, 1971, p. 276, no. 156  
3. Hall, 1973

SL-43  Soda Lake, 2 miles W. NE 1/4 sec. 4, T. 31 S., R. 19 E. (MDB&M)

Quadrangle: Simmler  
Formation: Soda Lake  
Age: Early Miocene

Remarks: Phosphatic pellets in siliceous clayey shale near top of the Soda Lake Formation.

2. Dickert, 1971, p. 276, no. 155

SL-44  Cuyama River. N. side, Highway 166 at SW cor. sec. 18, T. 11 N., R. 32 W. (SBB&M)

Quadrangle: Huasna Peak  
Formation: Monterey  
Age: Middle Miocene, (probably Luisian)

Remarks: 30 m section of silty sandstone with sparse phosphate pellets overlain by a few thin glauconite-bearing pellet layers in silty shale and by thinly laminated phosphatic and cherty shale.


Quadrangle: Caliente Mountain
Formation: Monterey
Age: Middle Miocene (Luisian)
Remarks: Minor pelletal phosphate in siltstone.
2. Dickert, 1971, p. 276, no. 157


Quadrangle: Caliente Mountain
Formation: Monterey
Age: Middle Miocene (Luisian)
Remarks: A few thin layers of phosphatic pellets in sandy beds near top of Monterey.
Reference: 1. Dickert, 1971, p. 276, 158


Quadrangle: Caliente Mountain
Formation: Monterey
Age: Middle Miocene (Luisian)
Remarks: Thin layers of abundant phosphatic pellets in sandy siltstone near top of Monterey.
Reference: 1. Dickert, 1971, p. 276, no. 159


Quadrangle: Point Sal
Formation: Monterey
Age: Middle Miocene (Luisian)
Remarks: Phosphatic shale in platy Monterey at Luisian-Mohnian transition.
References: 1. Dickert, 1971, p.277, no. 163
2. Hall, 1973

SL-49  NW 1/4 NW 1/4 sec. 1, T. 29 S., R. 12 E. (MDB&M)

Quadrangle: Atascadero
Formation: Monterey, upper member
Age: Middle Miocene (Luisian)
Remarks: Phosphatic pelletal, bituminous, limy sandstone.
Reference: 1. E. W. Hart 1978, written commun.; loc. SLO 204

SL-50  NE 1/4 NW 1/4 sec. 30, T. 28 S., R. 13 E. (MDB&M)

Quadrangle: Santa Margarita
Formation: Monterey, lower member
Age: Middle Miocene (Relizian)
Remarks: Impure limestone, probably phosphatic.
SL-51 NW 1/4 NW 14 sec. 31, T. 28 S., R. 13 E. (MDB&M)

Quadrangle: Santa Margarita
Formation: Monterey, upper member Age: Late Miocene (Mohnian)
Remarks: Muddy pelletal (siliceous?) sandstone—contains approx. 10% pellets.
Reference: E. W. Hart, 1978, written commun.; loc. SLO 177

SL-52 *SE 1/4 SE 1/4 sec. 16, T. 29 S., R. 13 E. (MDB&M)

Quadrangle: Santa Margarita
Formation: Monterey, lower member Age: Middle Miocene (Early Relizian)
Remarks: Sandy, algal, phosphatic limestone contains 11.5% P2O5. Estimated to be stratigraphic equivalent to fossil loc. 115.
Reference: E. W. Hart, 1978, written commun.; loc. SLO 50

SL-53 *SE 1/4 SW 1/4 sec. 28, T. 29 S., R. 13 E. (MDB&M)

Quadrangle: Lopez Mountain
Formation: Monterey, upper member Age: Middle Miocene (Late Luisian)
Remarks: Phosphatic pelletal shale contains 4.9% P2O5.
Reference: E. W. Hart, 1978, written commun.; loc. SLO 93

SL-54 *SW 1/4 SW 1/4 sec. 34, T. 29 S., R. 13 E. (MDB&M)

Quadrangle: Lopez Mountain
Formation: Monterey, upper member Age: Middle Miocene (Late Luisian)
Remarks: Tuffaceous shale with scattered pellets containing 0.5% P2O5.
Reference: E. W. Hart, 1978, written commun.; loc. SLO 131

SL-55 NE 1/4 NE 1/4 sec. 3, T. 30 S., R. 13 E. (MDB&M)

Quadrangle: Lopez Mountain
Formation: Monterey, lower member Age: Middle Miocene (Early Relizian)
Remarks: Shelly, sandy, algal phosphatic limestone.

SL-56 *SW 1/4 NW 1/4 sec. 2, T. 30 S., R. 13 E. (MDB&M)

Quadrangle: Lopez Mountain
Formation: Monterey Age: Middle Miocene (Late Luisian)
Remarks: Foraminiferal mudstone or siltstone containing 1.5% P2O5. Fossil loc. SLO 116.

SL-57 NE 1/4 SW 1/4 sec. 6, T. 30 S., R. 13 E. (MDB&M)

Quadrangle: Lopez Mountain
Formation: Monterey Age: Middle Miocene (probably Luisian)
Remarks: Phosphatic shale containing 0.9% P2O5.
Reference: E. W. Hart, 1978, written commun.; loc. SLO 8
SL-58 SW 1/4 NE 1/4 sec. 7, T. 30 S., R. 13 E. (MDB&M)
Quadrangle: Lopez Mountain
Formation: Monterey, lower member  Age: Middle Miocene
Remarks: Shale with thin phosphatic layers and scattered pellets containing 2.4 - 2.9% P2O5.

SAN MATEO COUNTY
SM-1 Stanford Linear Accelerator. Borehole in sec. 16, T. 6 S., R. 3 W. (MDB&M)
Quadrangle: Palo Alto
Formation: Unnamed—similar position  Age: Middle Miocene to Sandholdt (Probably Luisian)
References: 1. Dibblee, 1966
2. Dickert, 1971, p. 257, no. 18

SM-2 La Honda Creek. SE 1/4 sec. 35, T. 6 S., R. 4 W. (MDB&M)
Quadrangle: La Honda
Formation: San Lorenzo  Age: Eocene (Narizian)
Remarks: Phosphatic laminae in mudstone and phosphatic pebbles in sandstone.
References: 1. Narasimhan, 1960
2. Dickert, 1971, p. 257, no. 19
3. Brabb, Cark, & Throckmorton, 1977, fig. 7a

SM-3 W.side of Page Mill Road. 2,500 ft. N. of SE cor. sec. 16, T. 7 S., R. 3 W. (MDB&M)
Quadrangle: Mindego Hill
Formation: Lambert Shale  Age: Early Miocene (Saucesian)
Remarks: Phosphatic laminae in mudstone.
References: 1. Dickert, 1971, p. 258, no. 22
2. Brabb, Clark, & Throckmorton, 1977, fig. 7a

SM-4 S. side of Alpine Road. SE 1/4 SW 1/4 sec. 29, T. 7 S., R. 3 W. (MDB&M)
Quadrangle: Mindigo Hill
Formation: Monterey  Age: Middle Miocene (Luisian)
Remarks: Phosphate nodules in silty shale.
References: 1. Dickert, 1971, p. 258, no. 23
2. Brabb, Clark, & Throckmorton, 1977, fig. 7a
Quadrangle:  Mindigeo Hill
Formation:  Monterey
Age:  Middle Miocene
(Luisian)
Remarks:  Phosphate nodules in silty shale. Similar exposure in Peters Creek, 2,200 ft. N. and 1,400 ft. E. of SW cor. of sec. 4, T. 8 S., R. 3 W. (MDB&M)
References:  1. Dickert, 1971, p.258, no. 24
           2. Brabb, Clark, and Throckmorton, 1977, fig. 7a

SM-6  Little Boulder Creek bed. SE 1/4 SE 1/4 sec. 21, T. 8 S., R. 3 W. (MDB&M)
Quadrangle:  Big Basin
Formation:  Butano Sandstone
Age:  Eocene (Narizian)
Remarks:  12 m of laminated strongly phosphatic shale within upper part of formation.
           2. Dickert, 1971, p. 258, no. 28
           3. Brabb, Clark, & Throckmorton, 1977, p. 18

SM-7  Little Boulder Creek. SW 1/4 sec. 22, T. 8 S., R. 3 W. (MDB&M)
Quadrangle:  Big Basin
Formation:  San Lorenzo, Rices Mudstone Member
Age:  Oligocene (Zemorrian)
Remarks:  Glauconite and phosphatic pebble bed, 1 m thick. This is the basal glauconite of the Zemorrian Stage.
References:  1. Brabb, 1960, p. 160; loc. 205 G; 1964, p. 675 and fig. 2
           2. Brabb, Clark & Throckmorton, 1977, p. 19

SM-8  SE side of Ano Nuevo Point. In intertidal outcrop 1,500 ft. SE of the point, T. 9 S., R. 4 W. (MDB&M)
Quadrangle:  Ano Nuevo
Formation:  Unnamed
Age:  Early Miocene (Saucesian)
Remarks:  Arkosic sandstone and sandy limestone overlain by phosphatic mudstone.
           2. Dickert, 1971, p.259, no.36
           3. Brabb, Clark, & Throckmorton, 1977, p.84 (places this unit in Vaqueros (?) Formation)

SANTA BARBARA COUNTY
Quadrangle:  Huasna Peak
Formation:  Monterey
Age:  Middle Miocene (Luisian)
Remarks:  Phosphatic shale in Monterey.
Reference:  1. Dickert, 1971, p.276, no. 161
SB-2  S. side, Cuyama River, 1,500' N. and 6,300' W. of BM 791.
  *NE 1/4 SE 1/4 sec. 16, T. 11 N., R. 32 W. (SBB&M)
Quadrangle: Chimney Canyon
Formation: Monterey  Age: Middle Miocene (Luisian)
Remarks: Phosphatic shale in Monterey.

SB-3  Tepusquet Road, N. side. NW 1/4 NW 1/4 sec. 1, T. 10 N.
  R. 32 W. (SBB&M)
Quadrangle: Tepusquet Canyon
Formation: Monterey  Age: Middle Miocene (Luisian)
Remarks: Phosphatic shale in Monterey.

SB-4  Tepusquet Road, W. side. SE 1/4 sec. 2, T. 10 N., R. 32 W.
  (SBB&M)
Quadrangle: Tepusquet Canyon
Formation: Monterey  Age: Middle Miocene (Luisian)
Remarks: Phosphatic nodules in Monterey.

SB-5  Mussel Rock, S. of promontory. Sec.27, T. 10 N., R. 36 W.
  (SBB&M)
Quadrangle: Point Sal
Formation: Monterey, lower member  Age: Middle Miocene (Luisian)
Remarks: Phosphatic nodules and laminae in siliceous and calcareous shales in uppermost part of lower member of Monterey. Sample no. MR-d had 3.2% P2O5.
References: 1. Woodring and Bramlette, 1950, p. 18-21
  2. Gower and Madsen, 1964, p. D82, no. 41
  3. Dickert, 1971, p. 277, no. 166
  4. Hall, 1973

SB-6  Santa Maria Valley oil field. Wells in secs. 27 and 28,
  T. 10 N., R. 34 W. (SBB&M)
Quadrangle: Santa Maria
Formation: Monterey  Age: Middle Miocene (Luisian)
Remarks: Hard, platy, dark-brown shale with thin laminations of buff-colored phosphatic shale and occasional thin phosphatic shale and occasional thin phosphatic layers at Luisian-Mohnian boundary.
References: 1. Wissler and Dreyer, 1943, p.236
  2. Dickert, 1971, p.277, no. 167
SB-7 NW 1/4 NW 1/4 sec. 35, T. 10 N., R. 27 W. (SBB&M)
Quadrangle: New Guyana
Formation: Santa Margarita, upper Age: Late Miocene
Remarks: Cuyama Trench No. 297.
2. Vedder and Repenning, 1975

SB-8 South Cuyama oil field about 100' W. of loc. M 3895 of MI-876.
NE 1/4 SE 1/4 sec. 35, T. 10 N., R. 27 W. (SBB&M)
Formation: Santa Margarita, upper Age: Late Miocene
Remarks: Pelletal phosphate in siliceous mudstone.
Reference: 1. Vedder and Reppening, 1975; loc. 7k-33

Quadrangle: New Guyana
Formation: Santa Margarita, upper Age: Late Miocene
Remarks: 30 m section of pelletal mudstone in Santa Margarita.
References: 1. Hill, Carlson, and Dibblee, 1958, p. 2996
2. Dickert, 1971, p. 277, no. 168
3. Vedder and Repenning, 1975

SB-10 SE 1/4 NW 1/4 sec. 1, T. 9 N., R. 27 W. (SBB&M)
Quadrangle: New Guyana
Formation: Santa Margarita, upper Age: Late Miocene
Remarks: Guyana Trench no. 298.
2. Vedder and Reppening, 1975

SB-11 *NW 1/4 NW 1/4 sec. 12, T. 9 N., R. 27 W. (SBB&M)
Quadrangle: New Guyana
Formation: Santa Margarita, lower Age: Late Miocene
Remarks: Thin phosphorite and pelletal mudstone beds in siliceous shale in lower part of Santa Margarita. Cuyama Trench no. CC.
2. Dickert, 1971, p.277, no. 169
3. Vedder and Repenning, 1975

SB-12 SW 1/4 NW 1/4 sec. 7, T. 9 N., R. 26 W. (SBB&M)
Quadrangle: New Guyana
Formation: Santa Margarita, upper Age: Late Miocene
Remarks: Guyana Trench no. 299.
2. Vedder and Repenning, 1975
SB-13 NE 1/4 SW 1/4 sec. 7, T. 9 N., R. 26 W. (SBB&M)
Quadrangle: New Cuyama
Formation: Santa Margarita, upper
Age: Late Miocene
Remarks: Cuyama Trench no. 100.
References: 1. J. C. Osmond, 1975; written commun.
2. Vedder and Repenning, 1975
3. Roberts, 1979

SB-14 NE 1/4 SW 1/4 sec. 7, T. 9 N., R. 26 W. (SBB&M)
Quadrangle: New Cuyama
Formation: Santa Margarita, upper
Age: Late Miocene
Remarks: Cuyama Trench no. 200.
2. Vedder and Repenning, 1975

SB-15 SW 1/4 SE 1/4 sec. 7, T. 9 N., R. 26 W. (SBB&M)
Quadrangle: Salisbury Potrero
Formation: Santa Margarita, upper
Age: Late Miocene
Remarks: Cuyama Trench no. 300.
2. Vedder and Repenning, 1975

SB-16 SE 1/4 SE 1/4 sec. 7, T. 9 N., R. 26 W. (SBB&M)
Quadrangle: Salisbury Potrero
Formation: Santa Margarita, upper
Age: Late Miocene
Remarks: Cuyama Trench no. 400.
2. Vedder and Repenning, 1975

SB-17 Center SE 1/4 sec. 6, T. 9 N., R. 26 W. (SBB&M)
Quadrangle: New Cuyama
Formation: Santa Margarita, upper
Age: Late Miocene
Remarks: Phosphate pellet beds in siltstone and siliceous shale; phosphate zone is more than 25 m thick.
Cuyama Trench no. 294.
References: 1. Hill and others, 1958, p. 2996
2. Gower and Madsen, p. D82, no. 40
3. Dickert, 1971, p. 277, no. 170
4. Vedder and Repenning, 1975

SB-18 SW 1/4 NW 1/4 sec. 8, T. 9 N., R. 26 W. (SBB&M)
Quadrangle: New Cuyama
Formation: Santa Margarita, upper
Age: Late Miocene
Remarks: Cuyama Trench no. 295.
2. Vedder and Repenning, 1975

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SB-19 NE 1/4 SE 1/4 sec. 7 and NW 1/4 SW 1/4 sec. 8, T. 9 N., R. 26 W. (SBB&M)

Quadrangle: New Cuyama And Salisbury Potreto
Formation: Santa Margarita, upper  Age: Late Miocene phosphatic mudstone member (Mohnian)
Remarks: Cuyama Trench no. 700.
2. Vedder and Repenning, 1975

SB-20 NW 1/4 SE 1/4 sec. 8, T. 9 N., R. 26 W. (SBB&M)

Quadrangle: Salisbury Potrero and New Cuyama
Formation: Santa Margarita, upper  Age: Late Miocene phosphatic mudstone member (Mohnian)
Remarks: Cuyama Trench no. 301.
2. Vedder and Repenning, 1975

SB-21 SE 1/4 SW 1/4 sec. 8, T. 9 N., R. 26 W. (SBB&M)

Quadrangle: Salisbury Potrero
Formation: Santa Margarita, upper  Age: Late Miocene phosphatic mudstone member (Mohnian)
Remarks: Cuyama Trench no. 296.
2. Vedder and Repenning, 1975

SB-22 NW 1/4 NE 1/4 sec. 17, T. 9 N., R. 26 W. (SBB&M)

Quadrangle: Salisbury Potrero
Formation: Santa Margarita, upper  Age: Late Miocene phosphatic mudstone member (Mohnian)
Remarks: Cuyama Trench no. 500.
2. Vedder and Repenning, 1975

SB-23 NE 1/4 NE 1/4 sec. 15, T. 9 N., R. 26 W. (SBB&M)

Quadrangle: Salisbury Potrero
Formation: Santa Margarita, lower  Age: Late Miocene phosphatic mudstone member (Mohnian)
Remarks: Phosphatic pellets in mudstone and siliceous shale.

SB-24 Sea cliffs 1 mile SE of Lions Head at W. Boundary T. 9 N., R. 35 W. (SBB&M)

Quadrangle: Casmalia
Formation: Monterey, lower member  Age: Middle Miocene (Luisian)
Remarks: Laminated nodular phosphatic shale, siliceous and calcareous, near top of lower member of the Monterey. Sample LH-22 had 14% P2O5.
References: 1. Woodring and Bramlette, 1950, p. 18-20
2. Gower and Madsen, 1964, p. D82, no. 42
3. Dickert, 1971, p.278, no. 173
SB-25  Casmalia Hills.  NW 1/4 sec. 9, T. 9 N., R. 35 W. (SBB&M)
Quadrangle:  Guadalupe
Formation:  Monterey, upper member  Age:  Late Miocene (Mohnian)
Remarks:  Nodular phosphatic siltstone at bottom of upper third of the Monterey.  10 cm of phosphate pellets and pebbles appear at the same stratigraphic level in a section 1 3/4 miles NW of Casmalia (Map No. SB-26).
References:  1.  Woodring and Bramlette, 1950, p.23
            2.  Dickert, 1971, p.278, no. 174

SB-26  4,200' W., 7,800'S. of NE cor. sec. 15, T. 9 N., R. 35 W. (SBB&M)
Quadrangle:  Casmalia
Formation:  Monterey  Age:  Late Miocene (Mohnian)
Remarks:  Massive or poorly bedded siltstone containing phosphatic nodules and pellets at base of upper member of Monterey.
Reference:  1.  Woodring and Bramlette, 1950, p.23

SB-27  Casmalia oil field.  Well in NW 1/4 SE 1/4 sec. 17, T. 9 N., R. 34 W. (SBB&M)
Quadrangle:  Orcutt
Formation:  Monterey  Age:  Middle Miocene (Luisian)
Remarks:  Thin phosphatic layers in shale at Luisian-Mohnian boundary.
References:  1.  Wissler and Dreyer, 1943, p. 237
            2.  Dickert, 1971, p.278, no. 175

SB-28  Orcutt oil field, well in *center N 1/2 sec. 31, T. 9 N., R. 33 W. (SBB&M)
Quadrangle:  Orcutt
Formation:  Monterey  Age:  Middle Miocene (Luisian)
Remarks:  Thin phosphatic layers in shale at Luisian-Mohnian boundary.
References:  1.  Wissler and Dreyer, 1943, p. 237
            2.  Dickert, 1971, p. 278, no. 176

SB-29  East Cat Canyon oil field.  Well in SW 1/4 SE 1/4 sec.30, T. 9 N., R. 32 W.(SBB&M)
Quadrangle:  Sisquoc
Formation:  Monterey  Age:  Middle Miocene (Luisian)
Remarks:  Phosphatic shale in hard and brittle siliceous shale in the upper part of the lower third of the Monterey.  Phosphatized chert fragments are reported at the base of the Sisquoc Formation.
Reference:  1.  Dickert, 1971, p.278, no. 177
Quadrangle: Foxen Canyon
Formation: Sisquoc  Age: Late Miocene
Remarks: Phosphatic pellets, nodules, and phosphatized organic debris in the basal Sisquoc.
References: 1. Woodring and Bramlette, 1950, p. 29
2. Gower and Madsen, 1964, p. D82, no. 43
3. Dickert, 1971, p. 278, no. 178

Quadrangle: Los Alamos
Formation: Foxen Mudstone  Age: Late Pliocene
Remarks: Phosphatic pellets dispersed in mudstone.
References: 1. Woodring and Bramlette, 1950
2. Dickert, 1971, p. 279, no. 179

Quadrangle: Los Alamos
Formation: Foxen Mudstone  Age: Late Pliocene
Remarks: Several layers of phosphorite and pelletal sandy siltstone.
References: 1. Woodring and Bramlette, 1950
2. Dickert, 1971, p. 279, no. 181

SB-33 Canada de Santa Rosa, E. side. 6,200 ft. S. and 600 ft. E. of BM 529. *SW 1/4 NE 1/4 sec. 36, T. 8 N., R. 33 W. (SBB&M)
Quadrangle: Los Alamos
Formation: Foxen Mudstone  Age: Late Pliocene
Remarks: Phosphatic pellets dispersed in mudstone.
References: 1. Woodring and Bramlette, 1950
2. Dickert, 1971, p. 279, no. 180

SB-34 Santa Rosa Road. 6,500 ft. N. and 7,900 ft. E. of SW. cor. sec. 14, T. 6 N., R. 34 W. (SBB&M)
Quadrangle: Lompoc Hills
Formation: Sisquoc  Age: Late Miocene
Remarks: Thin layer of phosphatic pebbles at base of Siquoc.
References: 1. Dibblee, 1950
2. Dickert, 1971, p. 279, no. 182

SB-35 West of Santa Rosa Creek and north of Santa Ynez River. *SE 1/4 NE 1/4 sec. 12, T. 6 N., R. 33 W. (SBB&M)
Quadrangle: Santa Rosa Hills
Formation: Sisquoc  Age: Late Miocene
Remarks: Thin layer of phosphate pellets and pebbles at base of Sisquoc.
References: 1. Dibblee, 1950
2. Gower and Madsen, 1964, p. D83, no. 44
3. Dickert, 1971, p. 279, no. 183
SB-36  Santa Rosa Hils.  SW 1/4 SW 1/4 sec. 19, T. 6 N.,
       R. 32 W.  (SBB&M)
Quadrangle:  Santa Rosa Hills
Formation:  Rincon  Age:  Early Miocene
Remarks:  Phosphatic pellets dispersed in claystone.
Reference:  1.  Dickert, 1971, p. 279, no. 184

SB-37  Head of Alamo Creek.  *NE 1/4 NW 1/4 sec. 3, T. 5 N.,
       R. 33 W.  (SBB&M)
Quadrangle:  Santa Rosa Hills
Formation:  Monterey  Age:  Middle Miocene
Remarks:  Coarse phosphatic conglomerate at the contact between
       the Rincon and Monterey formations.
Reference:  1.  Dickert, 1971, p. 279, no. 184

SB-38  Llanito Creek, W. slope.  *SW 1/4 SW 1/4 sec. 32,
       T. 6 N., R. 32 W.  (SBB&M)
Quadrangle:  Santa Rosa Hills
Formation:  Monterey  Age:  Middle Miocene
Remarks:  Abundant pellets in basal sandstone of Monterey.
Reference:  1.  Dickert, 1971, p. 280, no. 186

SB-39  Little Pine Mountain.  1,500 ft. NE of guard station, T. 6 N.,
       R. 27 W.  (SBB&M)
Quadrangle:  Little Pine Mountain
Formation:  Monterey  Age:  Middle Miocene
Remarks:  Phosphatic shale in lower part of Monterey.

SB-40  SE San Rafael Mountains near BM 5620 in T. 6 N., R. 25 W.  (SBB&M)
Quadrangle:  Old Man Mountain
Formation:  Monterey  Age:  Middle Miocene
Remarks:  Phosphatic pellets in shale about a meter below Mf 1563.
       J. G. Vedder's field no. V-414d.
Reference:  1.  Vedder, Dibblee, and Brown, 1973

SB-41  Cojo Creek, W. slope.  1,800 ft. N., 1,200 ft. E. of Las Animas
       Spring.  T. 5 N., R. 34 W.  (SBB&M)
Quadrangle:  Point Conception
Formation:  Rincon  Age:  Early Miocene
Remarks:  Phosphatic pellets dispersed in mudstone.
            2.  Dickert, 1971, p. 280, no. 191

SB-42  Wood Canyon, W. side.  4,000 ft. due E. of Las Animas Spring.
       T. 5 N., R. 34 W.  (SBB&M)
Quadrangle:  Point Conception
Formation:  Rincon  Age:  Early Miocene
Remarks:  Hard bituminous pelletal mudstone and pellets dispersed
       in softer mudstone of the Rincon.
Reference:  1.  Dickert, 1971, p. 280, no. 192

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Quadrangle: Point Conception
Formation: Rincon  Age: Early Miocene
Remarks: Pelletal tuffaceous mudstone near top of Rincon.

SB-44  Canada de Santa Anita, E. side. 1,200 ft. NNE from intersection of creek road with Pt. Conception road. T. 5 N., R. 33 W. (SBB&M)
Quadrangle: Sacate
Formation: Monterey  Age: Middle Miocene
Remarks: Calcareous phosphatic shale in Monterey.
Reference: 1. Dickert, 1971, p. 281, no. 194

SB-45  Canada de Alegria. 500 ft. N. of creek crossing with Pt. Conception Road. T. 5 N., R. 32 W. (SBB&M)
Quadrangle: Sacate
Formation: Monterey  Age: Middle Miocene
Remarks: Large (25 x 15 cm) nodules of calcareous phosphatic material in Monterey.

Quadrangle: Gaviota
Formation: Monterey  Age: Middle Miocene (Luisian)
Remarks: Calcareous and phosphatic seams (4 cm) in lower Monterey.
References: 1. Bramlette, 1946, pl. 2
2. Gower and Madsen, 1964, p. D83, no. 46
3. Dickert, 1971, p. 281, no. 196

SB-47  Ridgetop E. of Canada del Refugio. 5,100 ft. N., 2,400 ft. E. of SW cor. of T. 5 N., R. 30 W. (SBB&M)
Quadrangle: Tajiguas
Formation: Monterey  Age: Middle Miocene
Remarks: Hard dense mudstone with pink phosphatic nodules at contact between Monterey and Rincon.
Reference: 1. Dickert, 1971, p. 281, no. 197

SB-48  Capitan oil field. Wells 1/2 mile N. of Capitan, SW 1/4 T. 5 N., R. 30 W. (SBB&M)
Quadrangle: Tajiguas
Formation: Rincon  Age: Early Miocene
Remarks: Phosphatic pellets in top 100 m of the Rincon.
References: 1. Kribbs, 1943, p. 375
3. Dickert, 1971, p. 281, no. 198
SB-49 Sea cliffs E. of Capitan Point. T. 4 N., R. 30 W. (SBB&M)
Quadrangle: Tajiguas
Formation: Monterey
Age: Middle Miocene
Remarks: Thick continuous section of laminated nodular bituminous phosphatic shale in near vertical beds of the Monterey.

SB-50 Lake Cachuma. In Tecolote Tunnel, 6,000' S. of inlet portal.
Surface outcrop NE 1/4 sec. 4, T. 5 N., R. 29 W. (SBB&M)
Quadrangle: Lake Cachuma
Formation: Vaqueros
Age: Early Miocene
Remarks: Abundant phosphatic pellets in upper part of formation.
2. Gower and Madsen, 1964, p. D83, no. 50

SB-51 Sea cliffs E. of the mouth of Dos Pueblos Creek and W. of Naples. T. 4 N., R. 29 W. (SBB&M)
Quadrangle: Dos Pueblos Canyon
Formation: Monterey
Age: Middle Miocene
Remarks: 150 m continuous section of bituminous phosphatic shale of the Monterey.
References: 1. Bramlette, 1946, pl. 2
2. Gower and Madsen, 1964, p. D83, no. 48
3. Dickert, 1971, p. 281, no. 200

SB-52 Elwood oil field. Wells in secs. 15 and 16, T. 4 N., R. 29 W. (SBB&M)
Quadrangle: Dos Pueblos Canyon
Formation: Rincon
Age: Early Miocene
Remarks: Phosphatic pellets in lower part of upper third of Rincon.
References: 1. Hill, 1943, p. 381
2. Gower and Madsen, 1964, p. D83, no. 49
3. Dickert, 1971, p. 281, no. 201

SB-53 West side of Rincon Point, T. 3 N., R. 25 W. (SBB&M)
Quadrangle: White Ledge Peak
Formation: Monterey
Age: Middle Miocene
Remarks: Phosphatic shale in upper part of lower member and in middle member of Monterey.
References: 1. Lian, 1954, map sheet 25

SB-54 *NE 1/4 sec. 22, T. 10 N., R. 36 W. (SBB&M)
Quadrangle: Point Sal
Formation: Monterey
Age: Middle Miocene (Luisian)
Remarks: Phosphatic shale with sample 1-3473 (7) containing 5.3% P2O5. Los Nietos Co. LeRoy A3 well.
SB-55  SW 1/4 SE 1/4 sec. 24, T. 10 N., R. 34 W.  (SBB&M)
Quadrangle: Santa Maria
Formation: Monterey  Age: Middle Miocene
Remarks: Phosphatic shale with sample 8-2757(2) containing 2.3% P₂O₅. Union Oil Co. of Calif. SMVU Adam 2 well.
Reference: 1. Pisciotto, 1978, loc. 8-2757(2)

SB-56  NW 1/4 SW 1/4 sec. 11, T. 9 N., R. 34 W.  (SBB&M)
Quadrangle: Orcutt
Formation: Monterey  Age: Middle Miocene

SB-57  SE 1/4 NW 1/4 sec. 23, T. 9 N., R. 34 W., (SBB&M)
Quadrangle: Orcutt
Formation: Monterey  Age: Middle Miocene
Remarks: Phosphatic shale with sample 31-3950 containing 0.37% P₂O₅. Union Oil Co. of Calif., Radium 1 well.
Reference: 1. Pisciotto, 1978, loc. 31-3950

SB-58  *SW 1/4 SW 1/4 sec. 29, T. 9 N., R. 33 W.  (SBB&M)
Quadrangle: Orcutt
Formation: Monterey  Age: Middle Miocene
Remarks: Phosphatic shale with sample 27-4345 containing 3.7% P₂O₅. Union Oil Co. of Calif. Newlove 79 well.

SB-59  *Center SE edge sec. 35, T. 9 N., R. 33 W.  (SBB&M)
Quadrangle: Sisquoc
Formation: Monterey  Age: Late Miocene
Remarks: Phosphatic shale with sample 23-3950 containing 2.0% P₂O₅. Union Oil of Calif. Bell 156 well.

SB-60  Intertidal exposures, 2,000' SE of Lions Head *sec. 18, T. 9 N., R. 35 W.  (SBB&M)
Quadrangle: Casmalia
Formation: Monterey, lower member  Age: Middle Miocene
Remarks: Hard phosphatic shale in lower member of Monterey.
References: 1. Woodring and Bramlette, 1950, p.15
Quadrangle:  Lompoc Hills
Formation:  Sisquoc
Age:  Late Miocene
Remarks:  Phosphate pellets and pebbles at base of Sisquoc.
References:  1. Barron, 1976, p. 121

SB-62  Center Sw 1/4 sec. 9, T. 9 N., R. 26 W. (SBB&M)
Quadrangle:  Salisbury Potrero
Formation:  Santa Margarita, lower
Age:  Late Miocene
Remarks:  Thin beds of pelletal phosphatic mudstone and siltstone.
Reference:  1. Fritsche, 1969

SB-63  3,000'S. and 50' W. of SW cor. sec. 12, T. 9 N., R. 26 W. (SBB&M)
Quadrangle:  Fox Mountain
Formation:  Santa Margarita, lower
Age:  Late Miocene
Remarks:  Thin beds of pelletal phosphatic mudstone and siltstone.

SB-64  2,450'S. and 60' W. of SE cor. sec. 12, T. 9 N., R. 26 W. (SBB&M)
Quadrangle:  Fox Mountain
Formation:  Santa Margarita, lower
Age:  Late Miocene
Remarks:  Thin phosphorite bed in siltstone.

SANTA CLARA COUNTY
SC-1  Calera Creek.  *SE 1/4 SW 1/4 sec. 29, T. 5 S., R. 1 E. (MDB&M)
Quadrangle:  Milpitas
Formation:  Claremont Shale
Age:  Middle Miocene
Remarks:  Phosphatic nodules in chert exposed in quarry.
Reference:  1. Hill, 1979, pl.2, section no. 3.

Quadrangle:  Calaveras Reservoir
Formation:  Claremont Shale
Age:  Middle Miocene (Early Luisian or older?)
Remarks:  Pellets in thin turbidite sand within Claremont Shale. Phosphate nodules in exposures of siliceous shale and chert, N. side, Penitencia Creek.
References:  1. Dickert, 1971, p. 257, no. 17
            2. Hill, 1979, pl. 2, section no. 1
SC-3 E. side, Skyline Drive (Route 35). 500 ft. N. of SE cor. sec. 26, T. 7 S., R. 3 W. (MDB&M)
Quadrangle: Mindego Hill
Formation: San Lorenzo Age: Middle (?) Miocene
Remarks: Phosphatic laminae in mudstone.
Reference: 1. Dickert, 1971, p. 258, no. 25

SC-4 Magdalena Avenue, N. 400 ft. NE of Ravensbury Ave. *NW 1/4 SW 1/4 sec. 5, T. 7 S., R. 2 W.
Quadrangle: Cupertino
Formation: Monterey Age: Middle (?) Miocene
Remarks: Sparse phosphate nodules in shale.
Reference: 1. Dickert, 1971, p. 257, no. 20

SC-5 Mora Heights Way. E. side of hill. SE 1/4 NE 1/4 sec. 8, T. 7 S., R. 2 W. (MDB&M)
Quadrangle: Cupertino
Formation: Monterey Age: Middle (?) Miocene
Remarks: Slightly phosphatic shale.
Reference: 1. Dickert, 1971, p. 257, no. 21

SC-6 W. Side of Shannon Road, Los Gatos. 2,100 ft. S., 900 ft. E. of NW cor. sec. 24, T. 8 S., R. 1 W. (MDB&M)
Quadrangle: Los Gatos
Formation: Monterey Age: Middle (?) Miocene
Remarks: Phosphatic laminae and abundant nodules in chalky shales.
Reference: 1. Dickert, 1971, p. 258, no. 29

SC-7 S. slope of Pine Ridge. SE 1/4 NW 1/4 sec. 5, T. 9 S., R. 4 E. (MDB&M)
Quadrangle: Mt. Sizer
Formation: Monterey Age: Middle (?) Miocene
Remarks: Sparse phosphate nodules in shale.

SC-8 *SE 1/4 NW 1/4 sec. 4, T. 11 S., R. 3 E. (MDB&M)
Quadrangle: Mt. Madonna
Formation: Unnamed (Temblor equivalent) Age: Early Miocene, (Zemorrian/Saucesian)
Remarks: Sample near base of basal sandstone of formation. Sandstone bioturbated and locally contains about 8% colophane (phosphatic mudstone) clasts along with about 16% glauconite (from thin section). Unnamed formation overlies Franciscan rocks and serpentine and is overlain depositionally by the Monterey Shale equivalent.
Reference: 1. McLaughlin, 1971; 1973; loc. no. SF-384-70

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SC-9  NW 1/4 SE 1/4 sec. 6, T. 11 S., R. 3 E. (MDB&M)
Quadrangle: Mt. Madonna
Formation: Unnamed  Age: Early-Middle Eocene
Remarks: Phosphatic concretions in dark gray to green shale and argillite. Unit grades upward into Eocene sandstone (Butano equivalent?). Lower part of unit faulted against Franciscan rocks along the Sargent Fault zone.
Reference: 1. McLaughlin, 1971; 1973; loc. no. SF-6-69

SC-10 NW 1/4 SW 1/4 sec. 25, T. 10 S., R. 2 E. (MDB&M)
Quadrangle: Mt. Madonna
Formation: Great Valley Sequence  Age: Lower Cretaceous
Remarks: Dark brown phosphatic concretions within black mudstone and argillite with sporadic carbonate concretions. Sequence lies entirely within Sargent Fault zone in fault contact with Franciscan rocks and serpentinite. Upper part in thrust contact with overlying lower Tertiary/upper Cretaceous rocks.
Reference: 1. McLaughlin, 1971; 1973; loc. no. SF-16-69

SANTA CRUZ COUNTY

SCr-1 SW side of Highway 9, several exposures in SW 1/4 sec. 12, T. 8 S., R. 3 W. (MDB&M)
Quadrangle: Big Basin
Formation: Monterey  Age: Middle Miocene (Luisian)
Remarks: Phosphatic nodules in shale.
Reference: 1. Dickert, 1971, p. 258, no. 27

SCr-2 Sempervirens Creek. 1,700 ft. S., 700 ft. W. of NE cor. sec. 32, T. 8 S., R. 3 W. (MDB&M)
Quadrangle: Big Basin
Formation: San Lorenzo, Towebar Shale  Age: Early Eocene (Narizian)
Remarks: Phosphatic lenses in shale.
2. Dickert, 1971, p. 259, no. 30

SCr-3 W. bank of San Lorenzo River. 1/4 mile N. of San Lorenzo Park. 1,500 ft. E., 500 ft. S. of NW cor. sec. 36, T. 8 S., R. 3 W. (MDB&M)
Quadrangle: Big Basin
Formation: San Lorenzo, Rices Mudstone  Age: Oligocene (Zemorrian)
Remarks: Glauconite and phosphate pellet bed in lower part of Rices Mudstone Member of the San Lorenzo.
References: 1. Brabb, 1960, p. 173, loc. no. 395B
2. Dickert, 1971, p. 259, no. 31

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SCR-4 Saratoga Gap. S. side of Highway 9. 1,000 ft. S. and 1,100 ft. E. of NW cor. sec. 7, T. 8 S., R. 2 W. (MDB&M)

Quadrangle: Mindego Hill
Formation: Lambert Shale  
Age: Early Miocene (Saucesian)

Remarks: Organic mudstone with phosphatic laminae and lenses in lower part of formation.

References: 1. Dickert, 1971, p. 258, no. 26
2. Brabb, Clark, & Throckmorton, 1977, p. 13

SCR-5 Kings Creek. SE 1/4 sec. 31, T. 8 S., R. 2 W. (MDB&M)

Quadrangle: Castle Rock Ridge
Formation: San Lorenzo, Rices  
Mudstone Member (Zemorrian)

Remarks: Glauconite and phosphate pellet bed in lower part of Rices Mudstone Member of the San Lorenzo.

2. Cummings, and others, 1962, p. 186-187
3. Gower and Madsen, 1964, p. D81, no. 8
4. Dickert, 1971, p. 259, no. 32

SCR-6 West bank of the San Lorenzo River. SE 1/4 sec. 1, T. 9 S., R. 3 W. (MDB&M)

Quadrangle: Big Basin
Formation: San Lorenzo, Rices  
Mudstone Member (Zemorrian)

Remarks: Glauconite and phosphatic pebble bed at base of Zemorrian Stage.

References: 1. Brabb, 1960, p. 183, loc. no. 498
2. Brabb, Clark, Throckmorton, 1977, p. 29

SCR-7 NW side of highway, about 4' NE of a concrete drainage trap. SW 1/4 sec. 9, T. 9 S., R. 3 W. (MDB&M)

Quadrangle: Big Basin
Formation: San Lorenzo, Rices  
Mudstone Member (Zemorrian)

Remarks: Probably glauconite and phosphatic pebble bed at base of Zemorrian Stage.


SCR-8 W. bank of San Lorenzo River, S. of road into Camp Campbell. SE 1/4 sec. 12, T. 9 S., R. 3 W. (MDB&M)

Quadrangle: Big Basin
Formation: San Lorenzo, Rices  
Mudstone Member (Zemorrian)

Remarks: Phosphate pellets and pebbles in glauconitic sandy mudstone in lower part of Rices Mudstone Member.

References: 1. Brabb, 1960, p. 172 and 163; loc. no. 383
2. Dickert, 1971, p. 259, no. 33

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SCR-9 Bear Creek. SW 1/4 sec. 3, T. 9 S., R. 2 W. (MDB&M)
Quadangle: Castle Rock Ridge
Formation: San Lorenzo, Rices Age: Oligocene
Mudstone Member (Zemorrian)
Remarks: Glaucinite and phosphate pellet bed in lower part
of Rices Mudstone Member.
References: 1. Brabb, 1960, p. 180; loc. no. 468
2. Dickert, 1971, p. 259, no. 34
3. Brabb, Clark, & Throckmorton, 1977 p. 56

SCR-10 Boulder Creek, E. side of roadcut 250 ft. N. of Spring Creek.
SW 1/4 sec. 29, T. 9 S., R. 2 W. (MDB&M)
Quadangle: Pelton
Formation: Monterey Age: Middle Miocene (Luisian)
Remarks: Phosphatic nodules in silty shale.

SCR-11 Newell Creek. SE 1/4 sec. 27, T. 9 S., R. 2 W. (MDB&M)
Quadangle: Felton
Formation: San Lorenzo, Twobar Shale Age: Eocene (Narizian)
Member
Remarks: Phosphatic laminae in shale of San Lorenzo.
References: 1. Brabb, 1960, p. 184; loc. no. 507
2. Dickert, 1971, p. 260, no. 41

SCR-12 Lompico Creek. 1,900 ft. E. and 150 ft. N. of SW cor. sec. 35,
T. 9 S., R. 2 W. (MDB&M)
Quadangle: Felton
Formation: Monterey Age: Middle Miocene (Luisian)
Remarks: Phosphatic nodules in shale.

SCR-13 Zayante Creek. NE 1/4 NE 1/4 sec. 19, T. 9 S., R. 1 W. (MDB&M)
Quadangle: Castle Rock Ridge
Formation: San Lorenzo, Rices Age: Oligocene
Mudstone Member (Zemorrian)
Remarks: Glaucninitic sandstone with phosphate pellets at base of
Zemorrian Stage.
Reference: 1. Brabb, Clark, & Throckmorton, 1977, p. 65

SCR-14 E. bank of Zayante Creek. 300 ft. S. and 1,800 ft. E. of NW cor.
sec. 30, T. 9 S., R. 1 W. (MDB&M)
Quadangle: Castle Rock Ridge
Formation: Lambert Shale Age: Early Miocene (Saucesian)
Remarks: Phosphatic laminae in mudstones of the Lambert.
References: 1. Dickert, 1971, p. 260, no. 38
2. Brabb, Clark, & Throckmorton, 1977, p. 61-62
SCr-15 Mountain Charlie Gulch. Sec. 29, T. 9 S., R 1 W. (MDB&M)
Quadrangle: Laurel
Formation: Lambert Shale          Age: Early Miocene (Saucesian)
Remarks: Graded, pale yellowish-brown, phosphatic laminae and lenses in shale.
References: 1. Clark, 1966, fig. 6, loc. no. J.C. 61-6
           2. Dickert, 1971, p. 260, no. 39
           3. Brabb, Clark, Throckmorton, 1977, p. 78

SCr-16 Burns Creek, 700 ft. E. of Laurel Road and 800 ft. N. of Laurel,
* SW 1/4 NW 1/4 sec. 27, T. 9 S., R. 1 W. (MDB&M)
Quadrangle: Laurel
Formation: San Lorenzo, Rices Mudstone Age: Eocene or Oligocene Member (Refugian or base of Zemorrian)
Remarks: Glauconite and phosphate pellet and pebble beds at base of Rices Mudstone.

SCr-17 Mountain Charlie Gulch Road. SE 1/4 sec. 32, T. 9 S., R. 1 W. (MDB&M)
Quadrangle: Laurel
Formation: Purisima          Age: Pliocene
Remarks: Glauconite and phosphate pellets in Purisima.
Reference: 1. Dickert, 1971, p. 260, no. 43

Quadrangle: Felton
Formation: Purisima          Age: Pliocene
Remarks: Glauconite beds with phosphate pellets and pebbles between tuffaceous siltstone and siliceous mudstone of the Purisima.

Quadrangle: Laurel
Formation: Purisima          Age: Pliocene
Remarks: Glauconite and phosphate pellets and pebbles within the formation.
References: 1. Dickert, 1971, p. 261, no. 45

SCr-20 W. side Rincon St., SE 1/4 NW 1/4 sec. 13, T. 11 S., R. 2 W., (MDB&M)
Quadrangle: Santa Cruz
Formation: Purisima          Age: Early Pliocene
Remarks: Contact between Santa Cruz Mudstone and Purisima Formation —glauconitic and slightly phosphatic pebbly sandstone.
SCr-21 6,000 ft. NW of Atherton Peak adjacent to the Santa Cruz-Santa Clara Co. boundary. T. 11 S., R. 3 E. (MDB&M)

Quadrangle: Watsonville East
Formation: Monterey Age: Early Miocene (Late Zemorrian to Saucesian)
Remarks: Phosphatic laminae in organic shale.
Reference: 1. E.E. Brabb, 1976, oral commun.; loc. no. 75 CB 1395

SCr-22 SE slope of Mt. Pajaro, N. side of Pescadero Creek Road, 600 ft. N. of Soda Lake, T. 12 S., R. 3 E. (MDB&M)

Quadrangle: Chittenden
Formation: Monterey Age: Early Miocene (Late Zemorrian-Saucesian)
Remarks: Occasional phosphatic laminae in siliceous shale.
Reference: 1. Dickert, 1971, p.261, no. 46

SIERRA COUNTY
Si-1 SE side of Upper Salmon Lake. SW 1/4 NE 1/4 sec. 29, T. 21 N., R. 12 E. (MDB&M)

Quadrangle: Sierra City
Formation: Elwell Age: Late Devonian
Remarks: The Elwell Formation (new name) is characterized by gray to black radiolarian chert with streaks, lenses and nodules of exceedingly fine grained phosphate rock, probably apatite.

SOLANO COUNTY
So-1 Potrero Hills gas field. SE 1/4 NW 1/4 sec. 9, T. 4 N., R. 1 W. (MDB&M)

Quadrangle: Denverton
Formation: Capay Shale Age: Eocene
Remarks: Limonitic phosphatic interbeds in shale.
References: 1. Tolman, 1943, p. 596
2. Gower and Madsen, 1964, p. D81, no. 4

STANISLAUS COUNTY
St-1 Del Puerto Canyon, 1,000 ft. due N. of the fire control station. SE 1/4 SW 1/4 sec. 20, T. 5 S., R. 7 E. (MDB&M)

Quadrangle: Patterson
Formation: Moreno Age: Late Cretaceous
Remarks: Phosphatic concretions in organic mudstones.

St-2 Black Gulch, 1,200 ft. N. of the creek bed. NE 1/4 SE 1/4 sec. 32, T. 5 S., R. 7 E. (MDB&M)

Quadrangle: Patterson
Formation: Moreno Age: Late Cretaceous
Remarks: Phosphatic concretions in mudstone.
Reference: 1. Dickert, 1971, p. 257, no. 15
ST-3 Salado Creek. N. side of Oak Flat Dad. NE 1/4 SE 1/4 sec. 9, T. 6 S., R. 7 E. (MDB&M)

Quadrangle: Patterson
Formation: Moreno
Remarks: Phosphatic concretions in jomite.
Reference: 1. Dickert, 1971, p. 257, no. 16

TRINITY COUNTY

T-1 About 1 mile N. of Hyampom. S. 1/2 ac. 13, T. 3 N., R. 6 E. (HB&M)
Quadrangle: Hyampom
Formation: Weaverville
Remarks: Phosphate in nonmarine sedimentsary rocks.
2. Lydon, 1964

VENTURA COUNTY

V-1 Upper Mono Creek. Near bench mark 4 55. NE 1/4 SE 1/4 sec. 31, T. 7 N., R. 24 W. (SBB&M)
Quadrangle: Rancho Neuvo Creek
Formation: Monterey

V-2 SE 1/4 NE 1/4 sec. 1, T. 6 N., R. 24 W. (SBB&M)
Quadrangle: Reyes Peak
Formation: Santa Margarita
Remarks: Abundant phosphate pellets in phosphatic mudstone member. U.S. Gypsum Co., Trench M.
2. Vedder, Dibblee, and Ewing, 1973

V-3 SW 1/4 NW 1/4 sec. 6, T. 6 N., R. 25 W. (SBB&M)
Quadrangle: Reyes Peak
Formation: Santa Margarita
Remarks: Stratigraphic section no. of D. R. Lowe.
2. Vedder, Dibblee, and Ewing, 1973

V-4 NW 1/4 SW 1/4 sec. 6, T. 6 N., R. 25 W. (SBB&M)
Quadrangle: Reyes Peak
Formation: Santa Margarita
Remarks: U.S. Gypsum Co., Trench G
References: 1. Dickinson and Lowe, 1966
2. Dickert, 1971, p. 280, no. 188
3. Vedder, Dibblee, and Ewing, 1973
V-5 SE 1/4 SW 1/4 sec. 6, T. 6 N., R. 23 W. (SBB&M)
Quadrangle: Reyes Peak
Formation: Santa Margarita  Age: Late Miocene (Mohnian)
Remarks: Abundant phosphate pellet beds in phosphatic mudstone member. U. S. Gypsum Co., Trench B.
2. Player, 1966
3. Vedder, Dibblee, and Brown, 1973

V-6 NW 1/4 NW 1/4 sec. 1/4, T. 6 N., R. 23 W. (SBB&M)
Quadrangle: Reyes Peak
Formation: Santa Margarita  Age: Late Miocene (Mohnian)
Remarks: Abundant phosphate pellet beds in phosphatic mudstone member. Stratigraphic section no. 3 of D. R. Lowe.
2. Vedder, Dibblee, and Brown, 1973
3. Thor, 1977, no. 3

V-7 NE 1/4 NW 1/4 sec. 8, T. 6 N., R. 23 W. (SBB&M)
Quadrangle: Reyes Peak
Formation: Santa Margarita  Age: Late Miocene (Mohnian)
Remarks: Abundant phosphate pellet beds in phosphatic mudstone member. Stratigraphic section no. 3 of D. R. Thor.
References: 1. Dickert, 1971, p. 280, no. 189
2. Vedder, Dibblee, and Brown, 1973
3. Thor, 1977, no. 3

V-8 SW 1/4 NW 1/4 sec. 8, T. 6 N., R. 23 W. (SBB&M)
Quadrangle: Reyes Peak
Formation: Santa Margarita  Age: Late Miocene (Mohnian)
References: 1. Vedder, Dibblee, and Brown, 1973
2. Thor, 1977, no. 2

V-9 NE 1/4 SW 1/4 sec. 8, T 6 N., R. 23 W. (SBB&M)
Quadrangle: Wheeler Springs
Formation: Santa Margarita  Age: Late Miocene (Mohnian)
Remarks: Abundant phosphate pellet beds in phosphatic mudstone member. U. S. Gypsum Co., Trench C.
References: 1. Player, 1966
2. Runvik, 1973, p. 169
3. Vedder, Dibblee, and Brown, 1973
4. Thor, 1977, no. 10
V-10 SE 1/4 SE 1/4 sec. 8, T. 6 N., R. 23 W. (SBB&M)
Quadrangle: Wheeler Springs
Formation: Santa Margarita  Age: Late Miocene (Mohnian)
Reference: 1. Dickert, 1971, p. 280, no. 190

V-11 SE 1/4 SW 1/4 sec. 9 and NE 1/4 NW 1/4 sec. 16, T. 6 N., R. 23 W. (SBB&M)
Quadrangle: Wheeler Springs
Formation: Santa Margarita  Age: Late Miocene (Mohnian)
Remarks: Abundant phosphate pellet beds in phosphatic mudstone member. U. S. Gypsum Co., Trench TP.
Reference: 1. Thor, 1977, no. 4

V-12 NE 1/4 NW 1/4 sec. 15, T. 6 N., R. 23 W. (SBB&M)
Quadrangle: Wheeler Springs
Formation: Santa Margarita  Age: Late Miocene (Mohnian)
Remarks: Abundant phosphate pellet beds in phosphatic mudstone member. U. S. Gypsum Co., Trench E.

Quadrangle: Wheeler Springs
Formation: Santa Margarita  Age: Late Miocene (Mohnian)
Remarks: Abundant phosphate pellet beds in phosphatic mudstone member. Stratigraphic section no. 2 of D. R. Lowe.

V-14 Piru Creek Road, W. side. NW 1/4 sec. 27, T. 5 N., R. 18 W. (SBB&M)
Quadrangle: Piru
Formation: Modelo  Age: Late Miocene
Remarks: Phosphatic pellets dispersed in sandstone unit within Modelo.
Reference: Dickert, 1971, p. 282, no. 206

V-15 Los Sauces Creek at S. boundary, SE 1/4 SE 1/4 sec. 32, T. 4 N., R. 24 W. (SBB&M)
Quadrangle: White Ledge Peak
Formation: Rincon  Age: Early Miocene
Remarks: Phosphatic oolites in upper part of middle member of Rincon.
References: 1. Cushman and Laiming, 1931
2. Dickert, 1971, p. 282, no. 203

V-16 Santa Paula Creek crossing at highway 150. SW 1/4 sec. 16, T. 4 N., R. 21 W. (SBB&M)
Quadrangle: Santa Paula Peak
Formation: Monterey  Age: Late Miocene
Remarks: Phosphatic shale in Monterey.
Reference: 1. Dickert, 1971, p. 282, no. 204
V-17 1/2 mile S. of Oat Mountain, on E. side, Rocky Mt. Drilling Co. road. 
SW 1/4 SW 1/4 sec. 8, T. 4 N., R. 19 W. (SBB&M)

Quadrangle: Fillmore
Formation: Monterey Age: Late Miocene
Remarks: Phosphatic shale in Monterey.

V-18 Lake Piru, W. side of canyon road. 1,500 ft. N. and 4,500 ft. E. of
SW cor. sec. 4, T. 4 N., R. 18 W. (SBB&M)

Quadrangle: Piru
Formation: Modelo Age: Late Miocene
Remarks: Thick section of pelletal sandstones within Modelo.

V-19 Lake Piru, W. side of canyon road. 10,000 ft. due E. of SW cor. sec. 8,
T. 4 N., R. 18 W. (SBB&M)

Quadrangle: Piru
Formation: Modelo Age: Late Miocene
Remarks: Pellets dispersed in sandstone unit within Modelo.

V-20 T. 3 N., R. 21 W. (SBB&M)

Quadrangle: Santa Paula
Formation: Pico Age: Late Pliocene
Remarks: Small deposits of white phosphates occur along the top of
South Mountain, four miles south of Santa Paula. Samples
of the material contained 5% calcium phosphate.
References: 1. Tucker and Samson, 1932, p. 270
2. Gower and Madsen, 1964, p. D83, no. 52

V-21 Grimes Canyon, E. side. 800' S. and 1,000' E. of BM 744.
NE 1/4 NW 1/4 sec. 18, T. 3 N., R. 19 W. (SBB&M)

Quadrangle: Moorpark
Formation: Monterey Age: Late Miocene
Remarks: Thick (135 m) section of laminated phosphatic and non-
phosphatic rock metamorphosed by surface burning.
References: 1. Bramlette, 1946, pl.2 and p.7
2. Brown, 1959
5. Bentor and Kastner, 1976

V-22 SW 1/4 NE 1/4 sec. 14, T. 6 N., R. 23 W. (SBB&M)

Quadrangle: Wheeler Springs
Formation: Santa Margarita Age: Late Miocene
Remarks: Abundant phosphatic pellet beds in phosphatic mudstone
member. Stratigraphic section no. 4 of D. R. Lowe.

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V-23 NE side of Grimes Canyon Road, 800 ft. SE of BM 744. NE 1/4 NW 1/4
sec. 18, T. 3 N., R. 19 W. (SBB&M)
Quadrangle: Moorpark
Formation: Monterey Age: Late Miocene
(Mbhnian)
Remarks: Burned phosphatic shale.

YOLO COUNTY
Y-1 Cache Creek, SW bank. NW 1/4 NW 1/4 sec. 5, T. 12 N., R. 4 W. (MDB&M)
Quadrangle: Morgan Valley
Formation: Boxer Age: Late Cretaceous
(Cenomanian)
Remarks: Pelletal phosphate in lenses and concretions in uppermost part of Boxer (formerly the Brophy Canyon Formation).
References: 1. Dickert, 1971, p. 255, no.1
2. Lawton, 1956