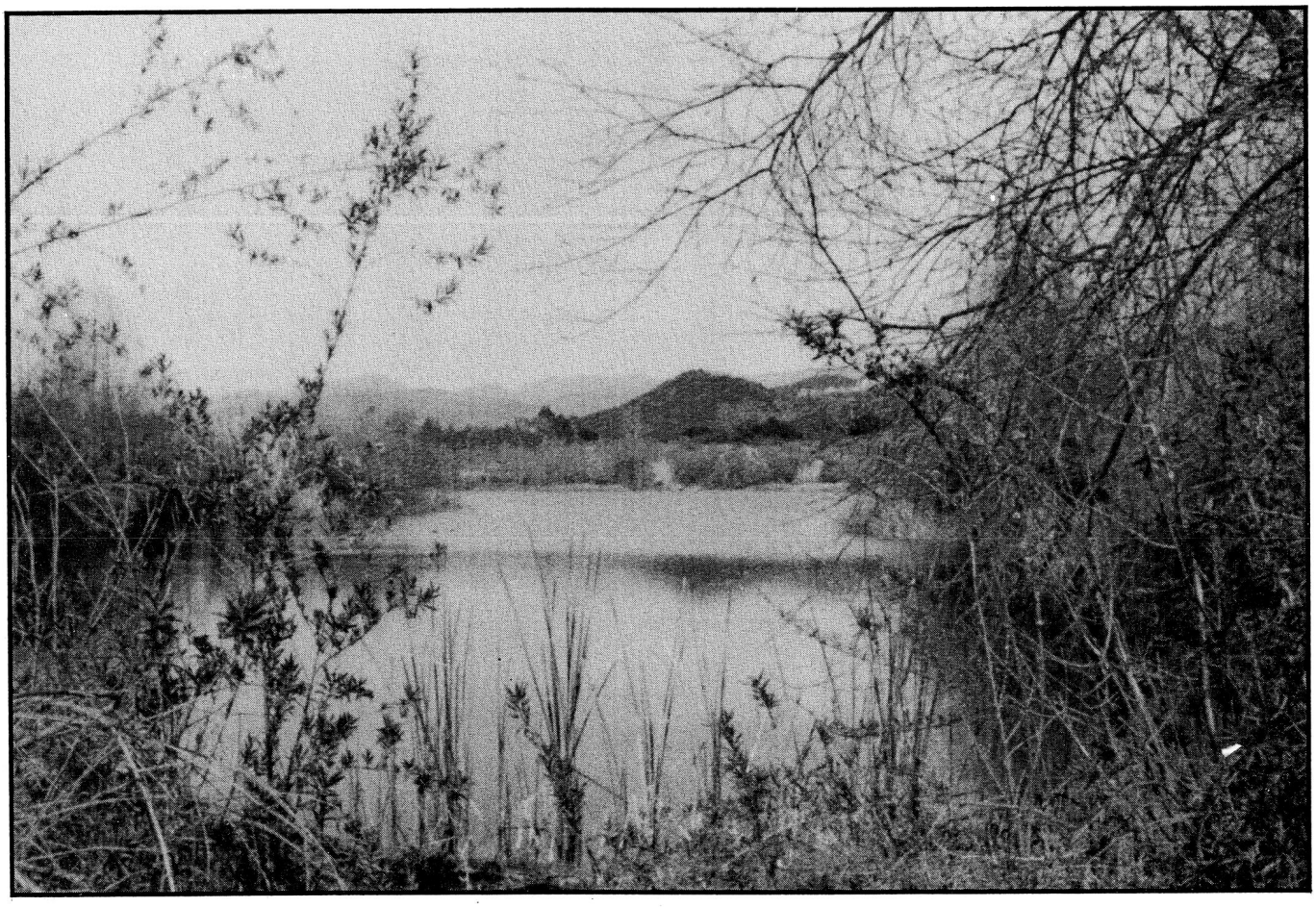
State of California
Department of Conservation

ANNUAL REPORT

of the

MINING AND GEOLOGY BOARD

1989-90



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THE RESOURCES AGENCY

PETE WILSON, Governor
STATE OF CALIFORNIA

EDWARD G. HEIDIG, Director
DEPARTMENT OF CONSERVATION

State of California

MINING AND GEOLOGY BOARD

ANNUAL REPORT

1989-1990

BOARD MEMBERS:

James A. Anderson - Chairman

Bob Grunwald

Dewayne Holmdahl

I. M. (Ed) Idriss

Anna C. Johs

J. H. (Jack) Lucas

R. Gary Miller

Jack Streblow

SPECIAL REPRESENTATIVE

Deborah L. Herrmann

1416 Ninth Street, Room 1326-A
Sacramento, California 95814

COVER PHOTO:
View of San Juan Creek from CalMat Company's San Juan Creek sand and Gravel operation in Southern California.

ACKNOWLEDGEMENTS

Special thanks to Margaret Walker of the Division of Mines and Geology's Public Information and Publications Unit for the map depicting progress of the classification-designation program; and to Fred Carillo, Bureau of Mines, Reno, Nevada for the pie chart compilation on the 1989 nonfuel mineral production in California.

ABSTRACT

The State Mining and Geology Board has broad policy responsibilities for earth science, mineral resource conservation, mining, and reclamation pursuant to the Surface Mining and Reclamation Act (SMARA); this responsibility also includes earth science and geologic hazards. The Board also establishes policy that guides the implementation of the Alquist-Priolo Special Studies Zones Act, which addresses the hazards of ground rupture from active faulting, and for the Landslide Hazards Identification Act, which provides for a state-local cooperative mapping program to identify landslide-prone areas in the path of urbanization. During the 1989-90 fiscal year, the Board took a number of actions fulfilling these responsibilities.

A task force, co-sponsored by the Department of Conservation and the Board, continued to work on developing a state-federal memorandum of understanding for more effective coordination of mining and reclamation activities on federal lands. The Memorandum of Understanding (MOU) was completed and signed between the State of California and the Bureau of Land Management (BLM) in February 1990.

Three mineral land classification reports were accepted and transmitted by the Board to local decision-makers. Three petitions for mineral land classification were accepted by the Board and forwarded to the Division of Mines and Geology for study.

The Board adopted, and the Office of Administrative Law approved, proposed regulations for designation of mineral lands of regional significance in the Palm Springs Production-Consumption Region pursuant to Public Resources Code, Section 2790.

Following a public review period, the Board adopted and the Office of Administrative Law approved regulations to establish procedures for processing reclamation plan appeals filed with the Board.

The Board also toured several reclamation sites in California this past year to gain knowledge on reclamation practices throughout the State.

A new Ad Hoc Committee on Deterministic/Probabilistic Seismic Hazards Evaluation has been established to provide technical review of earthquake information on active faults in California.

The Board has acted to develop guidelines for the Landslide Hazard Identification Act through various workshops conducted by the Geohazards Committee of the Board.

CHAIRMAN'S COMMENTS

James A. Anderson

This past year has been an extremely busy and challenging one for the Board. A major focus has been on mined-land reclamation. The Board's Reclamation Committee has been working to develop a Reclamation Plan Procedures Guide to provide assistance to local officials and industry in preparing reclamation plans for mining operations throughout California. It is anticipated that the Guide will be completed in coordination with development of the reclamation standards required by new legislation.

An additional challenge has been the 43 reclamation plan appeals received by the Board, pursuant to the "AB 747" (Chapter 975 Statutes of 1987) amendments to SMARA. Many of these require an environmental assessment pursuant to the California Environmental Quality Act (CEQA).

An agreement was signed between the State and the Bureau of Land Management that recognizes SMARA's applicability to federally managed lands and establishes a process for coordinating regulatory activities.

In an effort to improve mineral conservation and the reclamation of mined lands in California, the Board and the Department of Conservation worked closely with members of the mining industry, environmental groups, and local government in shaping legislation amending the State's Surface Mining and Reclamation Act. Important provisions of the enacted legislation (AB 3551 and AB 3903, Sher, Chapters 1097 and 1101, respectively, Statutes of 1990) include, among other things, the development of minimum verifiable reclamation standards, financial assurances for the reclamation of mined lands, an annual mine reporting and fee requirement, and local government response to land uses incompatible with mining in areas identified by the State as

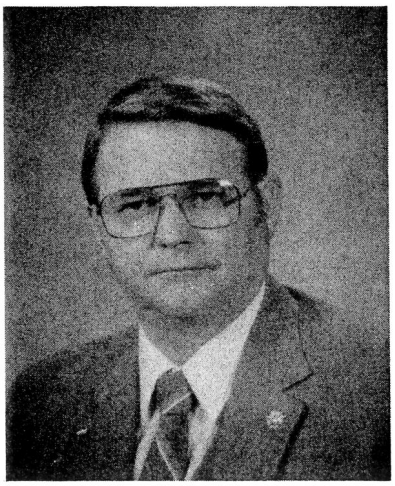
containing mineral resources important to the economy. The Board has been actively involved in overseeing the Division of Mines and Geology's activities relating to earthquake preparedness and seismic hazards research. The Board's visit in January, 1990 to the Santa Cruz area to survey the damage from the October 17, 1989 Loma Prieta earthquake offered an opportunity to gather first-hand information on the effectiveness of the Division's Geologic Hazards Assessment Program and its ability to react quickly following an emergency situation.

Other geohazards efforts included formation of two Ad-Hoc Committees of the Geohazards Committee to aid in development of new policy for the Hazards Program including: (1) Probabilistic versus Deterministic Committee, which is evaluating the Division's approach to assessments of the earthquake shaking hazard statewide; and (2) Landslide Hazards Identification Project Committee, which is evaluating the methods and strategy used by the Division in both the San Francisco and Los Angeles urban areas.

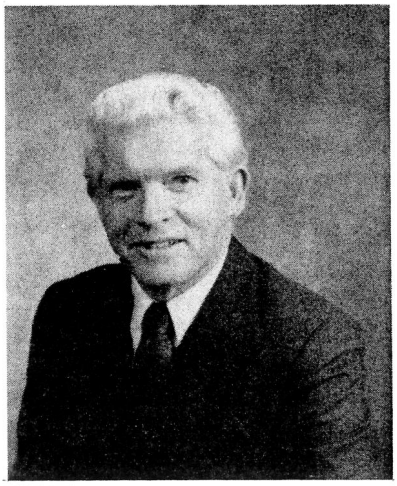
The encroachment of urbanization upon lands with significant mineral potential has been a Board concern for several years, particularly in the large metropolitan areas and the Sierra Nevada Foothill regions where population has increased dramatically. The Division of Mines and Geology (DMG), at the direction of the Board, has restructured the classification mapping program and reprioritized ongoing and new projects in order to shift emphasis to areas in Riverside, San Bernardino, and Nevada Counties that need immediate attention.

The upcoming year promises to be both challenging and rewarding. The Board's agenda includes completing the work on reclamation standards and its accompanying Reclamation Procedures Guide, gathering and providing information on geologic hazards issues, completing the reclamation plan appeals, as well as continued geologic mapping and mineral resource classification.

STATE MINING AND GEOLOGY BOARD MEMBERS



DeWayne Holmdahl



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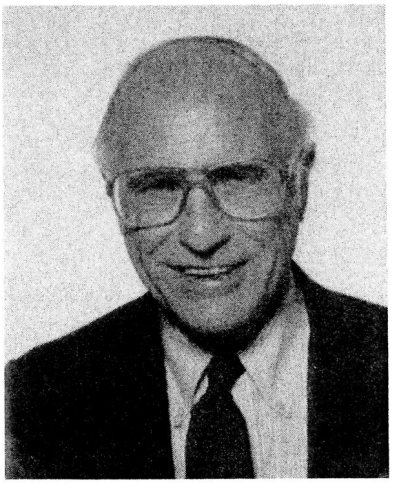
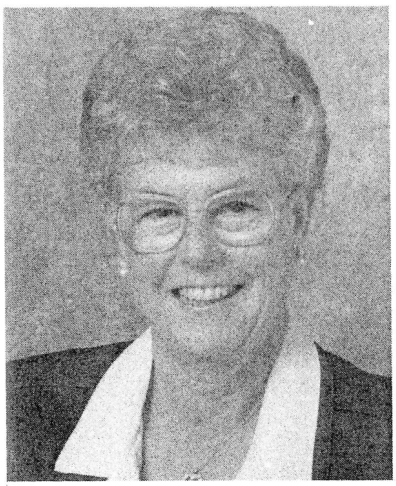


Jack Streblow



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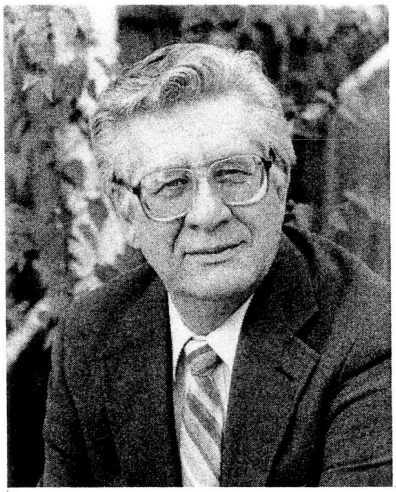
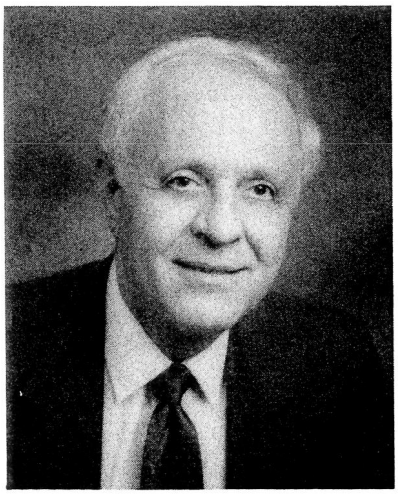


Bob Grunwald



I.M. (Ed) Idriss

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Part I.

INTRODUCTION

STATE MINING AND GEOLOGY BOARD, ORGANIZATION AND RESPONSIBILITIES

The State Mining and Geology Board is composed of nine members appointed by the Governor for four-year terms. By statute, the Board is comprised of individuals with specified professional backgrounds in geology, mining engineering, environmental protection, chemical engineering, urban planning, landscape architecture, mineral resource conservation, seismology, and one public member.

The Board has broad policy responsibilities under the Surface Mining and Reclamation Act of 1975 for establishing and maintaining State policy for the conservation and development of mineral resources throughout the state.

The Board represents the State's interest in having information necessary to the understanding and utilization of the State's terrain, and seismological and geological information pertaining to earthquake and other geological hazards. General policy for the State's geologic survey, the Department of Conservation's Division of Mines and Geology (DMG), is established by the Board. These responsibilities recognize the impacts that California's complex geology, large amounts of federally managed lands, high mineralization, and potential for geologic hazards have on the State's natural resources, economy, land use, and public safety.

The Board has policy responsibilities under the Alquist-Priolo Special Studies Zones Act. Hazardous fault zones are delineated by the State Geologist, and this information is provided to local government to assure that structures for human occupancy are not built across such faults. In addition, the Board establishes guidelines and priorities that enable DMG to carry out provisions of the Landslide Hazard Identification Program (AB 101, Moore, Statutes of 1983).

To enable the Board to meet its responsibilities, five permanent committees have been established. These include the Policy Committee, the Reclamation Committee, the Classification-Designation Committee, the Geohazards Committee, and the Legislation, Government and Public Relations Committee. The Board is assisted by three full-time staff.

Part II.

MAJOR BOARD ACTIONS RELATING TO SURFACE MINING AND RECLAMATION ACTIVITIES STATEWIDE

A. MINED LANDS RECLAMATION

California's Surface Mining and Reclamation Act (SMARA) is the State's solution to resolve two seemingly contradictory demands--the need for a continuing supply of mineral resources, and the assurance that significant adverse impacts of mining will be mitigated. SMARA created a program that assures the reclamation of mined lands while providing mineral information essential to local management of mineral resources needed for the future.

Summary of Reclamation Planning in California

Within the Department of Conservation's Division of Mines and Geology (DMG), there exists a Mined Lands Reclamation Program to carry out many of SMARA's reclamation provisions. The Board sets policy for this and other DMG programs, and is the agency responsible for certifying local surface mining and reclamation ordinances as being in compliance with State law.

Cities and counties having active mines within their jurisdiction are designated as Lead Agencies under SMARA. There are approximately 110 such agencies in California at the present time. Ordinances adopted by city councils and boards of supervisors that have been certified by the State Mining and Geology Board provide the regulatory framework within which mining and reclamation activities are carried out. These ordinances incorporate the requirements of SMARA and reflect the policies of the Board. They may also contain additional, more restrictive requirements deemed necessary by a Lead Agency to ensure effective reclamation within its particular jurisdiction.

Under SMARA, a mining operator is responsible for the preparation and submission of a reclamation plan to the Lead Agency. Local government approval of this plan is required before mining can begin. The reclamation plan includes information on the site, the mineral commodity, the mining method, processing requirements, and the specifics of the reclamation program to be undertaken such as reconturing and revegetation.

Who is subject to SMARA? With the exception of specified exemptions and provisions for vested operations, "...no person shall conduct surface mining operations unless a permit is obtained from, and a reclamation plan has been submitted to, and approved by, the Lead Agency for such operation..."

A lead agency is defined as the "city, county, San Francisco Bay Conservation and Development Commission, or the Board which has the principal responsibility for approving a surface mining operation or reclamation plan pursuant to the Act."

How is the Act implemented? California's approach to reclamation planning is to include the mining operator, local government, and the State as active participants in the process. This stresses a cooperative approach rather than an adversarial one, and resources and knowledge are combined to create cost-effective and environmentally sound reclamation plans. The operator's financial interest and investment are considered as well as community, regional, and statewide interests in mineral resource conservation, resource management and land-use planning.

What happens if an agency does not have a certified ordinance? In the absence of a certified lead agency surface mining and reclamation ordinance, the Board is empowered to review and approve reclamation plans to assure that the mined lands reclamation objectives of SMARA are met. Reclamation plans approved by the Board as such are not subject to modification at a later date by the lead agency with permitting jurisdiction, but may be amended by the Board. The Board returns these reclamation plans for lead agency administration once a Board-certified ordinance is in place at the local level.

What is the role of the mining operator? A mining operator is responsible under SMARA for the preparation and submission of a reclamation plan to the lead agency. Approval of this plan by the lead agency is required before mining can begin. The reclamation plan includes information on the site, the mineral commodity, and the specifics of the reclamation program to be undertaken.

Vested rights. Section 2776 of the Act exempts landowners and/or operators who have obtained a vested right to conduct surface mining operations prior to January 1, 1976, from the requirement to obtain a permit from the lead agency under Section 2770 of SMARA, but does not exempt them from the requirement to file with the lead agency for operations to be conducted after January 1, 1976. All persons who conducted surface mining operations on or after January 1, 1976, are subject to the Act's reclamation provisions, whether such operations were commenced prior to that date or not.

Record Keeping. To ensure consistent availability of information on surface mining operations statewide, Board policy requires lead agencies to forward copies of each permit and approved reclamation plan to DMG. The Mined Land Reclamation Program is responsible for maintaining complete files of these records.

SMARA also requires that lead agencies notify the State Geologist of the filing of an application for a permit to conduct surface mining operations. This provides a mechanism for alerting the Mined Land Reclamation Program that the final reclamation plan will be forthcoming should the project be approved.

Technical Assistance. Finally, Section 2774(c) provides that "...On request of a lead agency, the State Geologist shall furnish technical assistance to assist in the review of reclamation plans." Such assistance is provided through the Reclamation Program staff, which has the technical expertise necessary for the review of reclamation plans.

Memorandum of Understanding Between State and Federal Agencies

As a result of a public workshop held on January 22, 1988, sponsored by the Board (see 1988 Annual Report) on the applicability of SMARA to federal lands, the Department of Conservation and the Board jointly formed a Task Force to review an existing Memorandum of Understanding (MOU) between the State of California Resources Agency, the U.S. Forest Service (USFS), and the Bureau of Land Management (BLM). On February 7, 1990, a new Memorandum of Understanding (MOU) was signed between the State of California and BLM. Negotiations are ongoing with the USFS. The purpose of this MOU is to streamline and coordinate the reclamation plan approval process.

Board Site Visit of Reclamation Projects in Southern California

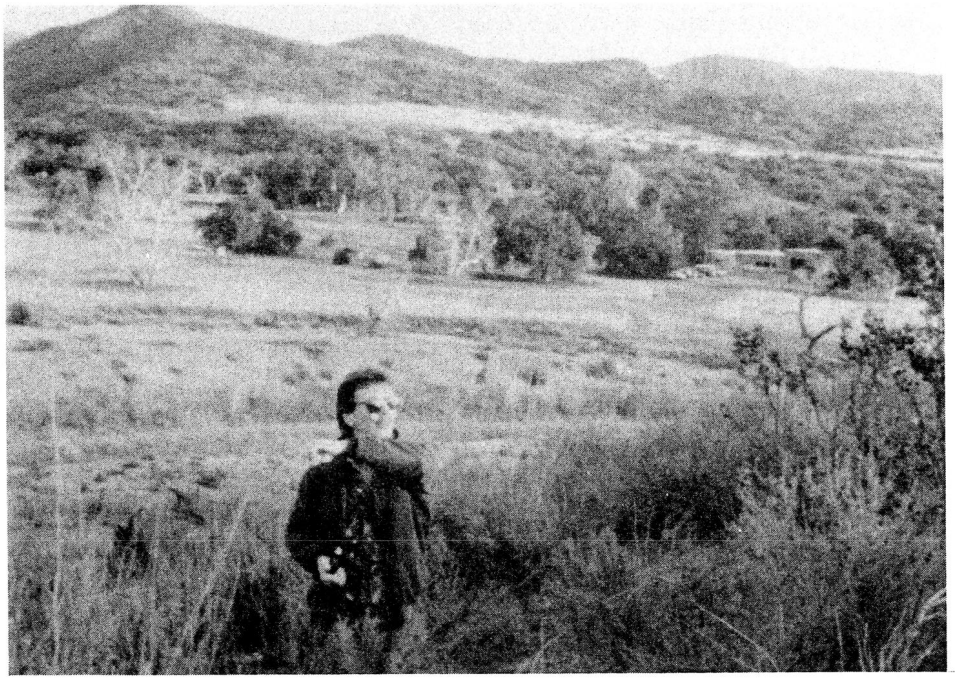
In March 1990, the Board toured several sites in the Southern California area for the purposes of studying reclamation practices and to gather information and ideas on the varied forms of reclamation. Information gathered on actual site visits is helpful in identifying needed policy change and/or research relative to reclamation.

On the first half of the tour, the Board visited two of CalMat Company's sand and gravel operations - Lang Station Sweetwater Aggregates and San Juan Creek. At Lang Station the Board reviewed the proposed reclamation methods for the active mining site. At San Juan Creek the Board viewed both completed and ongoing reclamation of the inactive mining site. Mining began at San Juan Creek in April 1966, and ceased in July 1989 when the sand and gravel deposit was depleted. Reclamation of the excavated areas included recontouring of the slopes and revegetation of native plants.

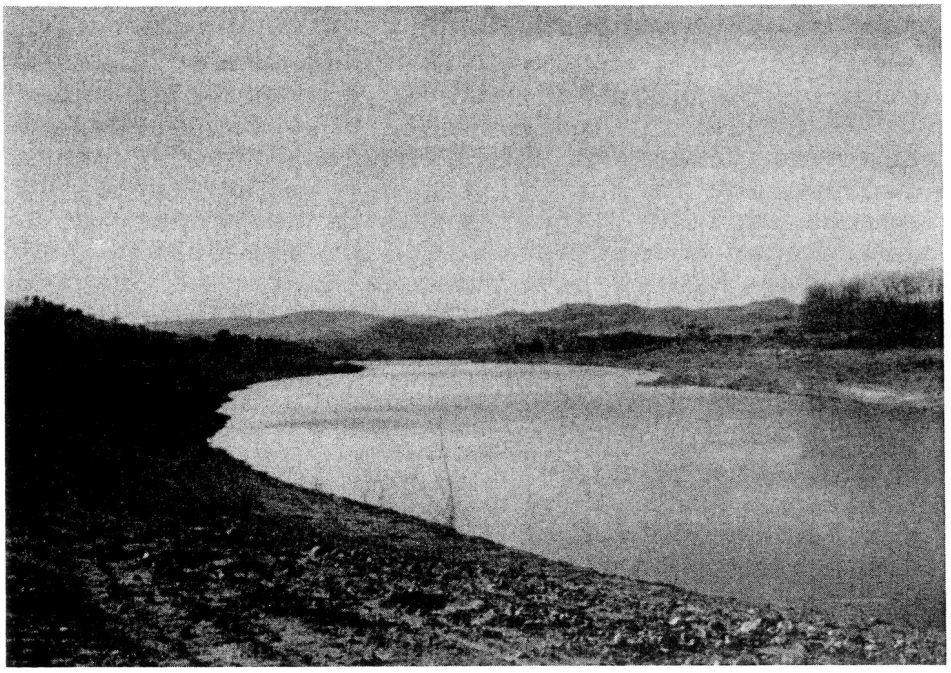
On the second half of the tour, the Board visited mining sites owned by Pacific Rock and Gravel Company, Nu-Way

Industries, Inc.; Owl Rock Products; Livingston-Graham, Inc.; CalMat Company; and Transit Mixed Concrete Company. Reclamation of these sites included a variety of end uses including an industrial park, waste disposal sites, and water reservoirs. At Owl Rock Products' Upper Azusa Rock Plant, reclamation is part of the ongoing operation in preparing the land for ultimate use by the County of Los Angeles for water quality control. At the Transmit Mixed Concrete Company mining site, once a section of aggregate has been mined out, the area will be quitclaimed back to the landowners, who will then reclaim the site through non-hazardous, solid waste sanitary landfill for land-use development.

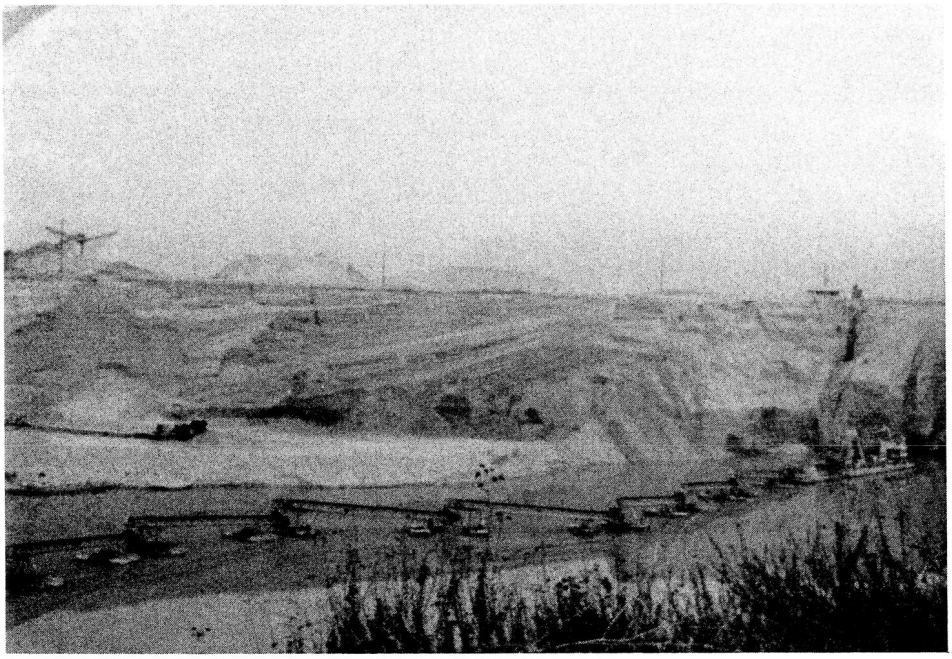
The tour provided the Board with a better understanding of how reclamation takes place "on the ground" and the problems encountered by both lead agencies and operators in addressing environmental impacts of mining.



Engineering Geologist, Mike Sandecki of the Division of Mines and Geology Reclamation Program, at Ronald W. Casper's Wilderness Park, upstream from CalMat Company's San Juan Creek sand and gravel operation.



CalMat Company's sand gravel reclamation project. This area is being reclaimed to a natural-looking lake to attract wildlife.



Livingston Graham 1,000-TPH ladder dredge at their Irwindale, California pit.

Board Site Visit of Reclamation Projects in Foothill Area of California

In May 1990 the Board visited the mining sites of Calaveras Asbestos, Royal Mountain King Mine, Sonora Mining Corporation's Jamestown Mine, and Carson Hill Mine to study reclamation practices and methods in the California Foothill Area.

At the Calaveras Asbestos Mine, the Board was briefed on the now inactive mine's history and safety record. Operations at the mine ceased following the nation's ban on the use of asbestos in building materials. The proposed reclamation for the site involves use of the open pits as a waste disposal site for materials containing asbestos removed from buildings and other construction, followed by revegetation of the area for open space.

At the Royal Mountain King, Jamestown, and Carson Hill Mines, the Board viewed ongoing reclamation practices that included the enhancement of wildlife habitat and revegetation of native trees, plants, and grasses.

While in the Foothill Area, the Board also toured the California State Mining and Mineral Museum located in Mariposa. The museum, which houses thousands of California mineral specimens as well as specimens from virtually every state and several countries, incorporates a 200-foot tunnel depicting various underground mining techniques developed over the last century.

Reclamation Plan Appeals Process

SMARA, as amended by AB 747, Sher, (Chapter 975, Statutes of 1987), provided a "window" period for vested mining operators to file reclamation plans for approval by lead agencies in compliance with reclamation planning provisions of SMARA. The amendments also created an appeals process to the State Board, which was intended to assure speedy review and action by lead agencies based on the merits of the reclamation plan's compliance with specified provisions. In fiscal year 1988-89, following an extensive public review period culminating in a public hearing, the Board adopted, and the Office of Administrative Law approved, regulations to establish procedures for processing such appeals filed with the Board.

The Board's regulations set standards for site inspections and committee structure review. After the committee reviews the appeals that are accepted, the full Board must vote on the committee's recommendations. The Board received 41 reclamation plan appeals filed under Section 2770 of SMARA, and is currently processing them pursuant to the Act and Board regulations.

The Board notified operators and lead agencies on several occasions of the July 1, 1990 deadline for approval of reclamation plans for vested surface mining operations. As of that date, all vested surface mining operations must: (1) have a lead-agency approved reclamation plan; (2) be pending an appeal with the Board pursuant to SMARA Section 2770(c); or (3) have ceased operations if they still do not have an approved reclamation plan, and remain closed until a reclamation plan is approved by the lead agency.

Certified Ordinances

Throughout the year, the Board adopted the following resolutions certifying city and county surface mining and reclamation ordinances as being in compliance with State policy governing the regulation of surface mining and reclamation in California:

- Resolution #89-09 was adopted by the Board on September 8, 1989, certifying the City of Amador's surface mining and reclamation ordinance, adopted by the City of May 11, 1989.

- Resolution #89-10 was adopted by the Board on September 8, 1989, certifying the City of Highland's surface mining and reclamation ordinance, adopted by the City on December 27, 1988.

- Resolution #89-13 was adopted by the Board on November 17, 1989, certifying the City of Redland's surface mining and reclamation ordinance, adopted by the City on October 17, 1989.

- Resolution #89-14 was adopted by the Board on November 17, 1989, certifying the City of Tracy's surface mining and reclamation ordinance, adopted by the City on October 3, 1989.

B. MINERAL RESOURCES CONSERVATION

Summary of Classification-Designation Program

California is one of the nation's leading mining states in terms of both value and diversity of minerals produced--approximately 1,100 active mines and quarries produce about $2.8 billion worth of nonfuel minerals annually.

In the early 1970's, the Department of Conservation's Division of Mines and Geology (DMG) estimated that California would face a $17 billion loss of mineral resources by the year 2000 if patterns of present land use continue. This projected loss represents almost nine years of the State's current mineral production.

Despite this projected forecast, land use decisions in California are often made without knowledge of the location of important, underlying mineral deposits and their value to the State, the nation and society overall. California is faced with increasingly difficult land use decisions, and the harvesting of mineral resources must compete with other land uses such as agriculture, timber harvest, urban development, and recreational, sensitive ecological or scenic areas. In many areas, pressure from competing land uses has severely reduced or completely eliminated access to available mineral resources.

In an effort to remedy this problem, SMARA provides for a mineral lands inventory process termed "classification-designation", which jointly involves State and local government. The Department of Conservation, its Division of Mines and Geology, and the State Mining and Geology Board are the State agencies responsible for administering this process.

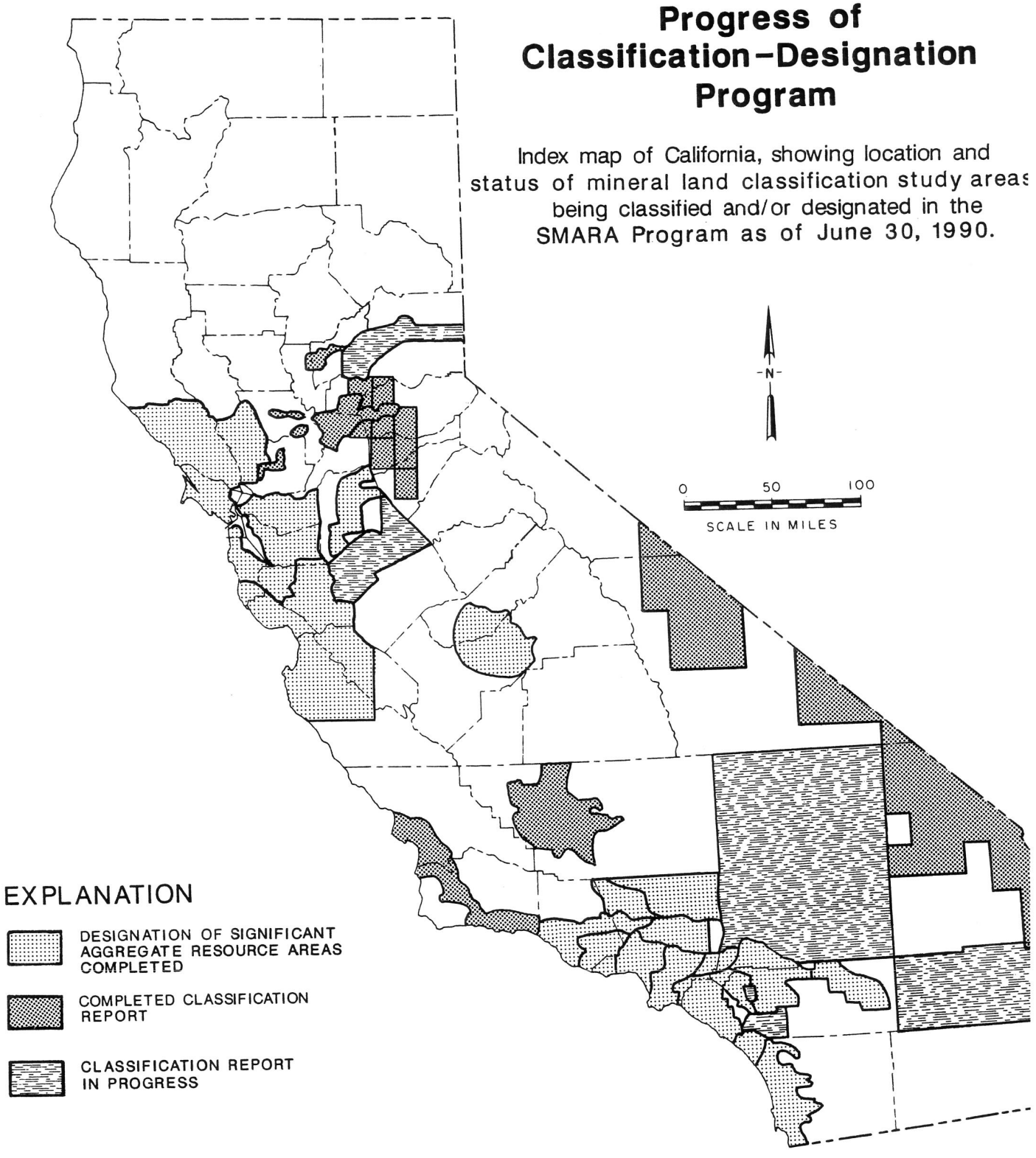


Figure 1. Map of California Depicting Progress of the Classification-Designation Program.

Information on the location of important mineral deposits is developed by DMG through the process of mineral land classification. This information can then be used by the Board in designating those deposits that are of economic significance to a region, the State, or the nation. The objectives of this process are to provide local agency decision-makers with information on the location, need, and importance of mineral resources within their jurisdiction, and to require that this information be considered in local land-use planning decisions. These objectives are met through the adoption of local mineral resource management policies, which provide for the conservation and development of these resources.

During the classification phase of this program, the State Geologist is responsible for preparing a geologic inventory of selected mineral commodities within a defined study region. Major objectives of a classification report include: (1) identifying the market area of the commodity (a production-consumption region); (2) projecting the future (50-year) needs for the commodity within the study region; and (3) geologically classifying the lands within the region as to the presence or absence of the commodity.

The State Geologist classifies mineral lands solely on the basis of geologic factors. By statute, existing land-use is not considered. Classification of an area as a Mineral Resource Zone-2 (MRZ-2) indicates the existence of a deposit that meets certain criteria for value and marketability. The classification report also describes other categories of mineral resource zones -- MRZ-1, 3, and 4. The first two of these categories are used to indicate if an area contains no resources (MRZ-1) or contains potential but presently unproven resources (MRZ-3). Areas where it is not possible to assign any of these categories are classified MRZ-4.

In many regions, large portions of the areas classified as MRZ-2 are already committed to various urban uses, which limit access to the underlying resources. As an aid to local planning agencies, classification reports prepared for metropolitan areas also identify MRZ-2 quality deposits, or portions of these deposits, that have not been preempted by incompatible land uses such as urbanization. These nonurbanized areas, called resource sectors, are important because they contain resources that remain potentially available for future use. The identification of resource sectors also facilitates estimating the volume of aggregate material that is available in the production-consumption (P-C) region. Resource sectors are typically considered for designation by the Board.

Once the classification report has been completed, the Board may choose to proceed with the second step in

SMARA's mineral lands identification process -- designation of those deposits that are of regional or statewide significance. In contrast to classification, which inventories mineral deposits without regard to land use, the purpose of designation is to identify those deposits that are of prime importance in meeting the future needs of the study region, the State or the nation and that remain available from a land use perspective.

The first mineral commodity selected by the State Mining and Geology Board for classification by the State Geologist was construction aggregate -- sand, gravel, and crushed rock. The importance of construction aggregate is often overlooked even though it is an essential commodity in today's society.

Aggregate is a key component in products such as Portland cement concrete, asphaltic concrete (blacktop), railroad ballast, stucco, road base, and fill. Aggregate provides 80 to 100 percent of the material volume in these products. Portland Cement Concrete is used to produce concrete blocks and pipes, foundation pilings, precast concrete beams, and tilt-up concrete walls. Clearly, aggregate is very important to the construction industry and the local economy.

The construction industry is dependent on readily available aggregate deposits within reasonable distance to market regions. Because aggregate is a low unit-value, high bulk-weight commodity, aggregate for construction must be obtained from nearby sources in order to minimize cost to the aggregate consumer. If nearby sources do not exist, then transportation costs can quickly exceed the value of aggregate. In fact, transportation cost is the principal constraint defining the market area for an aggregate operation.

With the passage of SB 1300 in 1979, the State also initiated mineral land classification studies in the highly mineralized Sierra Nevada and the California Desert Conservation Area, where focus is on the potential for minerals other than construction aggregate in more rural areas of the State.

Schedule of SMARA Mineral Land Classification Mapping

The Board determined at the July 14, 1989 meeting to revise the existing mapping priorities and to request DMG to modify its procedures for mineral land classification. The DMG was instructed to complete classification studies on a countywide basis for all mineral commodities.

Priorities will be based on the: (1) relative threat of urbanization; (2) perceived needs of individual counties; and (3) other factors that might be linked to activities already underway. Nevada County was scheduled to be completed later this year; Western Riverside, Stanislaus, and Eastern Riverside Counties were scheduled to be completed in the 1990/91 fiscal year; Tulare County was scheduled to be completed in fiscal year 1991/92 along with Eastern and Western San Bernardino Counties, and Inyo County in fiscal year 1992/93.

Based on the new criteria, Nevada County was selected to be the first county where classification for all mineral commodities on a county-wide basis would be done. Report completion is expected during FY 1990/91.

Following are the mineral land classification reports completed by DMG for Fiscal Year 1989/1990.

1. <u>San Andreas Quadrangle, Calaveras County</u>.

   In September 1989, the Board accepted, and formally transmitted to affected lead agencies, a nonurban classification report on the San Andreas Quadrangle located in Calaveras County.

   - Two areas in the San Andreas quadrangle, (the Mountain King-Royal and the Carson Hill Mines) contain measured reserves of 9.07 million tons at .070 ounces and 16 million tons at .046 ounces of lode gold, and have been classified MRZ-2a.

   - The Mother Lode Belt and the Big Seven Mine, are identified as containing significant inferred resources of lode gold (MRZ-2b). The gold, along with associated silver, copper, lead, and zinc, typically is present in small, but rich pockets in hydrothermally formed quartz veins that occupy faults, fissures, and joints which cut through metamorphic and igneous rock of the region. The mineralized areas occur within several northerly trending linear zones characterized by highly faulted and deformed rock, quartz veining, and talc-bearing schist. The remaining parts of these mineralized zones are identified as favorable geologic terrains for the occurrence of hydrothermally formed gold and associated metal deposits (MRZ-3a).

   - One area contains significant measured and indicated reserves of talc (MRZ-2a). The Red Hill talc quarry, operated by Western Source, Inc. produces a high quality talc formed by the hydrothermal alteration of quartz mica schist.

- The Kentucky House, Calveritas, and Cave City deposits, have been classified as containing significant inferred resources of limestone (MRZ-2b). Historic producers of limestone for cement are all currently ideal. An additional five areas are identified as being favorable geologic terrains for the occurrence of talc, limestone, and silica resources (MRZ-3a).

- An area along the foothill copper-zinc belt has been classified as being a favorable geologic environment for containing economic base and precious metal deposits formed by volcanogenic processes (MRZ-3a).

- An area within the Bear Mountains serpentinite belt has been classified as being favorable terraine for the occurrence of chromite resources (MRZ-3a). Chromite has been produced from several localities within this belt as recently as the 1950's.

- Remnants of ancient river channel deposits, partly or wholly concealed by younger volcanic and sedimentary rocks, occur throughout the study area. Although extensively worked in the 1890's, and periodically since, the so-called "auriferous gravels" remain a potential source for economic deposits of placer gold. Modern river and stream beds continue to be mined for placer gold as well. Both types of river channel deposits have been classified MRZ-3a.

2. <u>San Luis Obispo-Santa Barbara Production-Consumption Region</u>.

At its November 17, 1989 regular meeting the Board accepted and subsequently transmitted to the affected lead agencies a nonurban mineral land classification report for Portland Cement Concrete aggregate and active mines for other mineral commodities in the San Luis Obispo-Santa Barbara Production-Consumption Region. Some of the major findings are as follows:

- The anticipated consumption of aggregate in the P-C Region through the year 2038 is estimated to be 206 million tons, of which 37 percent or 76 million tons must be of PCC-quality.

- About 107 million tons of permitted PCC-grade aggregate and about 25 million tons of permitted aggregate other than PCC-grade exist within the P-C region.

- As of January 1989, seven mines operated by five different mining companies are permitted to produce PCC aggregate in the P-C region. Six of the seven mines are currently active.

- Unless additional aggregate resources are permitted for mining, or alternative resources are utilized, the present 132 million tons of aggregate reserves, including the 107 million tons of PCC-grade aggregate, will be depleted by the year 2033, 43 years after the publication of this report.

- The 132 million tons of aggregate reserves within the P-C region can provide only 64 percent of the anticipated consumption of all aggregate during the next 50 years. The expected longevity of these reserves is based on the assumption that mining will continue to be permitted until the reserves are depleted.

- 11,175 million tons of PCC-grade aggregate resources (including reserves) have been identified within the San Luis Obispo-Santa Barbara P-C Region. Of this total, 6,119 million tons are crushed stone resources, and 5,056 million tons are sand and gravel resources.

- The P-C Region covers an area of 2,062 square miles, of which 72 square miles (4%) were classified as MRZ-2 for PCC-grade aggregate. Of this area, 57 square miles (3%) have been sectorized as having current land uses which do not preclude mining. A little over two square miles (less than one percent) of the sectorized areas are permitted for mining of PCC-grade aggregate.

- The 57 square miles of sectorized land considered to be available for providing future PCC-grade aggregate needs of the region may not all be practically available.

Classification Reports Prepared in Response to Petitions

Mineral deposits threatened by incompatible land uses that may prevent mining may be brought to the Board's attention by petition. To qualify for a petition, the subject deposit(s) must meet a certain economic threshold and be faced with an imminent land-use threat related to urbanization.

Throughout the fiscal year, the Board accepted three petitions and denied two. Those accepted include:

1. Palomar Aggregates, Inc.

A petition for mineral land classification of Palomar Grading and Paving Company's Pankey Ranch site aggregate deposit, located in northern San Diego County, was accepted in July 1989.

The mineral land classification report was approved and transmitted by the Board in November, 1989. The primary land-use threat cited was encroachment by urbanization and opposition to industrial development in the area.

2. Baxter Iron and Limestone Mine, Inc.

This petition was accepted in September, 1989 from the CalMat Land Co., Baxter iron/carbonate rock deposit for classification of iron and limestone deposits, located in western San Bernardino County.

The threat to these deposits was cited as the presence of the Afton Canyon ACEC (Area of Critical Environmental Concern), the close proximity of the Cady Mountains WSA, the present BLM classification of the mine area as Class L, limited use, and the close proximity of the Mojave National Park as proposed under S-11 and HR 780 (the Desert Protection Act.)

Approximately 450 acres of the 470 total acres are patented mining claims and, therefore, they come under the jurisdiction of San Bernardino County, as lead agency under SMARA, rather than Federal agencies. Some important findings of the classification report are as follows:

- Iron ore is currently mined from the property by open-pit mining involving blasting, loading, crushing and truck haulage to CalMat Company cement plant near Mojave where it is used as an ingredient for making cement. Several thousand tons of ore are shipped each year.

- Based on the anticipated growth in Southern California over the next few decades, there is very likely to be an increase in cement production to satisfy the increased local demand. This will be especially true for the eastern margins of the greater Los Angeles area, notably the Riverside-San Bernardino-Victorville-Barstow area where development is occurring at an accelerated pace. Both iron ore and carbonate rock, which are basic ingredients in making cement, will be needed.

- Based upon an assessment of several hundred chemical analyses of carbonate rock samples collected from sample lines that were-well spaced across the deposit, it is concluded that there

exists a substantial body of material suitable for making cement with a value well in excess of threshold values.

The report was approved and transmitted to the County in April 1990.

3. Western World, Inc.

The petition was accepted from Western World Mining Company, Inc., in November, 1989 for the classification of the copper-zinc deposit located near Smartsville, Yuba County. The threat to this deposit was cited as a proposed development of residential and commercial sites to the north of the proposed mining area as well as to the east.

The mineral land classification report was accepted and transmitted by the Board in March, 1990. Some important conclusions of the classification report are as follows:

- The minable ore reserves of the Western World deposit are 1,450,000 tons grading 2.6T copper, 0.034 opt gold and 0.42 opt silver. The reserves are delineated by 76 surface drill holes totalling 28,000 feet and drilled on 50 to 100 foot center. Based on a December 1988 feasibility study by Wright Engineers, Ltd., Vancouver, Canada, for the Western World Mine, it was determined that from these reserves a marketable copper concentrate can be produced whose value by far exceeds the threshold value required by the State to be considered significant for classification.

Designation of Palm Springs Production-Consumption Region

Following a 45-day public review and comment period culminating in a public hearing, the Board adopted in September 1989 regulations for the designation of mineral lands in the Palm Springs Production-Consumption Region. These regulations were approved by the Office of Administrative Law on November 13, 1989 and took effect December 13, 1989.

As noted in the DMG classification report, (Special Report 159), the Palm Springs P-C Region covers an area of 629 square miles, of which 33.8 square miles (5.4% of the total area) were classified MRZ-2. Only 28.2 square miles (4.5%) were sectorized as having current land uses which do not preclude mining. About 1.3 square miles (0.2%) of the sectorized areas are currently under mining permits. Within the P-C region, eight sectors were identified as containing over 3.2 billion tons of aggregate resources.

This P-C Region has an average annual per capita consumption rate of approximately 10 tons of construction aggregate materials per year. Based on this rate and future population projections approximately 156 million tons of aggregate materials will be needed to supply this region through the year 2035 (fifty year projection). Of this amount, approximately 54 percent, or 84.4 million tons, must be of Portland-concrete cement quality.

Based upon information in the classification study the environmental impact report prepared for the designation, and on comments provided by public testimony, the Board designated 944.6 million tons of aggregate resources.

Local Agency use of Classification-Designation Information

Once a classification or designation report has been received by local lead agencies (cities and counties), SMARA requires that these agencies establish mineral resource management policies, to be incorporated into their general plans, that: (1) recognize the mineral information by the State; (2) assist in the management of land use that affects areas of statewide or regional significance (designated areas); and (3) emphasize the conservation and development of identified mineral deposits. Regulations to assist lead agencies in the development of these mineral resource management policies were established in 1988.

Information available in classification and designation reports is being used with increasing frequency by local agencies in planning studies and permit decisions. For example, during the past year, mineral resource information developed by the classification-designation program was used in at least 24 local agency environmental documents. These documents are monitored carefully by the Department of Conservation to ensure that factual information on classified and/or designated areas is brought before local decision-makers.

Information on mineral resources was included for project decisions in the Cities of Corona, Fremont, Fresno, Lancaster, Livermore, Oxnard, Rancho Cucamonga, Rocklin, Sacramento, San Bernardino, and Tracy, as well as in the Counties of Contra Costa, Riverside, San Diego, San Bernardino, and Ventura.

Board Site Visit of Mining Projects in Shasta and Lassen Counties

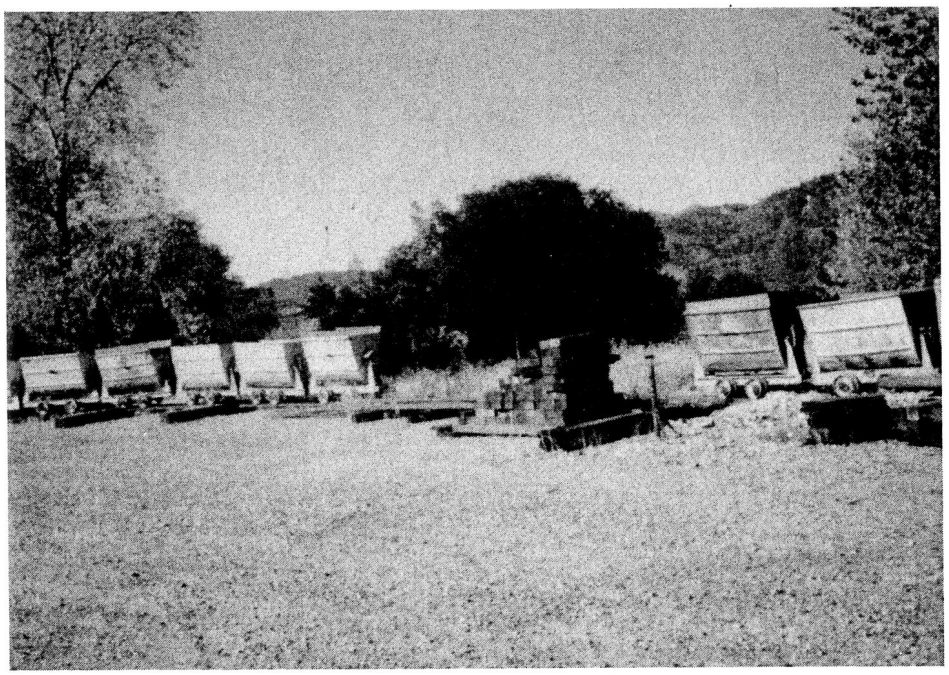
On September 7, 1989, the Board toured two mining sites located in Shasta and Lassen Counties. The first stop was the Reid Mine, a small lode gold mine near Redding, California, that is closed now, but had operated intermittently for many years in the Klamath Mountains.

The Klamath Mountains are highly mineralized and not yet densely developed. This region is also the focal point of important environmental and social issues.

The group also made a stop at Hatchet Pass located in the southwestern end of the Cascade/Modoc range to view the volcanic terrain. Mount Lassen and Mount Shasta are prominent local features of the area with diverse geologic features.

The next stop on the tour was the Grefco Lak Britton Diatomite Mine. This is a major diatomite deposit. Diatomaceous earth powders are utilized primarily as filtration aids, clarifying all kinds of liquids including water, juices, wines, beer and oils, along with various other applications.

The purpose of this trip was to provide the Board with an understanding of the issues involved in the management of these resources.



Reid Mine, a small lode gold mine
near Redding, currently inoperative.

1989 NONFUEL MINERAL PRODUCTION IN CALIFORNIA
(Value in Thousands of Dollars)

State total 1989: $2,854,116 (est.)
(Value in thousands)

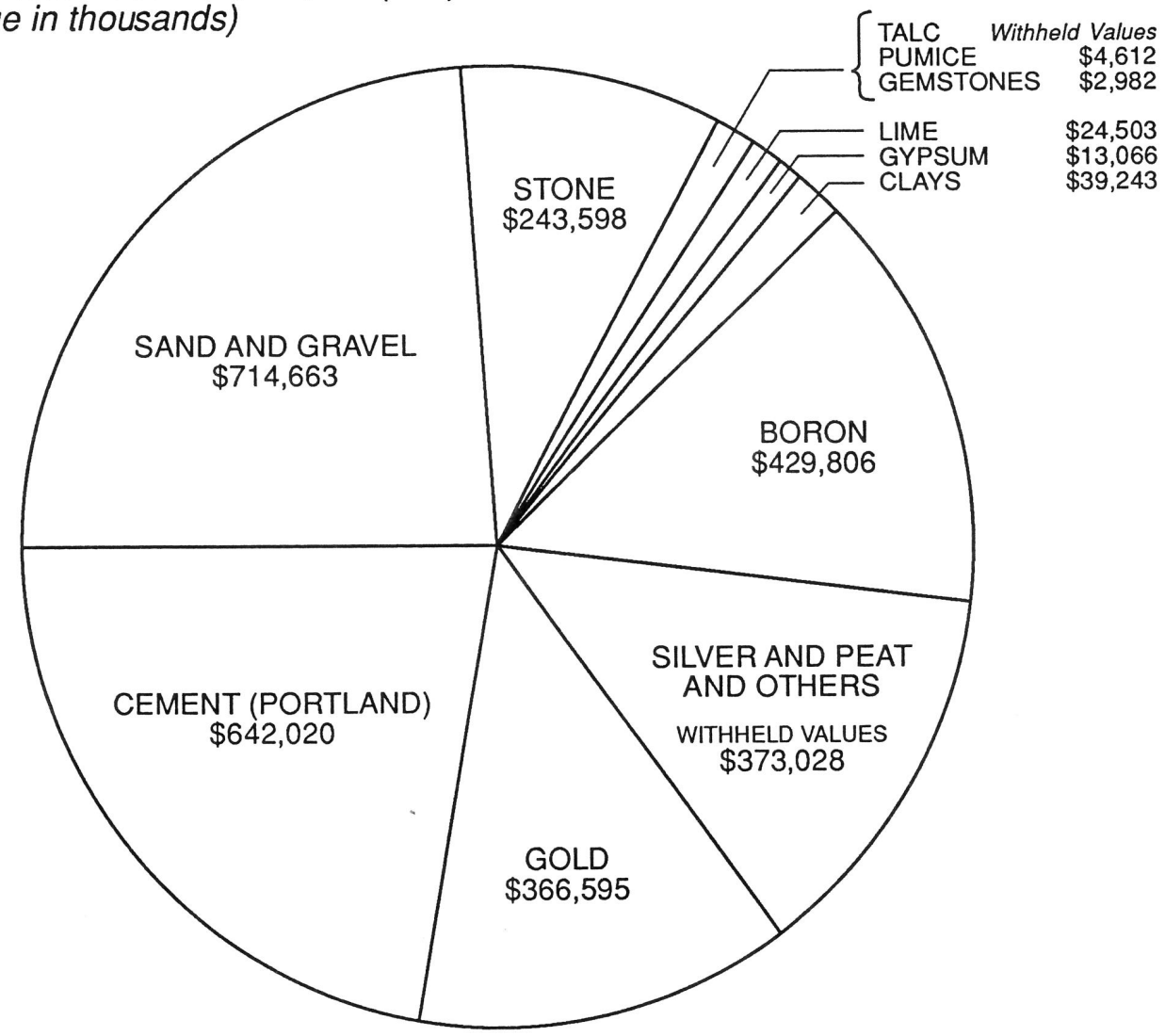


Figure 2. Combined value of asbestos, barite, calcium chloride, copper, diatomite, feldspar, iron ore, magnesium compounds, molybdenum, perlite, potassium salts, rare-earth metal concentrates, salt, sodium carbonate, sodium sulphate, tungsten ore and concentrates, wollastonite, and withheld values.

Source: U. S. Bureau of Mines Yearbook 1989, Volume II.

MAJOR BOARD ACTIONS RELATED TO GEOLOGIC HAZARDS PROGRAM, RESEARCH AND NEW RESPONSIBILITIES

C. SUMMARY OF BOARD RESPONSIBILITIES FOR GEOHAZARDS IN CALIFORNIA

California's propensity for geologic hazards--earthquakes, landslides, volcanism--underscores the importance of understanding these phenomena and their potential effects upon our society. In 1973, the Division of Mines and Geology estimated that the cost of these hazards from 1970 to 2000, if current land-use practices continue, would amount to $55 billion. To foster a better understanding of these hazards, the Board represents the State's interest in developing and disseminating related geologic information through the State's geologic survey -- the Division of Mines and Geology.

The Board is also charged with more specific responsibilities under such laws as the Alquist-Priolo Special Studies Zones Act and the Landslide Hazard Identification Act.

The Alquist-Priolo Special Studies Zones Act

The Alquist-Priolo Special Studies Zones Act provides for the mapping of active faults by DMG under policies established by the Board. Maps of these faults -- Special Studies Zones -- are provided to local government for their land-use planning and decision making. The Act prohibits construction of structures for human occupancy, as defined, across the trace of an active fault. No maps were completed this fiscal year.

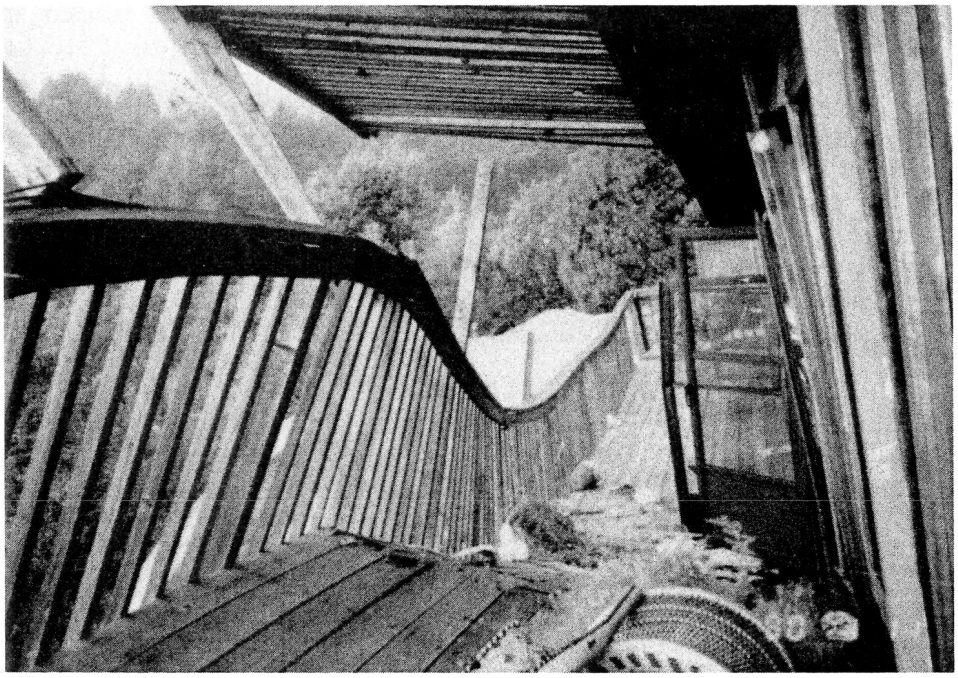
Board Site Visit of Areas in the Santa Cruz Mountains Damaged by the October 17, 1989 Loma Prieta Earthquake

On January 11, 1990 the Board toured several sites in the Santa Cruz area to study the geology and effects of the recent Loma Prieta earthquake on the region.

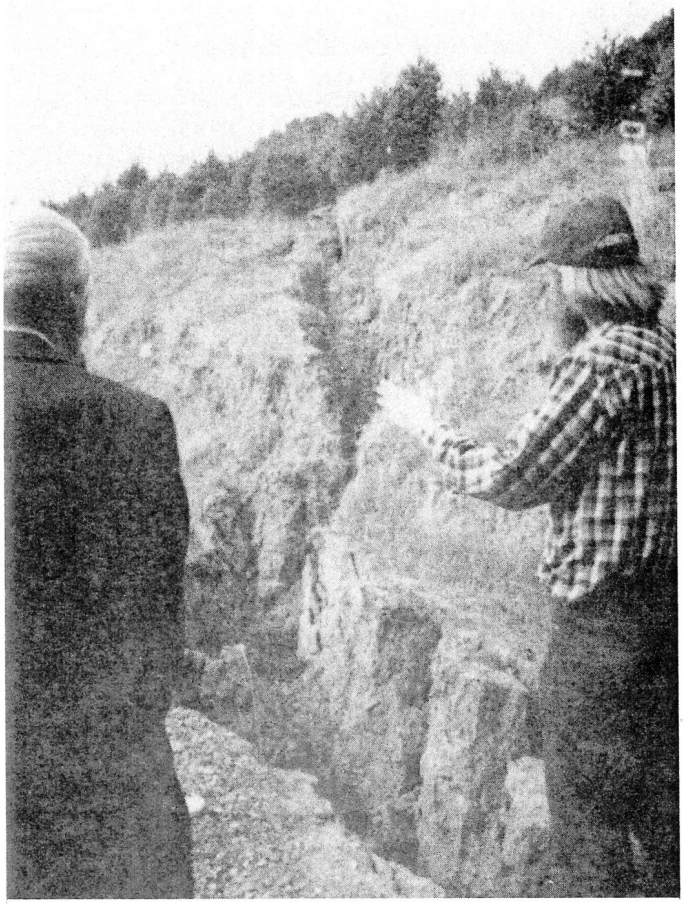
The October 17, 1989 earthquake that shook the San Francisco Bay/Santa Cruz area measured 7.1 on the Richter scale and caused extensive damage in the area. The major impact of the earthquake in terms of geologic effects was the generation of many widespread landslides in the Santa Cruz mountains.

As a result of the landslides, staff received emergency requests from officials of local counties for technical assistance. A clearinghouse for geologic information was established in San Jose.

House on small knoll on Comstock Road in the Santa Cruz area destroyed by the Loma Prieta earthquake.



A once level deck of a home on Robinwood Lane, off Summit Road in the Santa Cruz area, distorted by the Loma Prieta earthquake.



Extensional fissures
at the crown of a large
landslide complex caused
by the Loma Prieta earthquake.

Tops of trees sheared off by the force of ground
shaking from the Loma Prieta earthquake.

Additionally, the Division of Mines and Geology will release a publication on the Loma Prieta Earthquake, summarizing and providing more information on the earthquake to the community.

Probabilistic vs. Deterministic Committee

In May of 1989, an Ad Hoc Committee on Deterministic/ Probabilistic Seismic Hazards Evaluation was established. The purpose of the committee is to provide guidance to DMG on currently accepted knowledge and practice for quantitative mapping of shaking hazards. The committee also provided technical review of a proposed statewide map showing maximum earthquake acceleration from active faults in California. This committee is in the process of preparing a report that will describe the advantages and limitations of determination vs. probabilistic seismic hazards maps.

This committee consists of ten members, and is chaired by Board member I.M. Idriss, Ph.D. Included on the committee are eminent engineers and seismologists from California universities, state and federal government, and the private sector.

The Landslide Hazard Identification Act

The Landslide Hazard Identification Act (LHIA) was chaptered in September 1983, becoming effective January 1, 1984 (Chapter 997, Statutes of 1983). This Act formally recognized the problem of unstable slope hazards (landslides, mudslides, debris flows, slumps, soil creep, etc.) that occur throughout much of California. These problems have been underscored by the tragic loss of life and property due to storm and earthquake-triggered slides over the past few years.

The LHIA provides for a state-local cooperative mapping program to identify landslide-prone areas in the path of urbanization. The Act established within DMG a Landslide Hazard Identification program that is charged with developing maps of landslide hazards within urban and urbanizing areas of the State. Mapping of these areas by DMG is directed by priorities and guidelines established by the State Mining and Geology Board.

According to Section 2685(b) of LHIA, priorities for the mapping program are to reflect the following factors in order of importance: (1) the severity of the landslide hazard, (2) the willingness of lead agencies and other public agencies to share the cost of mapping within their jurisdictions, (3) the availability of existing information, and (4) the need to supplement information used in existing landslide hazard abatement or prevention programs.

The Landslide Hazard Identification Project (LHIP)

In response to the Landslide Hazard Identification Act's mandate, the Board has acted to develop guidelines by adopting recommendations made at various workshops and meetings convened over the years by the Geohazards Committee of the Board. Most recently, a workshop was held in Pleasant Hill in March 1990, to review the practices and products of the Division's Landslide Identification Program (Project). Changes in mapping and the maps themselves are already being made as a result of suggestions made at this workshop.

The criteria that must be considered in prioritizing the areas to be mapped are specifically itemized by the Landslide Hazard Identification Act (Public Resources Code; Division 2, Chapter 7.7, Article 4, Section 2685). Mapping priorities must address the severity of the hazard, the commitment of local government to share the costs of doing the mapping, the existence of useful landslide data, and the need for more information on landslide hazards to support local mitigation programs.

The primary goal of LHIP is to reduce landslide hazards by means of preparing maps of areas subject to such hazards. Some of the factors considered in prioritizing areas for landslide mapping include:

- Requests from local government officials/agencies for landslide maps to help them prepare planning documents, especially revision of the Safety Elements of the General Plans.

- Location in a region where there are exceptional development pressures due to rapid population growth.

- Knowledge of geologic framework (related to slope stability) and experience of each LHIP staff geologist with landslide mapping in adjacent areas (previous projects that can be built upon efficiently).

Areas identified for study this year include:

1. Southern California

   El Cajon and vicinity in San Diego County, approximately 125 square miles of land within the eastern margin of the San Diego Embayment. Moorpark and Santa Paula Quadrangles, Ventura County consisting of two quadrangels; approximately 125 square miles; located between Simi Valley and Ventura.

2. Northern California

Weaverville and vicinity, Trinity County continuation of landslide hazard mapping. Additional areas in Alameda County - completion of landslide maps of Altamont and Livermore quadrangles. Ongoing mapping of adjacent areas, including portions of the Tassajara, Dublin, and Byron Hot Springs quadrangles.