

# MINING IN NEW MEXICO

## **The Environment, Water, Economics, and Sustainable Development**

L. Greer Price, Douglas Bland,  
Virginia T. McLemore, and  
James M. Barker, Editors

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New Mexico Bureau of Geology and Mineral Resources  
A Division of New Mexico Institute of Mining and Technology  
2005

**Mining in New Mexico: The Environment, Water, Economics, and Sustainable Development**

L. Greer Price, Douglas Bland, Virginia T. McLemore, and James M. Barker, Editors

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## Preface

This is the fourth volume we've produced in conjunction with our Decision-Makers Field Conferences. These conferences are designed to provide decision makers with an overview of earth science and related policy issues of interest and importance to all New Mexicans. We produced the first volume in 2001 on *Water, Watersheds, and Land Use in New Mexico*. This was followed by volumes on *New Mexico's Energy, Present and Future* in 2002 and *Water Resources of the Lower Pecos Region* in 2003.

The conferences have been a resounding success. One of the highlights has been the guidebooks, which have taken on a life and significance that extends well beyond the conferences themselves. Designed to provide a broad overview of the topic at hand, with a focus on how science can aid in the decision-making process, these books have become references for decision makers, policy makers, industry, the environmental community, and the general public. Written for a non-technical audience, the books are intended to provide information that is otherwise not easily found, in an accessible style and format.

This year we tackled the topic of *Mining in New Mexico*, with a focus on the Taos region. But, as in previous years, the issues at hand are statewide issues. In particular we wanted to address those mining-related issues that face all of us in the years ahead: environmental and social concerns, policy and economics, regulation, and the issue of sustainability. We've tried to provide a balanced view rather than a comprehensive one, and if we've not provided answers to all of the questions, perhaps we have at least provoked significant thought and discussion.

We tried hard to focus on science, as always, because science and policy are (and should be) closely linked, particularly with regard to mining. So this year's volume includes a little more in the way of policy and regulation. Our authors were chosen for their ability to address these topics broadly, and with authority, based on their expertise and experience. We asked authors to rely on fact rather than opinion, but the papers invariably reflect to some degree the views of their authors. Those views do not necessarily represent the voice of the New Mexico Bureau of Geology and Mineral Resources or our partner agencies. This year's contributors are listed in the back of the volume, along with information about who they are and what they do. The contributors themselves are an

important resource; many of them will remain involved with shaping the future of mining in New Mexico.

Whatever that future may hold, it will require tough—and informed—decisions on the part of decision makers, industry, and the general public. It is our hope that this compilation will go far toward helping us all make informed decisions, based on an understanding of the science, as well as the social, policy, and economic issues, that are involved. Our economic health, our environmental well-being, and the quality of life that we have come to take for granted in New Mexico all depend upon it.

—The Editors



Map of field trip area.





# An Introduction from the State Geologist

Peter A. Scholle, *New Mexico Bureau of Geology and Mineral Resources*

Welcome to this decision-maker field conference, the fourth in our ongoing series of meetings dealing with geological and hydrological issues in New Mexico. These conferences—and this volume—are designed to provide New Mexico decision makers with the opportunity to see first-hand the influences and impacts of natural phenomena and human actions on our resources and landscapes. The conferences also provide an opportunity for participants to hear, see, and interact with leading scientific and technical experts from a wide range of partner organizations who will present material essential for an understanding of the relevant issues and their potential solutions. Those experts are the source of most of the papers in this volume. We strive to present a balanced program and to educate rather than lobby for specific legislation. Along with our many partners, however, we also hope that the information presented, the contacts made, the discussions engaged in, and a future of continued interactions after the trip all will lead to useful future legislation for New Mexico.

This year's meeting on mining-related issues deals with some of the most difficult and contentious topics we have tackled. Because mining issues revolve more around emotion-charged conflicts between differing societal values than around scientific disagreements, it is difficult to be dispassionate, and difficult to focus primarily on science. The social issues center on the differences between economic and environmental values. Clearly our society needs mining—it adds substantially to the economic welfare of the state and the nation (jobs, taxes, royalty revenues) and provides vital materials needed for our industrial economy. None of us, no matter how spartan our lifestyle, makes do without mined metals or industrial minerals. Such materials are found in our foods, our vehicles, our houses and appliances, our office buildings, our roads, and virtually everything else we use.

At the same time, however, we all want a clean and healthy environment, with safe water supplies, clean air to breathe, and pristine scenery to enjoy. Mining by its very nature impinges on some of those environmental values, at least during the working life of a mine.

This dichotomy between economic and environmental values is at the heart of the conflicts over regu-

lation, permitting, and cleanup in the mining arena. So where does science fit into such values conflicts? The young field of environmental science has clearly increased public concerns about ecological and health-related issues. Epidemiological studies on health effects of pollutants, long-term air- and water-quality monitoring studies, ecosystems investigations, and other scientific investigations have defined the hazards associated with a wide variety of industrial activities, including mining. But science does not really inform the debate, as long as the debate is focused on the relative merits of two sets of social priorities. The question of which is more important, generating economic benefits or protecting the environment, is not one for which science can provide an answer. But science can provide background information to make that decision more rational and less emotional. How much ore is present in a prospect area, how much will it cost to extract, how long can the deposit be mined at certain rates, how much revenue will it add to state or local coffers—these are questions that science can help to answer. On the environmental side, how much air or water pollution will be generated, how can pollution most effectively and economically be minimized, what substitutes can be found for especially scarce or polluting materials are all questions for which science and technology can offer at least partial answers. Equally significant, it is the growth of science, especially environmental and medical sciences, that has also led to a profound shift in societal perceptions in the economic-environmental values discussion.

Companies, including those in the extractive industries, work to societal standards of their time, and those standards have changed dramatically in the past century. I happen to collect postcards of the oil industry and so will illustrate this point with several such images, but the same point could also be made using illustrations from the mining industry. Images on postcards generally reflect things of which we are proud. Today beautiful scenery, wildlife, modern buildings or monuments, and similar themes grace our postcards. It is not easy to find modern cards depicting oil wells, refineries, storage tanks, or other symbols of the petroleum industry, even in areas that have been or now are major oil producing regions. The same is true

for mines, smelters, and other factories.

Postcards of the late nineteenth and early twentieth centuries, however, were very different in this regard. Thousands of towns across the nation, from Pennsylvania to California, issued postcards depicting oil fields. The scenes are perhaps horrific to the modern, environmentally conscious eye: forests of wooden derricks on deforested hillslopes, open lakes of oil, gushers and torpedoed wells spouting oil skyward, flaming storage tanks and oil fields. But the scenes also commonly show proud citizens in their finest clothing, walking under parasols through a rain of black gold or gazing at burning tanks. Identical scenes of environmental devastation are commonly claimed by multiple towns, each vying to become the industrial hub of their region. The inscriptions on the cards proclaim the manifest destiny of this nation, laud oil exploitation as a key part of the industrial revolution, and use the scenes to draw new population to the region. “Wish you were here” is a common, and sincere, sentiment expressed in the writings on the cards.

The point to be made here is that it is not really fair to hold modern industry solely responsible for the sins of earlier days. There is indeed a legacy of spoiled landscapes, air and water pollution, collapsing mine shafts, and other problems associated with past min-



A postcard depicting a burning oil storage tank in western Ohio from around 1910. Note the well-dressed citizens who have come out to have their group portrait taken in front of the billowing plume of black smoke.



A postcard view of a raging oil field fire from around 1900. Such fires were common occurrences given forests of wooden derricks that virtually touched at their bases, uncovered rivers and lakes of oil (foreground), and the common use of open blacksmith fires for dressing the cable tools used to drill these wells. This postcard is from Baku in the Russian Empire (now Azerbaijan), but comparable scenes were common in U.S. oil fields of the time.

ing, in New Mexico and throughout the nation. But in earlier days there was no widespread recognition of the potential problems, no scientific information on the health effects of pollutants. Instead, there was widespread jubilation at the jobs and wealth that mining and other extractive industries brought to the economy of a struggling and growing nation.

So how do we move forward more intelligently with mining today and in the future? We cannot expect companies working in a free-market economy, whether in the nineteenth century or today, to substantially exceed mandated environmental standards. It is those scientifically established and legislatively mandated standards that set the benchmark those companies must achieve. Regulations, which apply to all companies, really provide a level playing field for everyone by incorporating environmental costs into the price of doing business. In economic terms, such regulation internalizes the costs of environmental protection (making them part of the price a consumer pays for the product) as opposed to externalizing the costs (making all citizens pay the costs later in the form of higher taxes for environmental cleanup or public health services). The playing field is only completely level when everyone has to play by the same



A postcard from around 1910 from the oil region of western Pennsylvania (encompassing the towns of Franklin, Oil City, Titusville, Warren, and others). This card is typical of many from that time period, reflecting pride in the accomplishments of a dynamic young industry. Individual vignettes on the card show oil erupting from a torpedoed well, a tank fire, and somewhat more environmentally benign views of derricks and refineries.

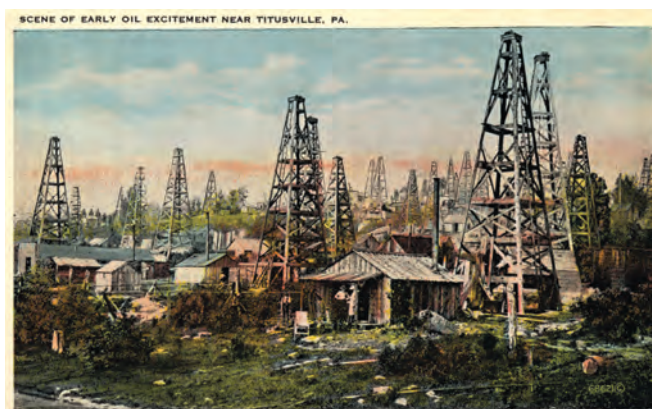
rules, and because many environmental regulations are formulated on a state by state basis, that level field does not exist for the nation as a whole, let alone the world.

Nonetheless, regulation remains important (and is a major focus of this conference), because it is not reasonable to expect that there will be less environmental disturbance associated with mining in the future than in the past. On the contrary, we have already mined the richest and easiest-to-mine deposits. Future minerals exploitation will necessarily involve lower-grade ores and deeper, or otherwise harder-to-mine deposits. In our copper mines, for example, we are now mining ore containing only 0.1–0.3 percent copper (and that represents the ore, not all the associated waste rock that must be removed to get to the ore). Mining lower-grade ore will entail blasting and moving more rock and creating more environmental disturbance. But offsetting that, we now know much more about how to mine in ways that protect the environment. Can we mine a deposit like Questa's molybdenum ore today in a sustainable fashion that meets all current and future environmental concerns? The answer is a resounding “maybe.”

The answer is “maybe” because we clearly cannot anticipate every potential future consequence of present day actions (any more than the citizens of the early twentieth century were able to predict the environmental consequences of the industrial activity of

their era). The maybe also comes because we may not have the will or the economic resources to finance projects that preclude all pollution. But we can take (and in many cases, have taken) sensible and cost effective steps in that direction. Requiring impermeable liners around and beneath potential sources of pollutants, clay caps above such sources to prevent water infiltration, and similar steps can prevent transport of virtually all potential pollutants, not just those elements for which we have current concerns.

Beyond environmental issues there remain the social questions surrounding the aesthetics of mines and mining. Because of the nature of ore-forming processes, metallic ore deposits generally occur in mountainous terrain, not in flatland areas. Thus, a conflict between the aesthetics of pristine mountain regions and mines will always exist. Mines and their infrastructure of haul roads, waste rock piles, stockpiles, mills, and tailings ponds are no longer seen by many, perhaps most, citizens as acceptable consequences of mining. Papers submitted for this volume from environmental groups go so far as to say that no responsible mining company should even submit plans for mines in the vicinity of parks, monuments, or wilderness areas. We are, however, willing to accept sprawling clusters of fast-food restaurants, motels, condos, and housing developments at or near the entrances to many of our parks. Denver, Salt Lake City, Colorado Springs, Aspen, Las Vegas, Albuquerque, and other large cities in the West spread their smog throughout the region and consume vast amounts of habitat in proximity to gorgeous mountains, and we accept and



A postcard from around 1900 showing a forest of oil derricks in an otherwise deforested landscape near Titusville in western Pennsylvania. The grim vista, from an area close to the original Drake well discovery in 1859, is captioned as a “scene of early oil excitement.”



even encourage that growth. Why are sprawling cities and towns and their pollution acceptable, whereas mines and their attendant impact on scenery unacceptable?

I am not advocating despoiling the surroundings of parks. I am questioning the values that allow urban sprawl but disallow mining of major mineral deposits. People can settle elsewhere, but minerals must be mined where the deposits are found.

At some point we will need to assess where we are going as a nation and how we plan to retain our economic viability. The industrial zeal of previous centuries is clearly gone. But how will we maintain the standard of living that we all love while producing few raw materials and even fewer manufactured goods? We cannot live on imports and service industries alone, and current trends of declining production and soaring international trade deficits are clearly unsustainable in the long run.

As we work toward creating a nation (and a state) that has safe pollution standards and that maintains its scenic beauty and natural habitat, we also need to develop a better concept of where mining and manufacturing fit into that picture. Our regulations need to protect and conserve natural settings, but they also need to recognize the unique opportunities provided by world-class mineral deposits such as those at Questa and Silver City. Even more importantly, we need to find ways to consume fewer resources, recycle and reuse materials effectively, and minimize the frequent “conserve versus develop” clashes that result from rampant consumption. European nations are far ahead of us in demanding recycling of consumer products and reuse of raw materials, a natural consequence of having a far higher population density than the U.S. More scientific information and the development of new technologies will clearly be needed to guide us in finding the balance between these three end members: conservation of our habitats, development of our natural resources, and sustainable reuse and recycling of industrial materials.