

# SHALE COUNTRY

20 03020008

SHELF

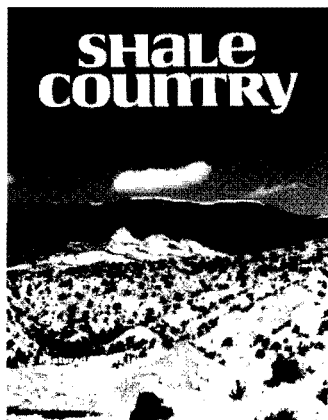
Toll Edl Repository  
Arthur Lakes Library  
Colorado School of Mines

## Featured in This Issue

- Union Oil Co. of California
- Energy-Impact Legislation
- Rangely, CO

October 1981

# THIS ISSUE



**On the cover:** Red Fleet Reservoir north of Vernal, UT, with namesake formations in background.

SHALE COUNTRY studies shale basics (p. 5), managing methane in mines (p. 12-13), the Peking connection (p. 10), and then graduates to commercial production (p. 6-8).



<b>Personality Profile</b>	<b>1</b>	Corey Grua: From 'Fiddler' to Shale
<b>Focus</b>	<b>2</b>	Lawmakers Tackle Energy Impacts
<b>Potpourri</b>	<b>5</b>	Brushing Up on Shale Basics
<b>Situation Report</b>	<b>6</b>	Union Oil: Graduating to Commercial Production
<b>Vignette</b>	<b>9</b>	From the Classroom to Capitol Hill
<b>Perspective</b>	<b>10</b>	Oil Shale's Peking Connection
<b>Environment</b>	<b>12</b>	Safety First: Managing Methane in Mines
<b>A Look At</b>	<b>14</b>	Filling the Health-Care Prescription
<b>Special Report</b>	<b>16</b>	Lab Scientists Study Shale's Secrets
<b>Community Profile</b>	<b>18</b>	Rangely: Adding a Touch of Sophistication

Alys Novak, **Publisher**  
 Jonijane Paxton, **Editorial Director**  
 Kathy Callahan, **Managing Editor**  
 Catherine Kilker, **Senior Editor**  
 Susan Luzader Prust, **Associate Editor**  
 Anne Wasko, **Associate Editor**  
 Carol Edmonds, **Contributing Editor**  
 Brian Novak, **Production/Circulation Director**  
 Debbie Slack, **Production/Circulation Assistant**  
 Linda Hope, **Circulation Assistant**

# SHALE COUNTRY

Volume 3, Number 7      October 1981

Shale Country © 1981 by The TRACOM Corp. Mountain Empire Publishing, a division of The TRACOM Corp. All rights reserved. Material from this magazine may be reprinted with credit line to SHALE COUNTRY, Mountain Empire Publishing.

Published 8 times annually. Executive and editorial offices, 200 Fillmore, Suite 100, Denver, CO 80206 (303) 388-5451. Third Class Bulk Postage will be paid at Denver, CO. SHALE COUNTRY is sponsored by the following members of the Rocky Mountain Oil and Gas Association Committee on Oil Shale: Chevron Shale Oil Co., Exxon Company, U.S.A., Gulf Oil Corp., Multi Mineral Corp., Occidental Oil Shale, Inc., Phillips Petroleum Co., Sohio Shale Oil Co., Standard Oil Co. (Indiana), Tenneco Shale Oil Co., Tosco Corp. and Union Oil Co. of California. The opinions expressed in this publication are those of specific individuals and do not necessarily reflect the viewpoints of the publication's sponsors or the oil shale industry as a whole.

SHALE COUNTRY is provided as a public service by the leaders of the oil shale industry. Published 8 times annually as a source of information for those interested in industry developments, SHALE COUNTRY is made available to shale area residents without charge through various community outlets. However, should a reader wish to receive issues of SHALE COUNTRY through the mail, please send your requests to Mountain Empire Publishing, 200 Fillmore, Suite 100, Denver, CO 80206, with a check for \$10 to cover postage and handling in the United States. Outside the United States the cost is \$24.

**Photo Credits**  
 Front Cover, Brian Novak; p. 1, Corey Grua; p. 2-4, Sen. Tilman Bishop, Kathy Callahan, Rep. Ron Strahle; p. 5, Ray Lewis; p. 6-8, Union Oil Co. of California; p. 9, Rep. Vickie Armstrong; p. 10-11, Chen and Associates, Inc.; Rio Blanco Oil Shale Co., Tosco Corp.; Boulder Office; p. 12-13, Rio Blanco Oil Shale Co.; p. 14-15, St. Mary's Hospital, Valley View Hospital; p. 16-17, Lawrence Livermore Laboratory; p. 18-20, Evert Jones; Inside Back Cover, Carol Edmonds.

Once, Corey Grua staged "Fiddler on the Roof" at Vernal's high school in Utah. Now he is helping set the stage for White River Shale Project's venture on federal tracts U-a and U-b south of Vernal. The connection between the two productions is Grua's appetite for community involvement. "I've always been up to my head in the community," says Grua, formerly a Vernal speech teacher, and now White River's community relations specialist, a post he took command of last February.

### Earning good grades

Grua gets high marks from Vernal leaders such as Mayor Sam Synder, who describes him as typical of the "good, responsible people" affecting energy development in the Uintah Basin. Grua, whom the mayor has known "since he was a little kid," is honest and straightforward, in Snyder's view. The mayor says those qualities came through when Grua sought but lost a bid for a State House seat last fall.

The night after the election, Grua says he received a phone call from Salt Lake City, home of White River executive Rees Madsen, a former Vernal resident who had moved next door to Grua in 1974 when the project first began. During the phone call, Madsen mentioned a new position that his company was creating in community relations and asked if Grua might be interested. Talking the prospect over with his wife Marilyn, Grua decided to leave his teaching post and join the oil shale venture. There, he felt he could continue to use his communication skills as well as work with and increase his community activities.

Grua is a familiar face in Vernal, since his family moved to the town when he was in the ninth grade. He has lived there almost continuously ever since. The only interruption came when he spent 2 years on a Central States mission for the Mormon church to work among Indians in Oklahoma. Grua also studied for 4 years at the University of Utah in Salt Lake City to earn a Bachelor of Science degree in speech communications in 1972.

Grua chose teaching as a career "where I could serve people." He explains that his



Corey Grua with his Scout troop's senior patrol leader, Tracy Gardner.

### Personality Profile

## Corey Grua: From 'Fiddler' to Shale

interest in communication was kindled at an early age when he worked for radio station KVEL in Vernal.

So, in 1972, he combined those interests by accepting a job teaching speech and drama at Uintah High School in Vernal. In this position, Grua directed students in productions of "Fiddler on the Roof," "Oliver" and less-common fare, such as the Greek tragedy "Antigone." In 1978 he transferred from the high school to Vernal Junior High to teach English.

### Keeping up with the community

While he was teaching, Grua participated in many community groups—including the American Cancer Society, Uintah Arts Council, Uintah Poetry Society and the Boy Scouts. He also became first vice president of a new Lions Club chapter and director of a task force to encourage more public involvement in the school system. So when

Grua assumed the community relations post for White River, he was pleased to hear from Vernal office manager Jim Godlove that "Our industry will not thrive unless we are involved in helping the community."

Among Grua's other community efforts is membership on a Kids With Energy Steering Committee to help children of parents who are newcomers employed in energy projects. He is also chairman of the Industrial Development Committee of the Vernal Chamber of Commerce.

One of Grua's keen interests is working to encourage good zoning principles in the Vernal area. "We have the beginning of a trailer influx here now," he says, explaining that trailers have randomly moved in on undeveloped property next to permanent homes or adjacent to "painstakingly landscaped" church buildings. One way to encourage planning and zoning may be a valley-wide government encompassing Vernal and neighboring suburbs in the Ashley Valley, says Grua. He serves on a committee, organized by the county commissioners, to investigate such a possibility.

Grua also feels that another community concern associated with growth is the need for community financing before energy development gets into full swing. He notes that Utah Governor Scott Matheson is organizing an industry/government effort to ease growth in energy communities. A chief worry of communities like Vernal is that the federal leasing monies from the bonus bids on tracts U-a and U-b may go to the more populated, more politically powerful Wasatch Front, Grua reports.

In tackling issues of energy and community development, Grua says it is heartening to note that "Industrial development is and has been welcomed with open arms in this part of Utah."

When not coping with community-relations issues, Grua likes to spend time with his chief interest outside the office—his family. Grua and his wife have four children, Emily, age 9, Julia, age 8, Melissa, age 5 and David, age 2. The Gruas also recently welcomed a new addition to the clan, a foster Indian child, Colleen, age 8, for the 9-month school year. C.E.□

# Lawmakers Tackle Energy Impacts



Following an exceptionally active 1981 session, the Colorado General Assembly recessed in June. However, it did not adjourn for the year, but remains technically in session so that legislators can return periodically to deal with such items as reapportionment and the effects of federal budget cuts. Nevertheless, most major legislation has already been passed.

Of the more than 1,136 bills that were introduced, almost half were passed. Some of this legislation has particular significance for shale country residents, since a number of bills were designed to deal with impacts from energy-related growth. Several others, while not specifically aimed at energy-impact assistance, can still benefit the shale area. Following is a discussion of Colorado legislation that either directly addresses energy development, or that can otherwise assist areas that will be impacted by energy development. In a future issue, Utah legislation will be featured.

## Energy-related legislation

**Distribution of federal leasing money (S.B. 177):** This legislation partially changes the way in which federal mineral-lease funds are distributed. The federal government receives yearly royalty payments on lands it leases for mineral, oil and gas development. It keeps half of this money and returns half to the state where the lands are located. Prior to federal legislation passed in 1978, only 37½ percent was returned to the state, with stringent requirements on how the money could be spent—schools, roads

and bridges, for example.

In Colorado, 50 percent of the money the state receives is returned to the counties where sales, leasing or production took place, 25 percent goes to the State Public School Fund, 15 percent to the Local Government Mineral Impact Fund and 10 percent to the Water Conservation Fund.

Although the counties theoretically receive 50 percent of the royalties, in actuality they don't. Instead, each impacted county is only allowed a certain percentage of the money based on the value of production—and no county can receive more than \$200,000 in a year. The money that remains after the counties receive their portions is then turned back into the Public School Fund as "spillover" funds. The original theory for putting it into the Public School Fund is so the money could benefit all the people in the state, including impacted areas. Also, this means that less money has to be allocated to the Public School Fund from the State General Fund.

The problem with this system has been that as production increased, so did the royalties and sometimes so did the impacts, but the counties still received very little additional money. According to Sen. Tilman Bishop, who was involved in much of the legislation discussed in this article and who was one of this act's sponsors, "It became clear that something had to be done. Last year the state received approximately \$21 million in royalty payments. Forty-nine out of 63 counties received some amount of money up to \$200,000, but the total the

counties received amounted to only about \$2.6 million in 1981. It became obvious that a bundle of money was going elsewhere."

While the new legislation does not change the basic distribution principles nor eliminate the \$200,000 ceiling (although the counties are expected to lobby for an \$800,000 limit next year), it does recognize the "spillover" money. This means that under the new legislation, the money left over from the counties' share will go to the Public School Fund until the spillover amount reaches \$10.1 million. After that, the Public School Fund will get 50 percent of the spillover and the Local Government Mineral Impact Fund will get the rest. Then, 25 percent of the latter fund's money will be returned to the counties based on a residence formula, and the other 75 percent will be distributed in the form of impact-assistance grants.

Jim Evans, public lands and energy representative with Colorado Counties, Inc., a lobbying group that represents 62 of Colorado's 63 counties, says, "We've estimated that from the period the legislation is in effect—January 1, 1983 through December 31, 1987—it will bring in an additional \$20.3 million for impact assistance. This is a conservative estimate since the figure is based on a 14-percent growth rate of royalty receipts, and growth could be greater, especially if there's additional federal leasing. It's our position that since energy companies should be paying for their own impacts, these funds should be used for impact assistance. In fact, we had several joint

meetings with industry representatives because they share this concern. They supported us and helped us lobby for S.B. 177."

He also points out that this legislation will benefit cities, schools and school districts as well as counties, because of the way the impact-assistance grants are determined. "It's a good process," he notes, "because representatives of various groups get together on a local level and determine project priorities. Then they present their requests to the Energy Impact Committee, which is composed of five private citizens, the director of local affairs, the director of natural resources, the director of the highway department and the commissioner of education. The committee makes a recommendation to the director of local affairs, who then makes the final decision."

Bishop agrees that the system has developed into a good one, and adds, "It isn't always an easy system, because, of course, everyone thinks their own project is the most important. But now local governments have become more sophisticated in identifying their needs and setting their priorities."

**Severance-tax credits (H.B. 1395):** In the past, a portion of the money from Colorado's severance taxes was going to the State General Fund, a portion to local governments and a portion to the Severance Tax Trust Fund. Interest from the trust fund goes into the State General Fund. As of July 1, 1981, 50 percent of the revenues from severance taxes will go into the Local Government Severance Tax Trust Fund to be used for impact assistance, and 50 percent into the state's Severance Tax Trust Fund; the money in the state's fund can now be used as loans to help with water projects.

H.B. 1395 amends the 1977 law to clarify provisions relative to prepayment of severance taxes. Now energy and mineral companies can receive credits against future state severance-tax liabilities by voluntary front-end contributions made directly to local governments in impacted areas. It also distributes a portion of oil and gas severance-tax revenues to local governments based on the residence of employees of crude oil, natural gas or oil and gas operations.

This act is not considered a total solution

to energy impacts, but rather, one more financial method companies can use to help local governments with impacts. Rep. Vickie Armstrong, one of the legislation's sponsors, notes, "My main concern is that the rules and regulations being developed to implement this legislation will not discourage companies from using this front-end financing method because of unnecessary technicalities."

The second portion of the legislation, which deals with oil and gas severance taxes, should have an immediate effect on towns such as Rangely. Previously all oil and gas severance taxes went to the State General Fund. Now, under this legislation, 50 percent will go to local governments, including cities. Fifteen percent will go to local governments based on where the



"The city councilmen and commissioners from the shale areas have credibility . . .," notes Sen. Tilman Bishop.

workers live and the balance will go to the Energy Impact Assistance Fund for grants.

**The Oil Shale Trust Fund/Long Appropriations Bill (S.B. 513):** When federal oil shale tracts C-a and C-b were leased, part of the monies the companies paid to the federal government for the leases were returned to the states to help with shale-related impacts. To handle this money, the state established the Oil Shale Trust Fund, and each year the commissioners from

Mesa, Garfield, Rio Blanco and Moffat counties made project requests to the Joint Budget Committee (JBC), which would then allocate portions of the fund to the projects. Some \$56 million were distributed in this manner from 1975 through 1980. By enacting S.B. 513, the Colorado General Assembly provided that the entire remaining \$47 million in the Oil Shale Trust Fund be distributed to the counties in 1981.

Sen. Bishop says, "I think the JBC decided to disburse the remaining funds because the counties demonstrated to the committee an accountability, based on previous needs and projects, which was held in very high esteem. For example, the past project requests were demonstrably needed and are now all in place. The city councilmen and commissioners from the shale areas have credibility, and it's foolish to make them come before the JBC every year—we know those projects are needed. Both Republicans and Democrats stuck together on this one and pushed for the legislation to go through."

As for distributing the \$47 million, Garfield County Commissioner Flaven Cerise explains, "The commissioners of all four counties got together to figure out a percentage distribution formula that's rather complicated, and is based on degree of impact in each county. After the money is received, each county sets its own project priorities. What's nice about having the money disbursed is that the interest being accumulated will now go to the counties on the same percentage basis."

**Prepayment of ad valorem taxes (S.B. 312):** Initiated by Sen. Dan Noble, this act allows energy and mineral companies to voluntarily prepay their property taxes to units of local government. This money can then be used for capital improvements, which are directly or indirectly related to additional public service demands created by the energy and mineral operations. Local government units and the company must enter a written agreement on the general details of prepayment, such as the total amount of the prepayment and the time for each payment. This legislation, along with the prepayment of severance-tax legislation, is expected to help get front-end money to the communities for capital construction projects.

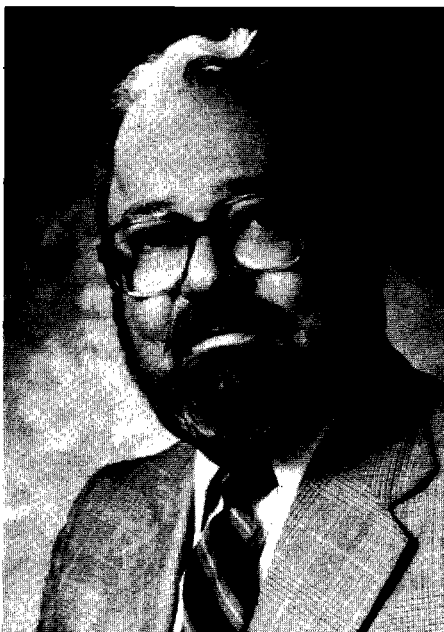
**Statutory tax-levy exclusions (S.B. 459):** Currently, property-tax revenues to any local government entity can increase by no more than 7 percent per year. Prior to this act, property-tax revenues derived from new construction of real property and annexations of real property were excluded from the 7-percent limit, because such construction usually produces growth, requiring additional local services. Now, personal property associated with new construction, such as equipment, is also excluded from the limit. Also, when increased mining production causes an increase in local services, the increased volume of production is considered "new construction," and is excluded from the 7-percent limit. Elaine Weaver, legislative representative for Colorado Counties, Inc., explains, "New construction often means new growth and a need for additional services, so property taxes derived from that growth can be excluded from the 7-percent limit. When a mine increases production substantially, the same thing can happen—you have more workers so you need more services, roads . . . With new construction you can just go out and assess the buildings, but it's more difficult to measure the growth with a mine since it is underground and its product is usually transported from the premises. Now the growth will be measured by the increased volume of production."

### **Non-energy-related legislation**

Several pieces of legislation were passed during the 1981 session that do not relate directly to energy-development impacts. However, while this legislation will benefit the state as a whole, it will also have specific effects on Colorado's shale area. Space does not allow discussion of all this legislation, but the following are some of the more relevant items.

**County home rule (H.B. 1579):** Colorado counties can now have home rule, which municipalities have had since the turn of the century. According to Rep. Ron Strahle, sponsor of the legislation, there are two kinds of home rule, structural and functional. Structural determines the way a government is organized—for example, are two commissioners or four needed, should they be appointed or elected? Functional home rule deals with the powers and functions of

local government, such as whether bonds can be issued, and, if so, under what circumstances. Before this legislation passed, counties were allowed to have structural home rule only, and then only by going to the legislature. Now counties can have both types of home rule and Strahle says, "I see more and more counties going for it because it gives them more options and greater flexibility. They can set up their governments in a way that seems appropriate to them. I would think that for counties experiencing energy growth, county home rule would be very important, especially if there's a large development in an unincorporated area. For instance, with functional



**Says Rep. Ron Strahle,** "I would think that for counties experiencing energy growth, county home rule would be very important . . ."

home rule, a county can decide to form a water district and issue special bonds."

**Financing public highways (H.B. 1090):** This act is probably the one most familiar to the majority of Coloradans—on July 1, 1981, it increased the tax on gasoline from 7 cents to 9 cents a gallon. Proceeds from this additional revenue will be distributed on a percentage basis among the state, counties and municipalities. A significant portion of the increased revenue is dedicated to highway bridge repair or replacement. Because the distribution is based in part on miles of

road and bridge needs rather than on population, rural energy-impacted areas should receive a fair percentage of the receipts.

**Lease/purchase agreement (H.B. 1452):** This act allows counties to enter lease/purchase agreements to finance a courthouse, jail or other building used for governmental purposes. Property financed by such agreements will be exempt from property taxes as long as the building is used for government purposes.

**Limitations on sales and use taxes (H.B. 1202):** This act amends the sales-tax law so that several counties precluded from levying a sales tax can now do so. There is a state-imposed 7-percent limit on sales tax; thus, since the state tax is 3 percent, if a municipality's tax was 4 percent, the county could not levy an additional tax. Now those precluded counties can impose an additional 1-percent sales tax, subject, of course, to approval of the voters.

**Local sales- and use-tax revenues (H.B. 1419):** This legislation authorizes a county, city or town to pledge sales- or use tax-revenues for capital improvements, and issue revenue bonds to finance the improvements, subject to voter approval. According to Colorado Counties' Weaver, "Before this bill, if you had pledged a certain amount of revenue from sales tax for capital improvements and you wanted to build a \$10-million jail, and you only took in \$1 million in sales taxes that year, you could only build that much of the jail. Now you can issue \$10 million in revenue bonds for immediate construction, with the bonds repaid by future years' sales-tax revenues."

It appears that state lawmakers have, in fact, been quite busy this session, and that they have made an effort to address shale country concerns. Bishop says, "I think this is happening because there's a growing sense of urgency about energy development at the capitol. Also, many legislators have been traveling over to the Western Slope recently, and they've met with local officials and listened to testimony at public hearings. And the companies have been very good about arranging tours of project sites and providing as much information as they can. I think leadership on both sides of the aisle has a much better understanding of our concerns than they used to." K.C. □

## Brushing Up on Shale Basics



One June day in early-morning darkness, a group of some 35 sleepy people congregated at 5 a.m. in front of the Grand Junction Holiday Inn to take a tour of four oil shale sites. Fortified with coffee, doughnuts and pillows, this intrepid crew boarded a bus and headed out for a first-hand view of federal tracts C-a and C-b, and the Paraho and Colony projects, returning at 7 that night.

This long, tiring, informative and most interesting trip was the culmination of a 3-day course entitled "Western Oil Shale 1981: The Birth of an Industry," sponsored by Mesa College in Grand Junction and Energy Development Consultants, Inc., Golden, CO. The course was conducted by Ed Piper, a man with many oil shale credentials, including plant manager and manager of operations, Paraho, 1973-1978. Presently he is manager of process projects for Stone & Webster Engineering Corp., Denver Operations Center. The course covered in summary many facets of oil shale development, including history, technology, mining, processes, economics and environmental considerations.

A number of courses such as this one are held each year and usually, these courses are open to the public for a registration and materials fee. Some of them sound very technical, and indeed, they are. But a few,

like Mesa/EDC's, are general enough that the average person can get a great deal out of attending. And even the more technical programs can offer valuable information to the layperson with an interest in a particular facet of oil shale development—environmental aspects, for example.

### Sherlock Holmes in shale country

Finding out about the courses can be quite a trick, since there is no one overall source that will tell you about all the various courses, symposia, seminars...coming up. However, if a person is determined, he can find out piecemeal by calling the continuing education offices and/or the science departments of educational institutions. Mesa College is one suggestion; for more technically oriented courses, Colorado School of Mines (CSM) in Golden is another source. CSM, in fact, offers the granddaddy of all oil shale meetings, the "CSM Annual Oil Shale Symposium." Held for 3 days each April at CSM, the symposium brings together developers, researchers, scientists and a smattering of interested laypersons and press. For most of us, the presentations bear some further interpretation, but it's a good opportunity to meet the people most interested in oil shale and hear what they have to say. For further information, contact the Director of Continuing Education, Col-

orado School of Mines, Golden, CO 80401.

### Who's who

Depending on what kind of course is selected, you can expect to associate with any number of people with different interests in oil shale. As an example, at the Mesa/EDC course, attendees ranged from oil-company employees who were just becoming involved with oil shale, to government employees, to manufacturers' reps, to two SHALE COUNTRY editors.

Each topic in the course included some lecture, either by Piper or a visiting speaker, with questions heartily encouraged. Some of the questions were quite sophisticated; most, however, dealt with basic concerns about oil shale. While the course content was quite informative, it was generally agreed that the highlight of the 3 days was the trip to the sites. On the tour, attendees had the opportunity to speak personally with staff at each site, in addition to seeing what the sites actually look like. At Paraho's Anvil Points operations, participants even got a quick course in mine safety, and were given a short, conducted tour of the mine. By the end of the day, when the grimier but wiser attendees returned to the motel, hard hats in hand, most felt that the tour was worth even the early rise and the many hours on the bus. J.P. □

Situation Report

# Union Oil: Graduating to Commercial Production

By Kathy Callahan

**P**hased development—these two words sum up the theme that underlies all Union Oil Co. of California's plans for commercial shale oil production. Should all go well, Union intends to have the first phase of production—a 10,000-barrel-a-day modular plant—in operation by mid-1983. If stage one proves successful, the company expects to construct additional modules, bringing the plant's capacity to at least 50,000-barrels-per-day by 1985.

## Early acquirer

Union, which is considered one of the shale industry's pioneers, began acquiring its shale properties along Parachute Creek in Colorado as far back as 1920. Currently, the company has a 30,000-acre block of property in the area, which contains 20,000



An artist's sketch of Union's oil shale project. The shale oil will flow to storage, the retorted shale will move down a chute to the valley floor (lower right) for vegetation, and a drainage pond (lower left) will capture runoff water for reuse in the retorting process.



Union Oil Co. is constructing these apartments at Parachute.

acres of shale lands, as well as 10,000 acres of valley lands that will be used for plant facilities and pipelines. This land, which is north of the town of Parachute, is owned outright by Union.

In the early 1940s, Union began developing its own experimental retorting process in a lab at its Los Angeles refinery. Then, from 1955-1958, it constructed and operated a semiworks retorting facility on its Colorado property, which processed up to 1,200 tons of shale per day. The low price of crude at that time discouraged Union from constructing a commercial plant, but the company continued its research efforts so the process could be commercialized whenever economic conditions warranted.

According to Jim Cloninger, manager of administrative service in Union's Grand Junction office, "With the information we gained from the semiworks plant, in 1960 we were negotiating a contract with a California utility company to sell shale oil to be used as boiler fuel at a price of about \$3 to \$3.25 per barrel. The contract eventually fell through, though, because natural gas or foreign crude were still even cheaper."

In the early 1970s, following the Arab oil embargo, Union announced it had reactivated its oil shale development efforts and began conducting various design studies. During this time, the company started environmental baseline data collection and monitoring work for its environmental permits and began applying for permits for the first 10,000-barrel-a-day module. Through grants to Colorado State University, the company sponsored revegetation experiments that were conducted by Dr. Bill Berg, an agronomist at the school.

Thus, by 1979 Union had been granted all necessary permits for the mine and retort—the first stage of development. Originally the shale oil was to be sold as boiler fuel; however, because of transportation fuels shortages Union revised its plan to include an upgrading plant for which final permits were secured early in 1981. Union is now forging on with the first phase of the project. According to John Hopkins, president of Union's energy mining division, "Major items of equipment are on order, and we plan to begin erecting them sometime around December 1981. We'll definitely be on-stream in mid-1983."

## Retort reversal

At the Union site, mining will be done by standard underground room-and-pillar methods, which means mining out large rooms and leaving pillars of rock between to support the roof. Retorting, or heating the shale to remove oil from the rock, will be done using Union's upflow retorting process. Hopkins explains, "The retort will be a large, cylindrical-shaped vessel about 100 feet high and 40 feet in diameter, completely enclosed. The crushed shale is fed into the bottom of the retort by a piston (rock pump), which will control the rate at which the rock enters the vessel. Unlike most other processes, the shale is retorted at the top of the vessel. The rock is heated to 900° Fahrenheit, in part by heating and recycling some of the gas that is a by-product of the process itself." Once the oil is removed from the rock, the processed shale falls off the side of the retort, where it is depressurized, cooled and loaded onto dump trucks, and hauled away to be moisturized and compacted for revegetation. The shale oil will be sent to the on-site upgrading facility for the first step of refining. There, elements such as nitrogen and arsenic will be removed from the raw shale oil. The shale oil will then be a premium feedstock that can be processed at existing refineries into a full range of petroleum products.

But the processed shale, or the residue that remains after the oil is removed from the rock, must still be dealt with. Union's Phase I Plan, which has been approved by the Colorado Mined Land Reclamation Board, calls for constructing two disposal piles against the wall of the East Fork Canyon. The piles, which will be revegetated, will take about 10 years each to construct. Cloninger reports, "While we're building the piles, we'll also be testing a number of 1-acre plots using varying amounts of topsoil, different seed mixes and different mulches, and reviewing them periodically. We will be revegetating 100-feet of the pile's surface height at a time, by working from a bench above the pile and from one below. Building the pile is a continuous process, and reclamation progresses as the pile surface becomes available for revegetation. The pile will be revegetated with native plant species, such as the type that grow

on surrounding areas and are suitable for wildlife habitat."

Construction on the Union project began last year, and included improving the mine access road by flattening out hairpin curves and installing drainage and safety features, enlarging the old mine and expanding the mine bench, where the retort and ancillary equipment will be located. The site for the upgrading facility is being prepared, and excavation is taking place to make room for crushing equipment and crushed-ore storage, a warehouse, maintenance shops and offices, all of which will be underground.

When Union obtained its permits for the upgrading facility, it also obtained permits for on-site construction housing. The housing, each unit of which has its own private bedroom and bath, became ready for occupancy in September, and will eventually house up to 1,400 single-status workers. Says Cloninger, "We went this route because it made more sense than a permanent form of housing. During the construction stage, for example, we expect our peak workforce to be about 1,600, but during operations the workforce will only number around 400. Part of the reason for the single-status housing is to reduce the influx of people into the area, and thus lessen some of the impacts on such facilities as schools, sewer and water systems."

Cloninger notes that Union and its contractor currently have about 1,200 workers, most of whom live in communities between Glenwood Springs and Grand Junction. Union's construction contractor is Daniel Construction Corp. of Greenville, SC. "During the first part of a project," he continues, "the contractor usually brings in his own experienced people to staff the operation. Daniel has a policy of hiring local people when available. It also subcontracts with local firms as much as possible, when those firms have the capabilities to handle the job. This helps reduce community impacts because local subcontractors and their employees already have established housing, and they know the area and how to work in it."

Union's 10,000-barrel-a-day facility is expected to be in operation in mid-1983. Cloninger says, "The Phase I facility will supply actual information on capital and operating costs, expenses and economics.



**F**rom a 6th-grade classroom in Grand Junction to the halls of the state capitol in Denver might seem a sweeping change to some, but it's a transition that Republican Rep. Vickie Armstrong has apparently made with ease. Not that Armstrong has given up teaching entirely, for although she has taken a leave of absence under a school board policy that allows for legislative service, she still returns to Columbus Elementary School when the House is not in session. Armstrong, who has taught for 8 years, is currently a reading specialist for 4th, 5th and 6th graders.

A Western Slope native, Armstrong was born and raised near De Beque. In fact, Armand de Beque, son of the town's founder, was her teacher through grade school and high school. After high school she attended

### Vignette

## From the Classroom to Capitol Hill

both Mesa College and the University of Colorado.

Armstrong first became intrigued with politics as a child, watching the national conventions on TV. Later she was an active member of the student body at Mesa College, and after college graduation she became involved with the Grand Junction Young Republicans and served as state Young Republican Chairman. She also worked on Richard Plock's campaign staff when he ran for governor in the Republican primary in 1978.

According to Armstrong, she decided to run for the house in last November's elections because "I always wanted to become involved in the political process, and I had a different philosophy than my opponent. But I certainly gave it a lot of thought before deciding to run, because I knew that if I won, I would have to devote a great deal of time to the job."

Armstrong notes that because of her previous experience with politics, she pretty

well knew what to expect from her first session in the House. But what impressed her most was "the quality of the people on both sides of the aisle. No matter what their political opinions, everyone was very dedicated, putting in a lot of long hours and hard work."

### Legislative notes . . .

The hard work seems to have paid off, for a great deal of legislation that will affect energy-impacted areas was passed during the 1981 session. (See related article on p. 2.) Armstrong was one of the sponsors of much of this legislation, including changes in the way federal leasing money is distributed and prepayments of severance and property taxes. She says, "I think this legislation is extremely important, and I'm very glad to see it come about. I think the Western Slope counties came out well, particularly with the Oil Shale Trust Fund." (The reference is to a bill passed that distributes the entire \$47 million remaining in the Oil Shale Trust Fund to impacted counties. Previously it was disbursed in varying amounts once a year.)

Armstrong also serves as a vice chairman of the Energy Coordinating Council (Sen. Ted Strickland is chairman). This group, which consists of industry and public sector representatives, as well as house and senate members, was set up to review present legislation for necessary improvements.

Besides working on actual legislation, during her first session Armstrong became very much involved, along with House Speaker Bev Bledsoe, in setting up a tour of the Western Slope for leadership of the house and senate last March. Because so much interest was expressed in the tour Armstrong scheduled another one for members of the legislature in September. "I think it's very important," she notes, "for state officials to have a chance to interact with local officials. Even people who are familiar with the Western Slope will find a great many changes have taken place during the last 2 years. It's important for people to see such things as the new community of Battlement Mesa, and the town of De Beque. Once they actually see De Beque's size, it's easier for them to visualize what kind of impacts energy-related growth will have. And there won't just be impacts from oil shale

development on the Western Slope, but also from coal, oil and gas."

Armstrong's main concern about energy development is that "We have orderly growth, of a sort that we can get a handle on. For this, we need strong local officials, and I think we're fortunate because we have them. They've been spending a lot of hours working with the situation. I feel one problem we have to deal with is that many people are just not sure oil shale development is actually about to happen, and I understand their doubts. After all, my father and my grandfather before him were always being told that shale development was just around the corner."



**Rep. Vickie Armstrong** has been involved in arranging tours of Western Slope communities and oil shale projects for members of the legislature.

### . . . And piano notes

Although the 1981 session has recessed, Armstrong's pace has still not slowed down much. She's currently investigating the possibility of the state building its own office building in Grand Junction, rather than leasing a building as it's doing now. She's also doing legislative follow-up work as well as meeting with various groups that need to talk with her. Add to this substitute teaching, and she has very little time for her favorite hobbies—bike riding, tennis and playing the piano. In fact, she says, "The other night I finally got a chance to sit down and play the piano for an hour. It's the first chance I've had in a year."

Nevertheless, Armstrong feels the experience has been worth it. "I've really enjoyed my first session," she says. "I'm impressed with the willingness of everyone there to help you and share their expertise." K.C. □

Perspective

# Oil Shale's Peking Connection

## Chinese visit C-a; Tosco goes to Peking

It may sound like the title of a James Bond novel, but there is a Peking connection between the Chinese and two Colorado shale developers. Unlike Bond, however, no spy-thriller motive is involved—instead, the connection is based on a straightforward exchange of information between the Chinese and both the Rio Blanco Oil Shale Co. (federal tract C-a) and the Tosco Corp. (a participant in the Colony Shale Oil Project). And this fact alone makes the situation intriguing, say U.S. oil shale officials.

Improved relations between the United States and the People's Republic of China have allowed Chinese officials to inspect oil shale tracts in this country, and have sent U.S. oil company representatives to Peking. In one recent tour, a delegation of four high-level Chinese and their interpreter toured tract C-a. And, on a separate visit last year, six Tosco Corp. officials participated in a U.S. technology exhibit in Peking.

Another sign of warmer relations was the selection of Tosco, last spring, by

the People's Republic of China, to help that nation develop its oil shale deposits. As a first step Tosco evaluated oil shale from Mao Ming and the Jilin province at its Rocky Flats Research Center in Colorado.

### Seeing C-a

The recent tour of tract C-a included Chinese engineers with government positions similar to those of U.S. Dept. of the Interior employees. The Chinese came with "many questions," according to Ted Neptune, Rio Blanco's manager of public affairs. Their chief focus was "how we manage technology for positive growth," he added.

Host of the delegation was Fu Hua Chen, a native of China who is an internationally known soils engineer and president of Chen and Associates, a geotechnical consulting firm in Denver. Chen left China in 1949 after the Communist takeover and moved to Denver in 1957.

In 1979 Chen was among a delegation from the American Consulting Engineers

Council who spent 3 weeks in China. The engineers' council then sponsored a return visit for the Chinese, who spent 5 days in Denver, one of seven U.S. cities the group visited.

Chen explains that the Chinese government launched an oil shale project in 1950 in Fuweishun in the Liao Ning province. Another oil shale project was later started in Mao Ming in the Guangdong province. Both these projects use surface retorts to process the oil shale; now the Chinese have also become very interested in underground retorting.

In addition, the delegation that visited this country was interested in the general question of productivity and efficiency of U.S. industrial operations. Notes Chen, "The Chinese don't care about a profit margin," but they do care about productivity. He says a Chinese operation similar to Rio Blanco's would require "five times as many personnel." He explains that the Chinese government bureaucracy, adopted decades ago from the Russians, provides for scant communication between the various ministries and is therefore poorly coordinated.

During the tour of tract C-a, the Chinese were intrigued by the integration of the mining and processing operations. Speaking through an interpreter, Neptune told them that Rio Blanco's modified in-situ process, combining above- and below-ground pro-



Tosco's Peking exhibit was shown to one-quarter million Chinese.



Chinese officials receiving instructions in mine safety prior to touring Rio Blanco's mine.

cessing, "requires a unique combination of both mining and processing techniques."

One outgrowth of the round of U.S.-Chinese visits sponsored by the American Consulting Engineers Council has been a tentative agreement for consulting between the Chinese government and U.S. professional engineers. Chen, a vice president of the council, says the agreement is unique, since in the past the Chinese government has consulted with U.S. government agencies, such as the Corps of Engineers, but never with the private sector.

### An overseas tour

Another exchange of information—this time from the United States to the People's Republic—occurred 1 year ago when the Tosco Corp. was invited to participate in an exhibit sponsored by the two governments in Peking to demonstrate American technology. According to Patsy Annison, director of special projects for Tosco, it was the only oil shale project included in the exhibit. She adds that the event was part of the normalization of relations between the two countries.

Annison, who speaks no Chinese, coordinated all the arrangements for the display and the trip. She recalls she spent months in painstaking preparation for the exhibit of

the Colony Project (Exxon Corporation is the other project participant), which included a model of the planned 47,000-barrel-a-day operations and a film, narrated in Chinese. A brochure, produced by a New York firm, was also written in Chinese.

In addition to the language barrier, Annison also faced logistical-cultural differences. The U.S. Dept. of Commerce, the government agency that chose the exhibitors, had a quota of 800 Americans, for whom the Chinese were to provide 800 beds. Annison recounts, "That meant 800 beds, not rooms—you could end up sharing a room with total strangers."

The exhibit itself drew a quarter of a million people during 10 days. They came by Chinese-government invitation only, from ministries, universities and research centers. Annison says the Chinese government provided interpreters and explainers (the latter being persons versed in technology)—all "immensely helpful" in translating questions from those who came to view the exhibit. Tosco personnel manning the exhibit were Sherm Brady, George Kane and Mark Loveland.

Visiting a foreign country for the first time, Annison initiated her own cultural exchange when she decided to visit the Great Wall of China and the Ming tombs the day

before the exhibit. Annison attempted to ask at her hotel if she could engage a taxi for the day. "A great cluster of people gathered about me, trying to understand what I wanted." The result was that a taxi dispatcher at the hotel agreed—she thought—to provide a good car and a driver who spoke some English. But when the driver and car arrived, Annison was somewhat aghast. Looking at the dispatched vehicle, she recalls, "I could not believe it would go anywhere for 2 hours," much less a day. And the driver spoke not one word of English.

However, by the day's end, she had visited all the places she had intended to see. She used a guidebook that listed the sites in both the English and Chinese languages, and she relied on pantomime to communicate with the driver. Luckily, the vehicle also cooperated.

Personal and official communication barriers overcome, and her "advance" work completed, Annison returned home and was replaced at the exhibit by technological personnel from Tosco. There is, however, a memento of the experience. Today, the display—recaptioned in English—is exhibited at the visitor's center in Battlement Mesa, the Colony Project's new housing development. C.E. □

## From Burma to Denver

Fu Hua Chen, who recently guided Chinese government officials during a tour of shale country, is an established Denver soils engineer who was born and grew up in China before the Mao Tse-tung revolution.

Among Chen's professional credits is his service in the 1930s as chief engineer for construction of the 717-mile Burma Road that stretches from southwestern China to Burma. He became involved with this project after his graduation from the University of Michigan and the University of Illinois in 1935 and 1936. This gargantuan road project was ordered built by Generalissimo Chiang Kai-shek in 1937; Japanese troops had marched into China, and Chiang Kai-shek decided that a highway link to the Western world was vital. Unskilled workers

used hand tools to move millions of cubic yards of dirt and rock. Construction began in 1939, and the road was usable in 1941.

After Mao won control of China, Chen moved to Hong Kong in 1949 and to the United States in 1957. He and his wife Edna came to this country to seek schooling for their three children. Chen founded his own company, Chen and Associates, in 1961.

Among the company's energy-related work has been research for oil shale companies. In the laboratory, workers are studying the unique problems of spent shale disposal. Work is also progressing on stability characteristics of surface excavation—addressing such questions as how steep the excavation bank can be.

Chen, age 69, says most of the firm's clients are private. "We like clients like Tosco and Exxon. In government, there's a lot of red tape. Oil shale work is especially challenging since it is state-of-the-art technology," Chen notes, adding, "We're glad to be part of the team."



**Fu Hua Chen**, Denver soils engineer, helped build Burma Road, today tests spent shale piles.

## Safety First: Managing Methane in Mines

Denver residents know when the city's air quality is below par: The famous brown cloud hangs over the skyline, and downtown shoppers can smell exhaust fumes as they wait to cross traffic-clogged streets. This evidence of pollution reminds city dwellers of health hazards in the atmosphere and leads some to take precautions, such as reducing outdoor activity when the air quality is poor.

However, not all dangerous substances in the air can be detected as easily as the brown cloud. For instance, methane, a colorless, odorless gas that is highly explosive when combined with oxygen in the right proportions, can only be detected through scientific testing, or in the worst case, when an explosion occurs. Methane, which is the basic component of natural gas, is often

contained in carbonaceous rock formations when hydrocarbons are trapped for a very long period of time, and because it is likely to be found in coal and shale deposits, can create special hazards for mine workers. So, for safety reasons, mine operators test the mine air for the presence of methane on a regular basis.

Also, as a regular inspection procedure, the Mine Safety and Health Admin. (MSHA) tests for the presence of methane in mine air by taking routine samples of exhaust air and analyzing it. All mines—no matter what mineral is being extracted—are tested for the presence of the gas, and, according to Jack Petty, subdistrict manager for MSHA in Denver, "If we suspect that there may be methane present, we test more frequently and in all areas of the mine."

Although a 5-percent concentration of methane is the lower explosive limit, MSHA will classify a mine as gassy for lesser percentages. Regulations state that a mine is gassy if:

- Methane is present in concentrations of .25 percent within 12 inches of the back (roof), face or ribs (walls) of the mine;
- The state government where the mine is located deems it gassy;
- Flammable gas has been ignited in the mine; or
- The mine is connected to another mine that has been declared gassy.

"When a mine receives a gassy classification," says Petty, "certain safety measures must be implemented by the mining company. For instance, ventilation must be maintained, only equipment with special safety features (called permissible equipment) can be used in certain areas and that equipment must be kept in permissible condition. MSHA then follows up as much as possible to see that these conditions are instituted and maintained."

### The shale situation

Although both coal and oil shale can contain methane, reactions to the gas are not entirely alike. For example, according to Nick Arentz, mining engineer for Rio Blanco Oil Shale Co., methane in coal mines is especially hazardous because "with coal, the dust is highly explosive. When gas ignites in a coal mine, the explosion will lift enough coal dust to continue the explosion. Thus, in coal mines, an inert rock dust, such as limestone, is sprayed on all coal surfaces to minimize the danger of a chain reaction.

"While oil shale dust can be explosive, it is regarded as less hazardous than coal dust. So far, there haven't been any problems with the dust in oil shale mines, so there are no federal regulations that require special treatment. Also, the quantities of methane associated with oil shale are generally much lower than those with coal, and methane liberation is most commonly associated with blasting operations."

Arentz is familiar with methane considerations because Rio Blanco's mine on federally leased tract C-a in Colorado is one of three oil shale mines that have been classified as gassy. The others, also in Colorado,



**This front-end loader** is used to haul blasted rock from the mine's working face; in a gassy mine such equipment must be certified permissible.

are the Cathedral Bluffs project (federally leased tract C-b) and Multi Mineral Corp.'s experimental mine on U.S. Bureau of Mines property near Meeker.

Having MSHA classify a mine as gassy is seldom welcomed by an oil shale operator, because it requires more extensive and more costly procedures and equipment, the standards for which originate largely with coal-mining operations. However, gassy-mine safety standards do add an extra measure of protection that may be beneficial during early development of a new mine, when methane is recognized but its severity is not well-established.

### Preventive medicine

One of the primary methods for dealing with gassy mines is to substantially increase ventilation throughout the mine. "By increasing ventilation," Arentz explains, "you dilute the gas to below the dangerous level. Increasing airflow through the mine, though, requires certain engineering measures, and these can be costly."

As an example, a non-gassy mine may be developed with only one entry or drift (a long horizontal tunnel). However, in a gassy mine, MSHA regulations require that two parallel entries be dug, and that every 100 feet an interconnection—called a crosscut—be constructed to allow air to circulate (see accompanying diagram). As development continues and the mine is enlarged, new crosscuts are constructed, and stoppings are placed in previous crosscuts to prevent mine air from reaching the working face. A fan is installed to draw the air through the mine, replacing the underground air with fresh air from the surface.

In order to meet federal standards, a certain volume of air must flow past the last open crosscut, which is the interconnection furthest into the mine. These standards require that at least 6,000 cu. ft./minute of air flow past the last open crosscut so that the methane level never exceeds 1 percent. When the volume of airflow cannot be maintained or the level of methane exceeds 1 percent, the mine must be evacuated until the situation is corrected. Also, if any methane is detected in the airflow through the intermediate connections, more fans must be installed.

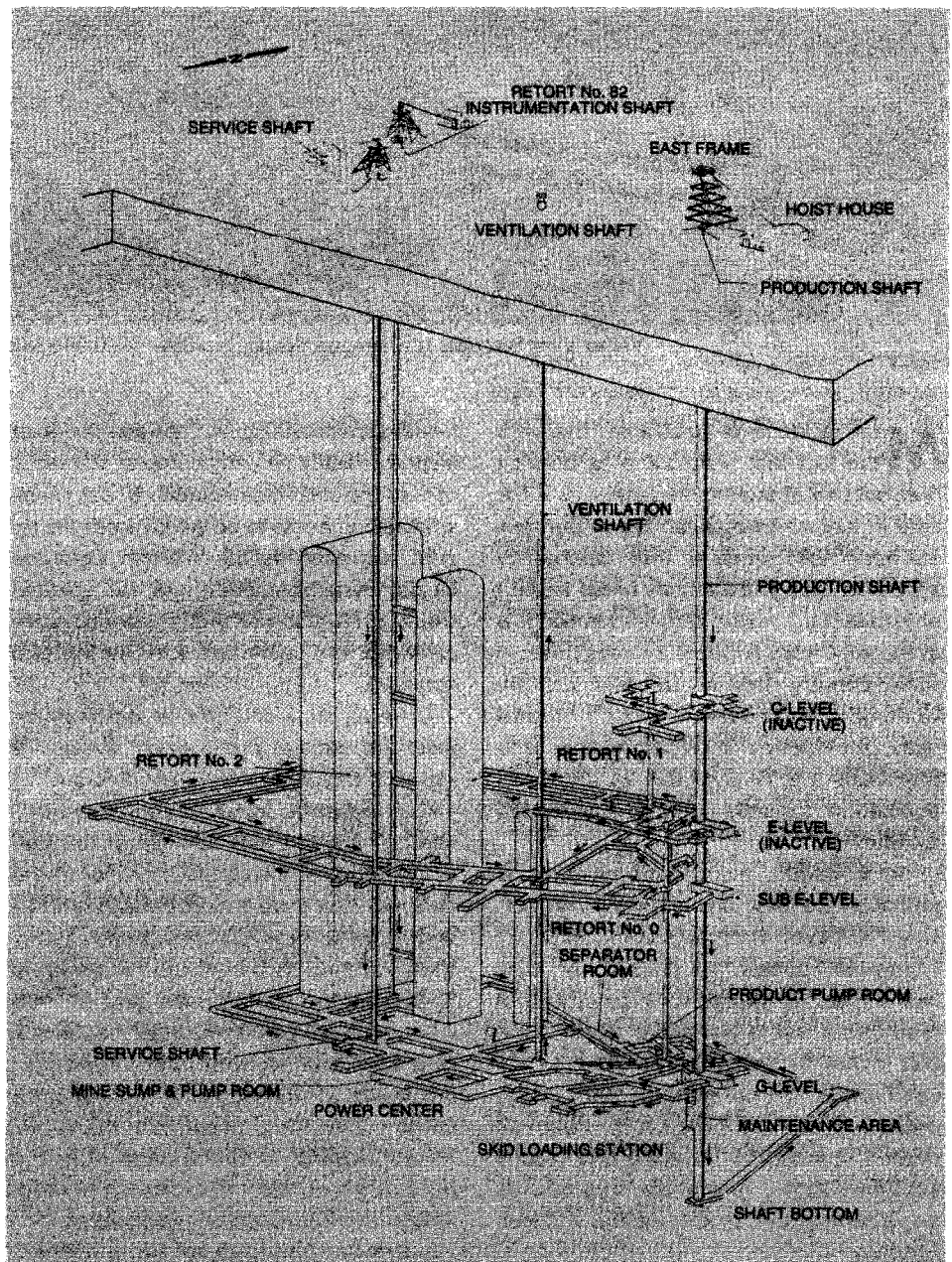
In addition to air-quality requirements,

MSHA requires miners to use equipment rated permissible when working in the area beyond the last open crosscut. This equipment is specially constructed to prevent sparks from igniting flammable gas that may be present in the work area.

Arentz notes that Rio Blanco also incorporates all other standard mine-safety procedures. "For example," he says, "all miners are required to carry a device called a

self-rescuer, which, in case of an emergency, eliminates the danger of carbon monoxide poisoning."

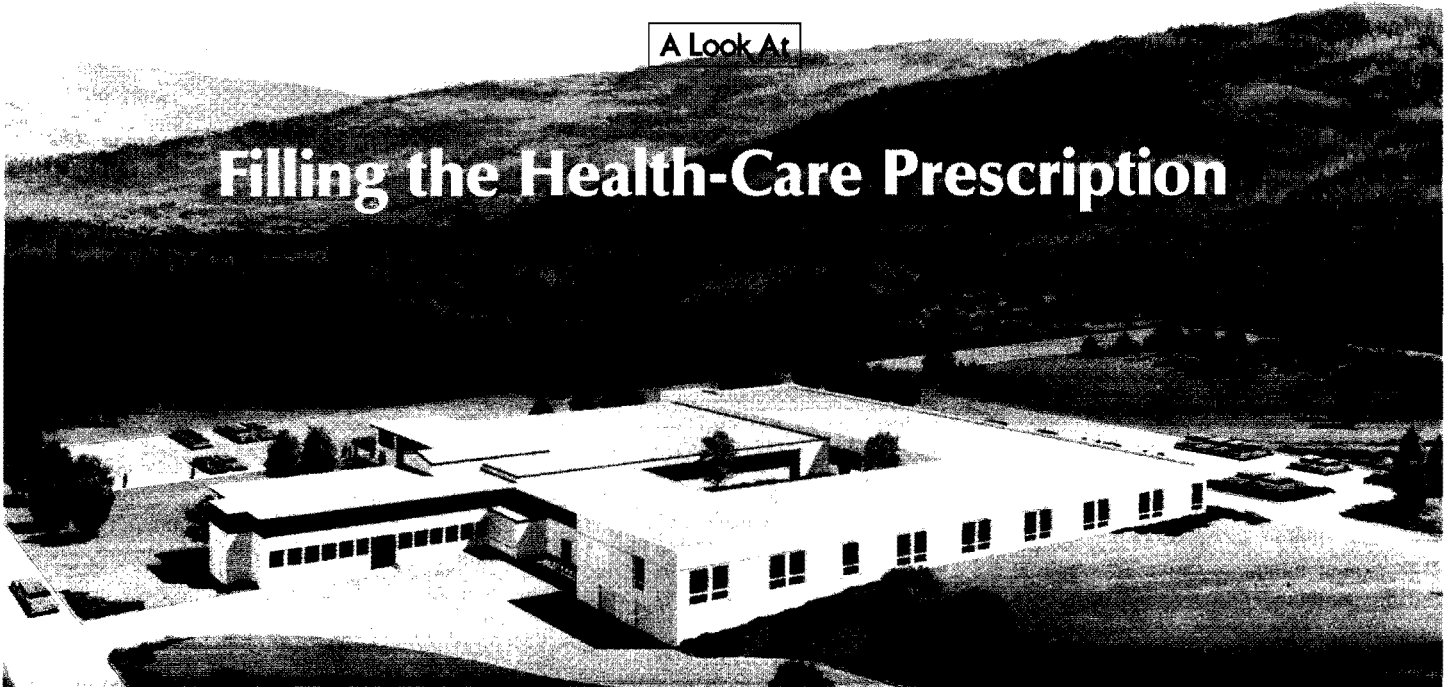
Arentz concludes, "Installing these safety measures is a costly proposition, but necessary. If there is no methane present in a mine, developing oil shale is a lot less expensive. But even when the gas is present, once safeguards are implemented, I don't see any serious risks." A.W. □



A drawing of Rio Blanco's mine ventilation system; the arrows show the direction of the airflow.

A Look At

## Filling the Health-Care Prescription



Valley View Hospital in Glenwood Springs currently has a 98-percent occupancy rate.

Most residents of rural areas live with the fact that a doctor or a hospital may not be just around the corner, as is the case in larger metropolitan areas. But they do hope that when a true emergency arises—or even when Johnny needs to see a physician for a sore throat—someone is available, even if it means a longer drive. In shale country, health-care planners are working to make certain enough hospital beds, emergency services, nurses and physicians *will* be available as the area's population expands with energy-related growth.

"In Colorado, health-care planning is probably the best organized human service," believes Mary Jo Jacobs, M.D., of Glenwood Springs. "It's probably because health care is generally a pay-for-itself proposition that only requires some front-end money to set up the service." Jacobs emphasizes, however, that being well-organized doesn't necessarily mean all needed services are in place and readily available. Rather, it indicates that officials are planning and evaluating the situation regularly.

While the planning for private health care is generally done by individual counties or

health-care providers, in Colorado, the state Dept. of Health recently completed a study of Garfield and Mesa counties to determine what action needs to be taken there. The report, requested by the Western Colorado Health Systems Agency and the Garfield County Human Services Comm. concentrated on health services in the two counties.

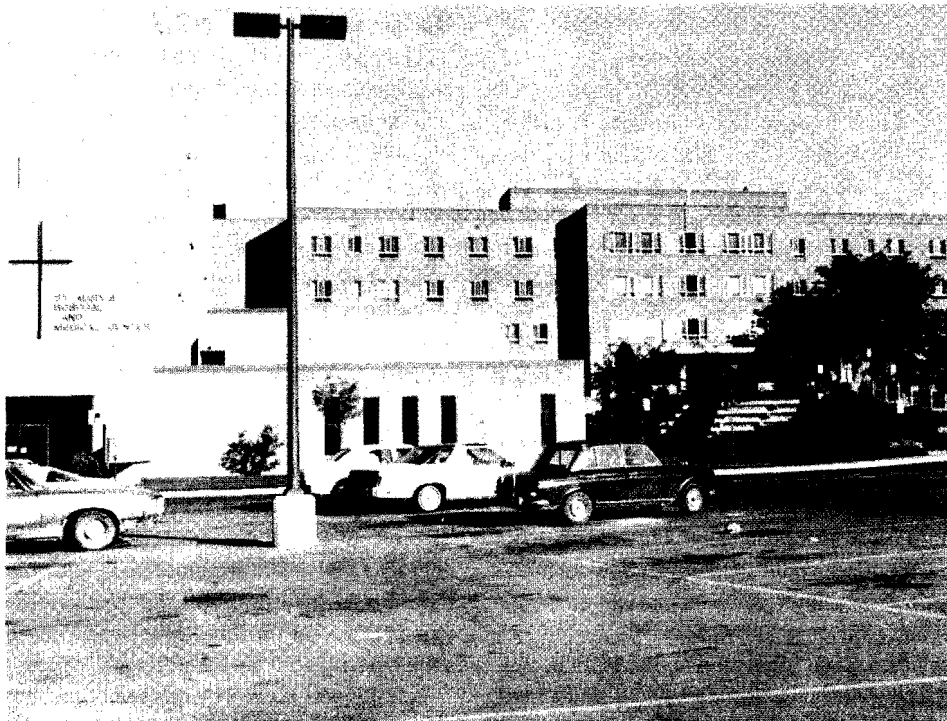
"The report found that at the moment there are enough primary-care physicians (general practitioners, family doctors...) and ambulances, to take care of the area's needs," explains Judy Glazner of the Colorado Dept. of Health (CDH). "But it did conclude that there are not enough hospital beds in some areas." As an example, Valley View Hospital in Glenwood Springs has a 98-percent occupancy rate, and patients who are having elective surgery are being rescheduled or delayed until the hospital has space. However, Valley View is presently considering expansion plans. St. Mary's Hospital in Grand Junction is also becoming crowded, but expansion plans for a burn unit and more specialized-care facilities have been approved. In contrast, the hospitals in Rangely and Meeker are under-utilized, says Jacobs, although this

will probably change as the population increases, according to the report.

### Theoretically, enough doctors

The report concluded that while Western Colorado statistically has enough physicians to take care of health-care needs, individual communities may nevertheless encounter a shortage. This can occur because the health-care personnel tend to be clustered in the more populated areas, leaving small communities more isolated. "While physician shortages have been reported for Wyoming and Montana boomtowns," the report states, "it appears that Colorado's Western Slope may not face this problem to the extent reported in those areas. It is possible that Colorado's Western Slope may be a more attractive place to live than the Wyoming and Montana energy resource areas, and there could be an adequate supply of primary care services." But if recruitment efforts are not maintained, the report warns there could be physician shortages as early as 1982.

"Manpower could be a problem in some areas," admits Jacobs. "Even though we theoretically have enough nurses and sec-



**St. Mary's Hospital** has plans for expansion.

retaries for the hospitals and clinics, the industry moving into the area offers higher salaries that could pull some individuals out of their field and into another in order to earn more money." But for now, she believes most people do have access to a doctor or nurse if they need help.

The doctor population in many shale country communities has remained fairly stable in recent years. For example, during the 70s, Rifle has had 4-6 doctors in town, while Meeker and Rangely have had 1 or 2 each. However, in other areas of shale country, rather dramatic growth in the numbers of physicians has occurred. At Glenwood Springs, for example, during the past 10 years, the number of doctors associated with Valley View Hospital has increased from seven to 38.

#### **Quick action needed**

Ambulance service and other emergency care was another focus of the study. Generally, adequate ambulance service is available now, it concluded, but area residents shouldn't take that to mean they will get the same speed and response time as do people in metropolitan areas.

Because of the often long distances be-

tween hospitals and accident sites, those who are critically injured may not be able to get to an emergency room quickly. "The Colorado Emergency Medical Systems (EMS) Div. estimates that the lives of victims of major trauma are particularly threatened if specialized hospital emergency care is not received within 1 hour after the onset of injury," the report warns.

In addition, anyone who suffers a heart attack is likely to die or suffer severe brain damage if appropriate care is not received in 4-6 minutes. To help that situation, the report suggests that rural residents learn cardio-pulmonary resuscitation (CPR) in order to help people who have had heart attacks. State patrolmen are also being trained as emergency medical technicians, since they are usually the first on the scene of a car accident.

Response times to the scene of an injury could be reduced if helicopters were used more, the study also suggests. One helicopter is already in operation from St. Mary's Hospital, and the Colorado EMS Div. notes that an additional helicopter might be located in the eastern end of the oil shale and coal belt. Such a helicopter could serve Rio Blanco, Northern Garfield

and Moffat counties as well as portions of Eastern Utah and Southwestern Wyoming. That would leave Mesa County, parts of Garfield and Delta counties, as well as parts of Eastern Utah to be served by St. Mary's helicopter.

#### **Public health woes**

Public health care, however, is not in as good a shape as its private counterpart. It is suffering from what ails many other services in shale country—not enough front-end money to provide the services as they are needed. "There's a definite shortage of people in the environmental health field," says Jacobs. "The number of water and sewer systems, mobile-home parks, houses and restaurants that need to be inspected is increasing, but the counties don't have the tax base yet to pay additional salaries for inspectors. As the area grows, there will probably be enough money to hire extra personnel, but for now there just isn't enough."

Oil shale companies and others in the energy field are working with communities and hospitals to provide more front-end money and services to the Colorado sites. Industry money, for example, was used to help pay for St. Mary's helicopter, and on the Colony and Union sites, the construction companies are providing ambulances, nurses and paramedics to cope with any injuries to their employees.

Public health-care services aside, it is expected that most, if not all, of the health-care expansion that is anticipated will be self-supporting once the clinics or hospitals are built. For example, private clinic interests from California and Arizona have already expressed interest in locating in the area. "It's definitely a free-enterprise system for the most part," Jacobs adds.

While there may be local shortages of health-care facilities and personnel in Colorado's shale country, local and state officials are continuously studying and planning for the additional people who will work in and around energy development. It is hoped that with monitoring and cooperation among everyone involved, those who need it will always be able to receive adequate health care. S.L.P. □

*In a future issue of SHALE COUNTRY, health care in Utah's impacted areas will be examined.*

# Lab Scientists Study Shale's Secrets

"They shall beat their swords into plowshares..." seems an unlikely motto to apply to oil shale development. But at one time, this sentiment expressed an attempt to use nuclear explosions in an on-going, government-sponsored shale research program that began in the 1960s. The nuclear device represented the sword, and the program, Project Plowshare, was initiated to develop peacetime applications for this energy source. Under the project, one of the avenues explored was using nuclear explosions to fragment and process shale seams in-place. Although this application was deemed unworkable, certain technologies produced when developing and testing nuclear weapons have been used in studying methods of shale oil recovery.

Project Plowshare has long since been terminated, but two of the organizations involved in developing and testing nuclear devices—Sandia National Laboratories, a wholly owned subsidiary of Western Electric Corp., located in Albuquerque, NM, and Lawrence Livermore Laboratory in Livermore, CA—continue to be active in government-sponsored shale studies. And, although individual companies constantly carry out their own development programs, these two labs are exploring specialized areas of technology that may benefit everyone involved in shale research.

## Sandia: technology in the field

Sandia's research is not confined to the laboratory, however, for although lab experiments provide information necessary for developing and understanding recovery processes, many field conditions cannot be

duplicated in such a setting. This fact is underscored by current and past efforts that have focused on underground extraction (true in-situ and modified in-situ retorting) of shale oil.

When shale is retorted above ground, the characteristics of the site of the shale bed are relatively unimportant to preparing the retort. The situation changes, though, when dealing with true and modified in-situ retorting. Preparing these retorts entails fracturing the shale and introducing voids by displacing the rock around the bed (true in-

situ) and mining out a portion of the shale (modified in-situ). Thus, site-specific characteristics, which cannot be adequately reproduced in a lab, will often determine the success or failure of a preparation scheme.

Ben Bader, division supervisor for Sandia's In Situ Processes Div., emphasizes the importance of field research by recounting a shale-bed preparation scheme tested at two sites near Rock Springs, WY. This true in-situ bed preparation technique involved inserting and detonating slurry (thick liquid)



LLL retorts light up the night.

explosives in previously hydraulically formed fractures. The intent was to create a rubble bed of shale sufficiently porous and permeable to permit successful retorting. "But," Bader explains, "because of natural fracture systems at the sites, the ultimate disposition of the slurry could not be controlled. Detonating the slurry produced fractures within and outside the region of the intended beds, and within these beds, permeability was only slightly enhanced. The bottom line is that we found that this technique neither creates the conditions necessary for retorting, nor does it permit—because of the extensive fracturing—using adjacent sites for efficient resource recovery."

According to Bader, much of the technology and experience used in the Rock Springs and more recent tests is derived from Sandia's activities in developing and testing—particularly underground testing—of nuclear devices. "The capability of performing remote acquisition and analyses of real time data, and the ability to perform sophisticated computerized modeling of shale bed response to blast effects are but two instances of this technology transfer," says Bader.

Among the firms that Sandia is currently working with are Geokinetics, which is developing near-surface, true in-situ horizontal retorting in Utah, and Occidental, which is developing modified in-situ vertical retorting in Colorado. The technology that Sandia has applied and is developing in cooperative programs at the field sites of these two firms is not, however, directed toward developing a site-specific processing method.

"Sandia's efforts," Bader reports, "are funded by the Dept. of Energy (DOE, and the DOE is concerned with developing technology for shale oil extraction using data acquired from a variety of processing techniques at a variety of sites." By collecting and analyzing field data and by performing supporting experimental studies in the laboratory, Bader explains, Sandia is helping to generate an integrated body of information that will identify and describe the means for controlling critical parameters in the principal phases of shale oil recovery, from bed preparation to actual retorting.

#### And from California . . .

Lawrence Livermore Laboratory (LLL) has also been involved in applying nuclear

technology to retort development. "Our first interest came with the Plowshare Program," explains Art Lewis, project leader for oil shale research, "but that work was discontinued in early 1972. The present program, begun shortly after the first was discontinued, was initially directed at modified in-situ retorting, but has since been extended to surface retorting as well.

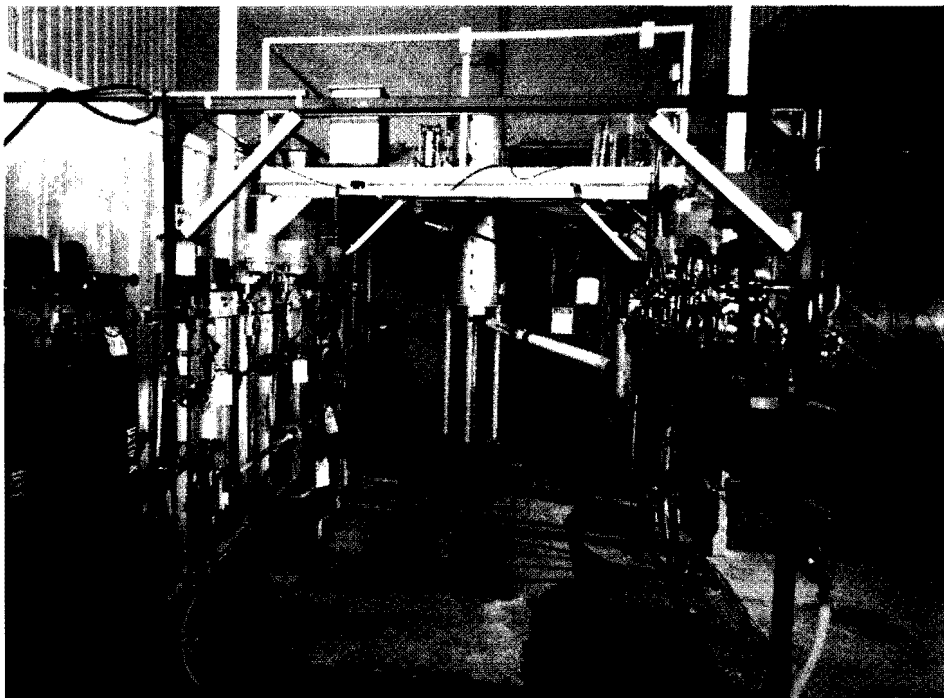
"Our work is directed at discovering the basic chemistry of retorting. The studies examine the chemical and physical changes that take place in the shale during the retorting process."

The work done at LLL is also funded by DOE, so, "The information we gather is not proprietary," says Lewis. "The lab itself is managed by the University of California, and the results of the studies performed are published in various scientific journals. Some preliminary reports, containing information on such areas as retort chemistry, are published in the University of California Research Reports series, and other findings have been printed in publications such as 'Chemical Engineering.'"

LLL has extensive laboratory facilities, including two experimental retorts, one of which measures 20 ft. high by 3 ft. in diameter and the other 5 ft. high by 1 ft. in diameter. These are used to examine chemical and physical changes in the shale during the actual retorting process.

"From our research," says Lewis, "we helped develop process and control strategy, which is the operating conditions and the methods for controlling the temperature and other conditions in an in-situ retort. Much of this technology was adopted by the Rio Blanco Oil Shale Co. and was used in operating their Retort Zero at federal tract C-a." (Retort Zero was ignited last October, and produced approximately 1,750 barrels of oil. The company ignited a second demonstration retort last June.)

"Through work such as this," Lewis continues, "we hope to provide a basic understanding of the conditions and chemistry involved in retorting shale. The general objective of the research is to provide fundamental data and information for private industry to build and expand upon in the development of oil shale as an energy source." A.W. □



The vessel, plumbing and collection system for LLL's 5' x 1' retort.

"One big family" is a term that surfaces often when talking about their community with residents of Rangely, CO. But it's a family that is expanding rapidly as the town feels the impact of energy development, not only in Colorado, but across the border in Utah.

Projections by the Colorado West Area Council of Governments (COG) show Rangely's current population of 2,000 expanding to 6,500 by 1985, then jumping to almost 20,000 by 1990—a tenfold increase in as many years. That adds up to a family with a lot of cousins, aunts, brothers and in-laws. "We are definitely going to receive impact (from energy development) and we have to learn to deal with it," comments Rangely Mayor Peggy Rector. "Hopefully, we're learning to do this in a cooperative effort, rather than butting our heads against a wall."

Although Rangely's population has remained relatively stable in recent years, local residents are beginning to feel the rumblings of the approaching growth surge. Explains Marguerite Majors, a resident for 19 years, "It used to be you could drive down Main Street on a Saturday and not hit a thing. Now, though, there seems to be traffic constantly, especially in the rush-hour

times during the week."

"We don't keep statistics," adds Ruth Miller, who, with her husband, Bill, owns the Gambles store, "But we can tell by our ordering that we are seeing increased sales." Other businesses in Rangely, from restaurants to grocery stores, are also beginning to feel the effects as energy development unfolds. Once-abandoned buildings downtown are being painted and repaired, now that an increased population can support the installation of new businesses.

## Community Profile

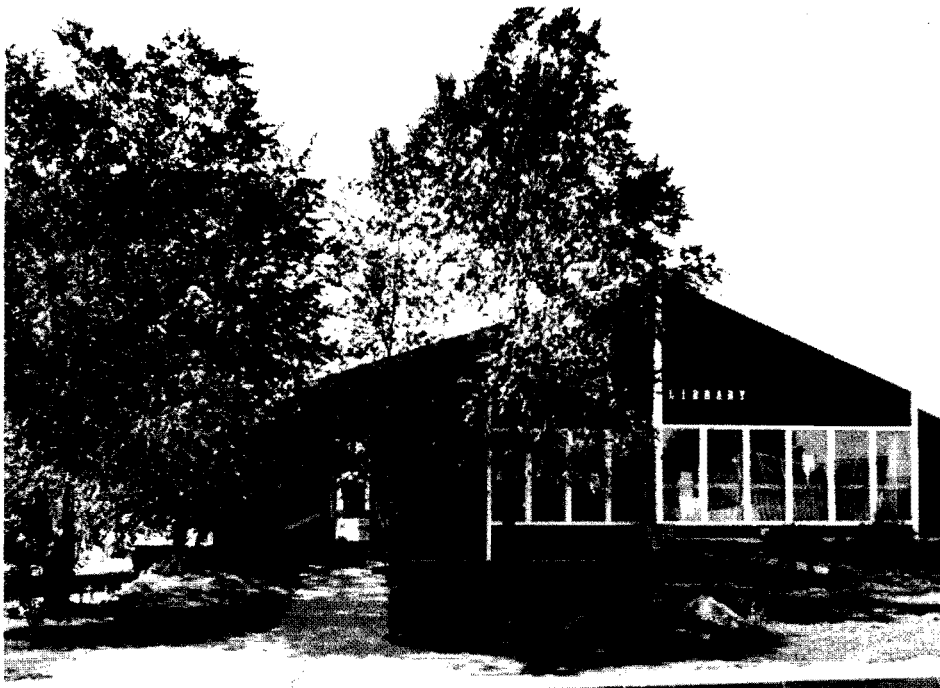
# Rangely: Adding a Touch of Sophistication

By Susan Luzader Prust

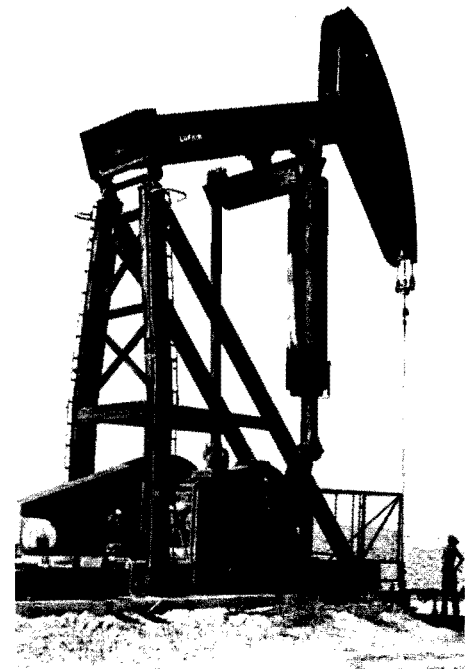
"So far," reports Majors, "the growth has been very orderly because people try to watch out for the town." But she, along with other residents and local officials, fears the projected growth leap could turn that order into chaos if adequate planning and funding are not developed along with the increasing population.

### Finding the funds

And money could be a problem in Rangely since, although it is surrounded by



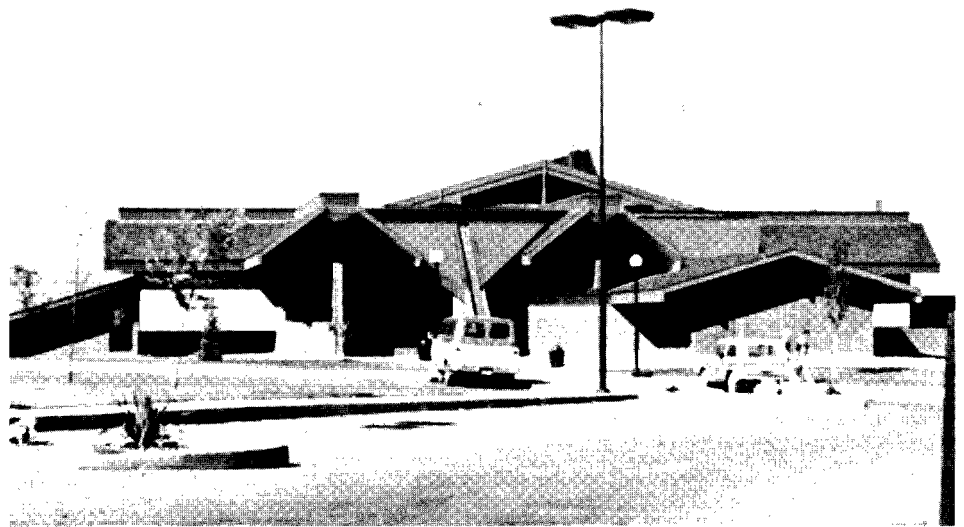
Rangely's public library was built in 1971.



One of many oil rigs in the Rangely Field.

oil and gas fields, as well as coal and oil shale deposits, town money generated by the vast energy reserves has been almost nonexistent. "Rangely can, perhaps, best be characterized as a 'pocket of poverty in a land of immense wealth.' It has a \$5.3-million assessed valuation versus a \$212-million assessed valuation for Rio Blanco County," contends Rich Levengood, Rangely's assistant manager for special projects. "Oil is, literally, pumped out from under the streets, yet the town realizes not one dime in direct severance-tax revenue from this oil nor any ad valorem (property) taxes from the oil and gas fields located in the unincorporated area surrounding the town." This situation occurred because town limits don't include any of the oil and gas fields, so the city cannot collect property taxes, but recent amendments in the state's severance-tax law will make it possible for Rangely to collect some oil and gas severance taxes in the future. Until the law was amended, oil and gas extraction was not included in the dispersal of severance taxes (See related article on page 2.)

But, since it is the closest town to many energy developments, Rangely must provide services and housing to those who work in the mines and oil fields. That means



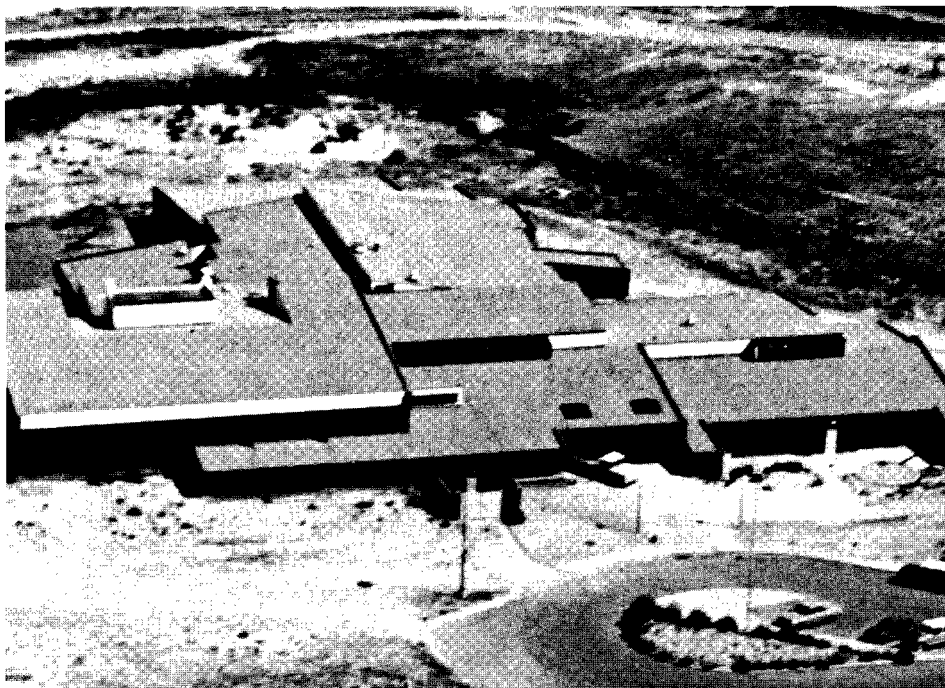
Homeowners banded together to build the recreation center.

more water and sewer facilities, improved road systems and expanded services that must be planned, built and paid for. "We have to keep up to speed in every area," emphasizes Mayor Rector. "This means small towns such as ours have to become more sophisticated and develop a staff that can cope with the growth."

Rangely officials are working to acquire that sophistication before they are enveloped in a soaring population. "The town council members and the mayor used to have the time to deal with water leaks, or any other problem that came up," explains Rector. "But that has all changed—now, we're limited strictly to making policy since that is all we have time for."

Rangely has increased its town staff, but Rector feels it isn't as large as it needs to be. A community development department to deal with housing was recently established, but Rector would like to see Rangely also acquire a town engineer as well as an expanded financial staff. "We need to get these people on board prior to the impact," she adds. "Otherwise, we won't have the expertise to deal with the problems caused by growth."

So far, the largest problem Rangely residents and officials are facing is the lack of housing as more people move into the community. "Right now, we simply don't have a vacancy rate. That term is not applicable to Rangely," Rector says. When homes can be found, their cost is usually prohibitive—as much as \$65,000 for a 1,000-square-foot house. With housing payments now reaching \$1,500 a month, town officials are searching for ways to hold down costs while making more homes and apartments available.



Rangely's elementary school is just one of the new faces in town.

## A possible solution

Rector thinks the town has found one way to ease the housing crunch: by making city land available to developers at cheaper rates than lots sold by private owners. After negotiating with the Bureau of Land Management (BLM), Rangely has purchased 106.87 acres of federal land at a cost of \$500,000. (Almost 44 percent of the land surrounding Rangely is owned by BLM.) The land has been appraised at \$4,500 per acre for residential and \$7,500 per acre for commercial development. Town officials plan to make the land available to private developers at those rates, which are considerably lower than private land that has been selling at \$45,000 per acre for residential and \$65,000 per acre for businesses and industry.

A special committee is screening the de-

chases and rent in the near future. Adds Rector, "We believe we can help put something into place that is affordable."

## More money sources

Another way Rangely is hoping to cope with energy-development impact is with the money it has received from Western Fuels-Utah, Inc. After extensive negotiations, Western Fuels agreed to give more than \$7 million to Rangely to help provide housing and services for employees. Western Fuels is expected to start construction this year on its Moon Lake Power Plant in Utah, but since Rangely is one of the communities closest to the project, some of its 400 employees may live in Colorado, with very little tax benefit to Rangely. Western Fuels will also have a coal mine approximately 7 miles east of Rangely to provide fuel for the

be preserved by providing services and housing. Keeping the rural flavor of the community is important, especially to those residents who were drawn to the area because of it. "I have to admit it was an adjustment at first after living in the Denver area," explains Miller. "But once we became established, we never wanted to leave. Rangely is like a big family. When someone hurts, everyone chips in."

One example of the family concept occurred this year when a young man who had recently moved into town was injured and had to be hospitalized. A quiet movement was started to raise money, and the town generated enough to enable the boy's parents to fly out to be with him until the crisis had passed. "It was not a big deal as far as we were concerned," says Majors. "We just wanted to help them without any big fuss."

Since its beginnings as a ranching and Indian trading center in 1882, Rangely has continued as a small, secluded community. Even with the discovery of the Rangely Oil Field after World War II (the largest oil-producing area in the Rocky Mountain region), sheep and cattle ranching remained an important part of the local economy. But as energy development progresses, residents will find their numbers increased by those who have moved to the area seeking jobs. "We're all working hard, though, to try and make the newcomers feel welcome," explains Miller.

Not everyone is welcoming the growth enthusiastically, but many residents are trying to make the adjustment and retain Rangely's personality. One benefit has been that residents seem to be taking more pride in their homes and striving to keep them in good shape. "We've been selling lots of paint, wallpaper and hardware lately," explains Miller. "People have been paying more attention to their homes since we are trying to encourage residents to clean up, pretty up and beautify their homes, and as a result, the town."

With continuing community spirit and efforts to keep the town a good place to live, residents and officials feel Rangely has a chance to be the showcase of the Western Slope. "Generally speaking, Rangely is a fantastic place to live," believes Miller. "We know there will be problems as the growth continues, but we can handle them." □



Colorado Northwestern Community College is housed in Rangely.

velopers who have applied to purchase the land, and will recommend three-five to the town council. The council will make the final decision, after studying plans submitted by the developers, on who will be able to buy and build on the land.

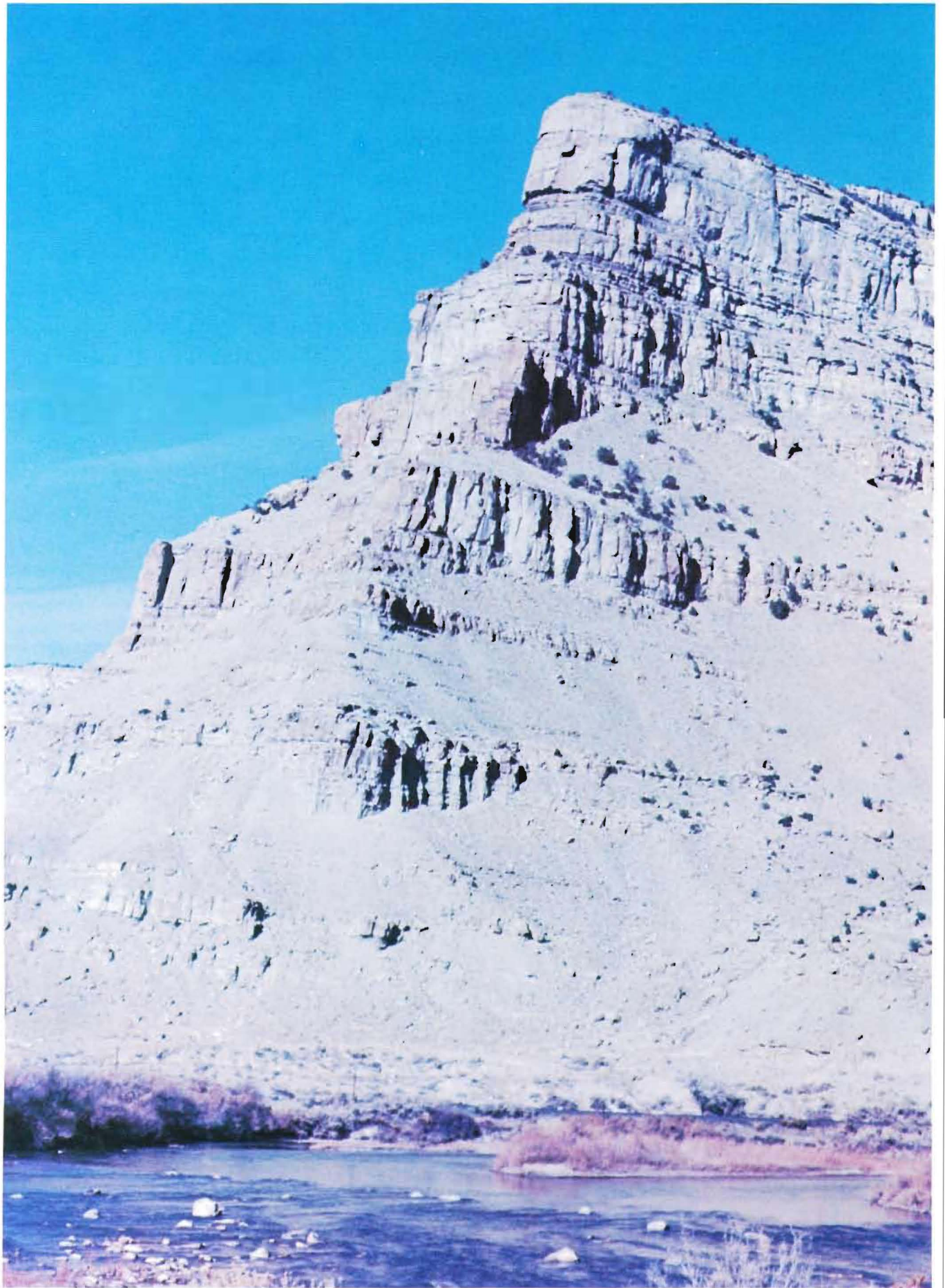
"This is a very intricate project," explains Rector. "It hasn't been done before, and we have housing specialists from Washington, DC, who are helping us to define the issues and deal with the contracts." Potential developers must meet stringent requirements on types of housing and site development, and they are restricted from raising the price of the land, except for an inflation factor. Town officials have received many inquiries from private developers about purchasing the land, and they are hopeful it will mean as many as 500 units available for pur-

plant as well as an electrical train system to move the coal from mine to plant.

A detailed agreement specifies how the money is to be used and provides for increasing the payments if the population growth in Rangely is greater than anticipated. The agreement with the coal company is a major example of the sophistication Rector thinks her town is developing. "We went out on a limb on this project. We had to hire people to put together the vital information we needed before we could go to the company and request funding," she adds.

## Keeping the character

But it's not just obtaining funds that concerns Rangely officials and residents. It's the way the town's character and stability can



**Fall comes** to shale country.

Mountain Empire Publishing  
200 Fillmore Street  
Denver, CO 80206  
ADDRESS CORRECTION REQUESTED

BULK RATE  
US POSTAGE  
PAID  
PERMIT NO. 489  
DENVER, CO

