Open-File Report 80-8

The Effects of Mineral Conservation Legislation on Colorado's Aggregate Industry

by Stephen D. Schwochow

1980

Colorado Geological Survey
Department of Natural Resources
Denver, Colorado

(Reprinted from Resource Series 8, Proceedings of the Fifteenth Forum on Geology of Industrial Minerals)

PREFACE

The Colorado Geological Survey has printed this paper separately from its recently published Resource Series 8, Proceedings of the Fifteenth Forum on Geology of Industrial Minerals. Interest in this paper following its presentation at that forum in June 1979, and again in October at the annual meeting of the Colorado Sand and Gravel Producers Association has brought about this release mainly for local distribution.

Events in the past year warrant some updating of the quarry proposals described in the text. Changes in Jefferson County regulations late last year to require Official Planned Development (PD) submittals for mining rather than conventional mineral conservation zoning has prompted the operators to withdraw their original rezoning requests and to resubmit their plans as PDs. In attempting to simplify the permitting process, the Planning Commission now will review both the proposed land-use changes and the operational standards.

For its PD, Brannan Sand and Gravel resubmitted the 7-year Phase 1 quarry plan for the Bertrand site on Clear Creek essentially unchanged from the original proposal. However, the Phase 2 excavation on the Golden Gate Canyon site was dropped from the request. During the Phase 1 operation, Brannan will conduct pilot studies on the Golden Gate site to determine the engineering and economic feasibility of producing rock by underground mining methods.

A long-awaited mining plan now has been submitted in the South Table Mountain case, now into its sixth year of hearings. The 7-phase 75-year plan incorporates both surface and underground quarrying and an underground crushing and conveying system designed to alleviate aesthetic impacts and transportation problems.

The Survey trusts that distribution of this paper will provide more insight into the complexities of the aggregate conservation issue along the Colorado Front Range.

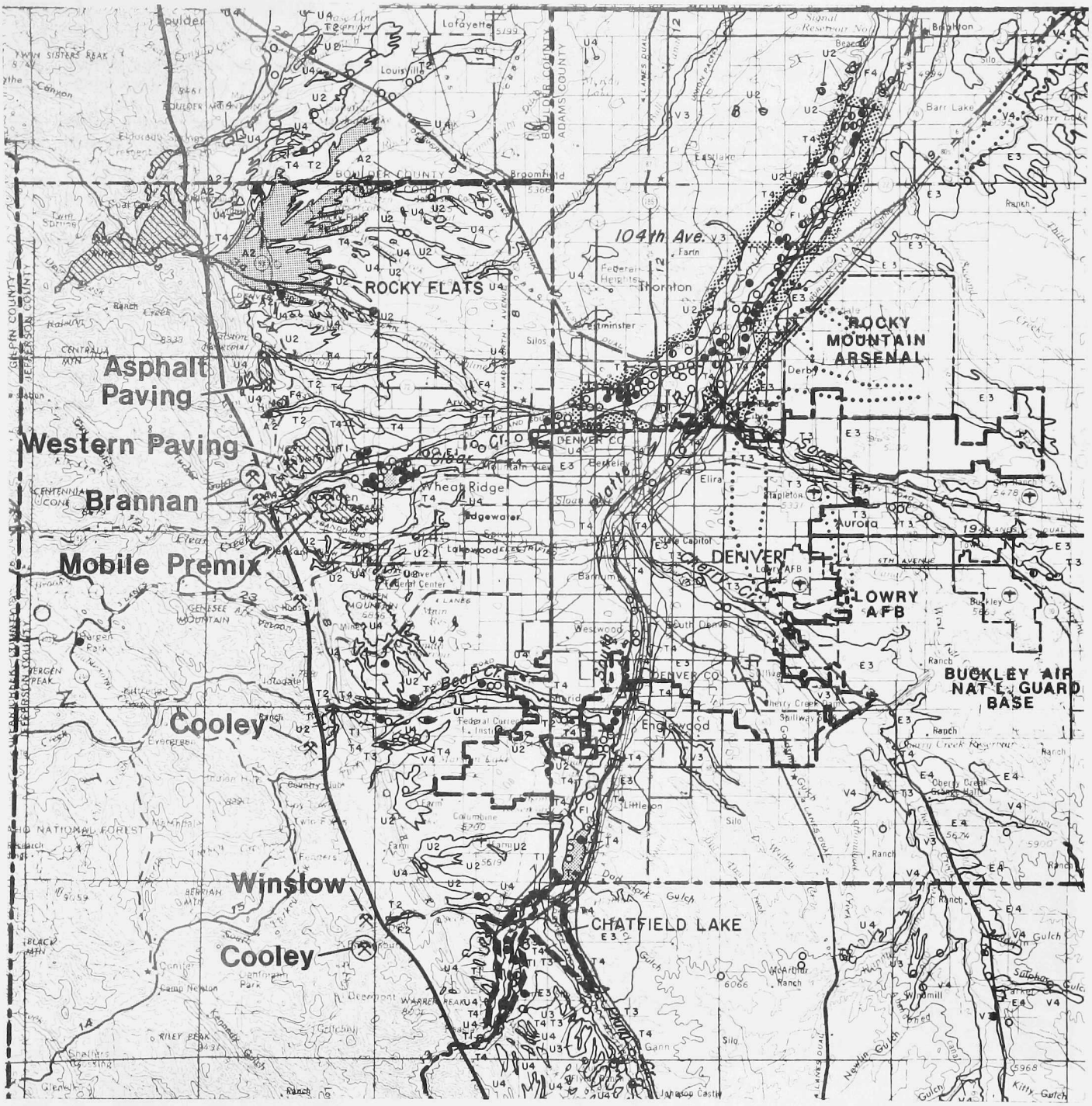

Figure 3. Aggregate resoures in the Denver metropolitan area, with aggregate reserve areas, recent and proposed mining activities. See previous list of landforms and Table 2 for explanation of resource units. (Gravel base map modified after Schwochow and others, 1974).

Figure 3. EXPLANATION

quarry aggregate resources exclusive of Front Range crystalline rocks

major gravel resources outside Adams County Mineral Conservation Area

Adams County Mineral Conservation Area (MCA). Principal MCA is north of 104th Avenue.

mountain front edge of Precambrian crystalline rocks

- inactive, abandoned, reclaimed gravel pit
- gravel pit active since 1973
- proposed new gravel pit
- abandoned crushed-rock quarry
- operating crushed-rock quarry
- proposed new crushed-rock quarry
- proposed reopening of inactive crushed-rock quarry
- ▲ expanded-shale aggregate pit

this area has been gradually consumed by very small development tracts that will effectively preclude mineral conservation unless a producer should obtain sufficient acreage for a mining proposal.

So far we have seen area operators turn to four alternatives to the resource shortage problem. The first alternative is the operation of a unit train to bring gravel in from more accessible deposits outside the metro area. Only one company, Western Paving Construction Company, has excercised this operation in Denver. The company's unit train hauls gravel from a pit and loading site at Lyons (Figure 5a) 45 miles southeast to its asphalt mixing plant on Clear Creek at Pecos Street (Figure 5b). The train began full-time operation in 1975, and its 32 Ortner rapid-discharge cars have a total capacity of 3,200 tons. However, this very unusual economic and logistical situation may not be feasible for more than one or two companies in the long term. The second alternative is the manufacture of lightweight expanded aggregate. Two companies in Colorado have been engaged in this branch of the industry. The Idealite Company operated a clay pit (Pierre Shale) and expansion plant at the north end of Rocky Flats until 1976. Fountain Sand and Gravel continues to process slag from the CF&I Steel Corp. in Pueblo.

Like the unit train, though, the possibility of future large-scale production of expanded aggregates in the Denver area is questionable and must await further evaluation. The third alternative has gained considerable momentum and importance in the last 6 or 7 years. Producers are now operating and planning large operations along the South Platte River on the north side of Denver. These deposits

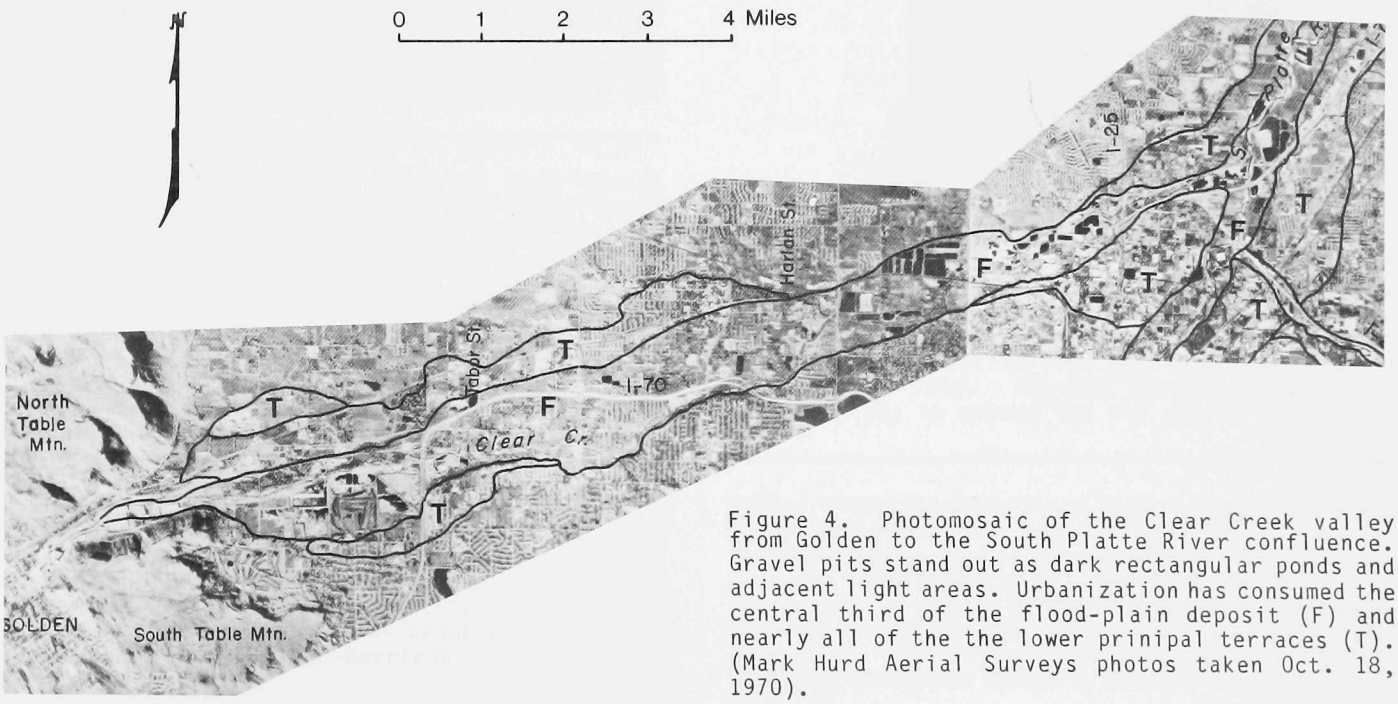

Figure 4. Photomosaic of the Clear Creek valley from Golden to the South Platte River confluence. Gravel pits stand out as dark rectangular ponds and adjacent light areas. Urbanization has consumed the central third of the flood-plain deposit (F) and nearly all of the the lower prinipal terraces (T). (Mark Hurd Aerial Surveys photos taken Oct. 18, 1970).

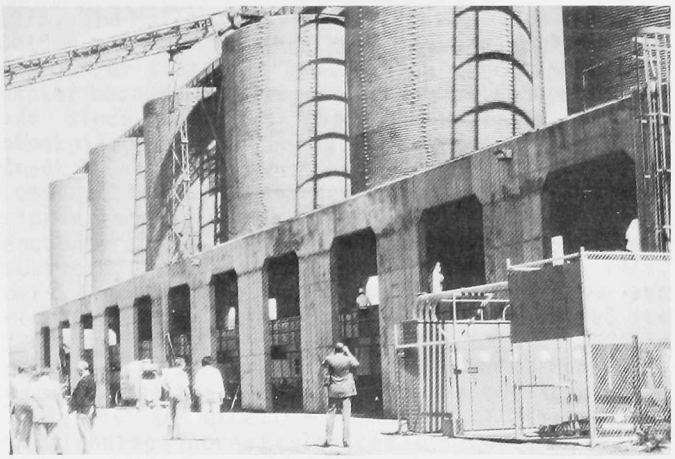

Figure 5. a) Top, Western Paving Construction Company's gravel loading facility on St. Vrain Creek at Lyons. Gravel is conveyed to a height of 65 ft and selectively dumped into the six 530-ton-capacity concrete-stave silos. Underneath, the rail cars are loaded at a rate of 200 ton/min/silo. b) Bottom, the 32 Ortner 100-ton-capacity cars are positioned on the 270-ft-long trestle to discharge the pit run into six 1500-ton-capacity bays. From there the material can be either surged to a stockpile or fed directly to the crushing and screening plant.

are known to contain more sand and less coarse material than upper South Platte and Clear Creek deposits, but they are the last large reserve closest to the Denver markets, and at least part of them is now protected by mineral conservation in Adams County. Figure 3 shows the locations of recently active pits in that area and the surprising number of new sites that have been applied for.

The fourth alternative that I will examine is the one making news headlines and receiving the most publicity. Several companies are now turning to the long-term development of quarry aggregate to sustain themselves. The Front Range not only provides a variety of suitable rock types (described earlier) but also presents a myriad of siting, mining, environmental, transportation, and social problems not always associated with gravel pit operations. Most of the past, present, and proposed activities are centered in the Golden-Morrison area due west of Denver (Figure 3).

The Quarry Alternative

To set the present scene let us briefly look at the history of quarrying in this area. Few people realize that the South Table Mountain latite in Golden was quarried as early as 1905. Four quarries there have yielded road materials, concrete and asphaltic aggregate, and riprap intermittently through the late 1950s. One quarry has been converted to a firing range, and another is used to test rock-drilling equipment. The one latite quarry unobtrusively located on North Table Mountain (Figure 6) began in 1925, was enlarged in 1949, and

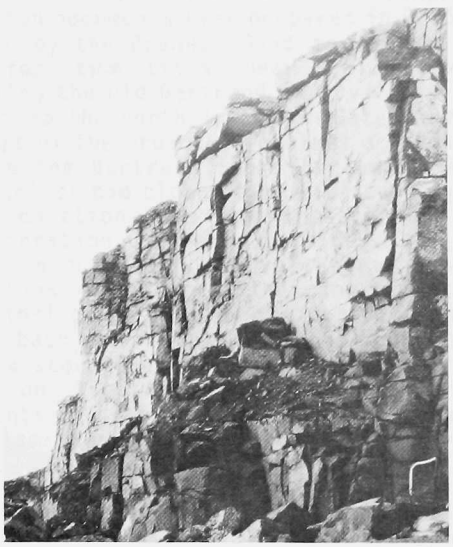

Figure 6. Top, southwestward view of the Rogers quarry on the west rim of North Table Mountain. Bottom, on the old quarry wall, notice how columnar jointing in the latite flow stabilizes the cut on the vertical face. Western Paving Construction Company plans to expand the old quarry eastward.

worked intermittently since then. Many years ago, two monzonite quarries operated at Ralston Reservoir north of Golden, and a new excavation was approved there in 1975 (Figure 7). The Bertrand quarry at the mouth of Clear Creek Canyon in Golden was started in 1926 and since then has provided aggregates and riprap intermittently until an imminent landslide forced a closure of the site in

1975. The Holloway quarry on Jackson Gulch south of Golden started in 1965 and produced much of the riprap for Chatfield Dam. Mining was stopped last winter because of alleged dust-emission violations and since then has changed ownership. Only stockpiled rock is being removed now. The Deer Creek Canyon quarry, operated by Winslow Construction Co., started in 1970 and provides riprap mostly, but igneous rock now being encountered deeper in the excavation will provide a source of concrete aggregate (Gordon Hays, 1979, pers. comm.) This quarry's somewhat hidden and remote location in a side canyon has minimized its "impacts" on the area. Cooley Gravel Company operates the Strain Gulch quarry south of Morrison. As we saw on the field trip, this site, started in 1971, is an excellent example of siting and preplanning (Thorne Ecological Institute, 1972). The other notable commercial operation in this region is the Andesite Rock Company site (Figure 8) southwest of Lyons, a quarry developed in a Paleocene rhyodacite sill in the Fountain Formation. Rhyolite of Oligocene age caps a number of buttes in eastern and southeastern Douglas County. These deposits yielded a fine building stone in past years, but the only active quarry now is operated for crushed stone. One other deposit is now being evaluated for reopening. As one can see, rock quarrying is neither a new nor unusual land use in the Golden area, but nearly all of the largest operations started after 1970.

Figure 7. Working face at the new Ralston quarry, operated by Asphalt Paving Company. The company currently produces dark-gray monzonite from the oval-shaped intrusive at a rate of 3000 ton/day for use as road base and concrete and asphaltic aggregates.

What I find especially interesting is the industry's recent interest in applying for new quarry sites in this restricted geographical area. All of the applications either include one of the above-mentioned quarry sites or lie adjacent to the older or active operations. Hearings for the rezoning of 180 acres on the north side of South Table Mountain have continued for over 4 years but are scheduled to end on June 14. I attribute the delays in this case to faulty procedure on the part of Jefferson County and the fact that its master plan was not completed until the spring of 1977, two years late. Recent questionable involvement of the

Figure 8. Andesite Rock Company quarry on South St. Vrain Creek southeast of Lyons. This rhyodacite sill intrudes east (left)-dipping sandstones and dark shales of the Pennsylvanian Fountain Formation. Photo by James Soule, Colorado Geological Survey.

Solar Energy Research Institute has not helped in the case. If the rezoning and subsequent mining proposal are approved, the site will be operated by Mobile Premix Sand and Gravel, which also assumed ownership of the Holloway quarry.

One of the most attractive and comprehensive application documents ever prepared in Colorado was presented by the Brannan Sand and Gravel Company (1979) for two sites near Golden--94 acres surrounding the old Bertrand quarry and a 233-acre site just to the north in Golden Gate Canyon. The first part of the proposal involves a 7-year effort to remove the Bertrand quarry's landslide hazard (which earlier had closed the site) and reclaim the entire excavation. The second phase is a 30-year quarry operation on the south side of Golden Gate Canyon. In an attempt to relieve transportation difficulties in the area, the company has changed its original plan to allow the quarried rock to be conveyed back over the hill to the Bertrand quarry site to a storage and load-out facility. For its application the company hired more than 20 consultants to prepare sections on geology, mining and reclamation, noise control, air and water quality, climatology, archaeology and history, materials analysis, slope stability, blasting and seismic monitoring, geophysics, safety, soils, vegetation and wildlife, and transportation. Brannan's hearings with the county and the public began in March of this year and are scheduled to end in June.

Directly across the highway from Golden Gate Canyon is North Table Mountain, on which Western Paving Construction Company (1979) proposes to reopen and expand the old quarry over a 375-acre site. WPCC's property has two advantages--1) rock will be conveyed down the west side to a processing plant at the base of the hill, thereby eliminating truck traffic on the steep access road; and 2) because of the high position near the west rim and primary crusher location on the quarry floor, the benched excavation will not be visible from Golden, Lakewood, or Denver. WPCC's hearings began in April of this year.