

SAND AND GRAVEL MINING AND RECLAMATION
PROBLEMS IN EASTERN MONTANA¹

by

J. Edward Surbrugg²

Abstract. Sand and gravel mine reclamation is mandated by the Montana Opencut Mining Act. There are three basic types of sand and gravel operators: County Road Departments, the Montana Department of Highways, and private operators. Major concerns for mine sites in urban areas are principally noise, air, water, and aesthetic pollution. Principal problems with mining in rural sites are poor reclamation potentials, multiple operators in a single pit, and conflicts between landowners, operators, and regulating agencies. Thousands of acres are disturbed on an annual basis, and this amount surpasses the mining of most other minerals. Public awareness and regulatory involvement are necessary for the protection of the environment and the continued advancement of land reclamation practices.

Additional Key Words: Opencut Mining Act, aesthetics, landowners.

Introduction

Sand and gravel mining and reclamation is regulated in Montana by the Opencut Mining Bureau of the Montana Department of State Lands. Since 1971, Montana has had a general reclamation law which included the regulation of sand and gravel. In 1973, the Opencut Mining Act was passed and it has stayed basically in its original form. The law covers all operators who mine 10,000 cubic yards of product or overburden. The intent of this exclusionary volume is to allow farmers and ranchers to mine on their own land without any requir-

ed reclamation. The law specifies a volume per operator rather than volume per operation so that the cumulative effects of mining small amounts in many pits are still covered. (Montana Department of State Lands 1983)

Sand and gravel mining has traditionally operated in the background. This is particularly true in Montana where first copper and then coal have been "King" of the minerals mined. There has also been essentially no federal involvement with sand and gravel mining. Federal involvement, as with coal mining, tends to spotlight certain issues and concerns and tries to make the general public aware of the potential environmental impacts. There are significant impacts associated with sand and gravel mining and increased awareness and education are the first steps toward understanding these concerns. It is the purpose of this paper to help begin that process of understanding sand and gravel mining and reclamation problems in Eastern Montana.

¹Paper presented at the 1986 National Meeting of the American Society for Surface Mining and Reclamation, Jackson, Mississippi, March 17-20, 1986.

²J. Edward Surbrugg is a Reclamation Specialist/Soil Scientist for the Montana Department of State Lands, Billings, Mont.

Proceedings American Society of Mining and Reclamation, 1986 pp 89-92

DOI: 10.21000/JASMR86010089

Operators and Operations

There are approximately 300 individual sand and gravel operators in Montana that mine over 2000 different sites. The State is so large that it has been divided so that operations in the eastern third of Montana are handled out of the Billings' field office. For this paper, Eastern Montana will be generally defined as all land lying east of an imaginary line running north and south through Billings. The other two-thirds of the State are regulated from Helena, the capitol. In the eastern third of the State, there are 114 individual operators mining in 1060 different sites. Contracted acreages associated with these 1060 sites equal approximately 4000 acres or about an average of 4 acres per site. Actual acres mined each year amount to approximately 1000 acres which surpasses the mining of most other minerals in the State. (Welch 1986)

Eastern Montana geology was principally formed during late Cretaceous time when sedimentary deposits were spread over the eastern plains from mountain building and erosion processes in western Montana. The geologic parent material of Eastern Montana is a relatively young and flat-lying deposit. The general terrain of the region is gently rolling, wide, shallow valleys and broad, flat divides. The topography is locally rugged due to differential erosion of harder and softer beds near the larger river systems. (Veseth and Montagne 1980)

Sand and gravel deposits are found and mined in all 24 counties in Eastern Montana. The quantity and quality varies tremendously due to different geologic sources of the material and the varying degrees of reworking by the river systems. Two of the well-known deposits of importance are the Yellowstone River gravels and the glacial deposits of the Laurentide Continental Ice Sheet. The Yellowstone River gravels are some of the best gravels in the State and fortunately they occur where a fairly high percentage of the population resides. The glacial deposits are vast and are located in the northern part of the State. There are other areas, like the southeast corner of Montana, where gravel is extremely hard to find.

There are three basic types of sand and gravel operators. They are the County Road Departments, the Montana Department of Highways, and private operators. County Road Departments mostly mine gravel for use in road construction and maintenance. This material may be hauled directly from the pit without processing or it may be crushed and screened. The Montana Highway Department was a major operator in the past but has lately gone to contracting private operators for its major highway construction. The State Highway Department still operates some smaller sand pits for use in sanding icy winter roads. Private operators mine sand

and gravel for a variety of different uses. Two main uses are highway construction as mentioned above and for making concrete for buildings. Typical highway jobs would involve crushing, screening, and making asphalt. Concrete and ready-mix operations usually crush, screen, and wash the material for their final product.

The type of operator and operation makes each sand and gravel mine site a unique situation. County Road Department operations are generally spread throughout the county and are often on private land. Many counties are looking for pit-run material which needs little, if any, processing. This material can be hauled directly from the pit to the road. These pits are often ongoing sources which are used from time to time as the need arises. There may be large areas of these pits which were operated prior to reclamation laws and thus are not required to be reclaimed.

Private ready-mix operations are usually located near population centers. They utilize fairly sandy deposits with little contamination of silts and clays. Associated with all ready-mix operations are processing facilities, however, these are not always located at the extraction site.

In comparison to County Road Departments and private ready-mix operators, private operators working on state and federal highways operate in a totally unique manner. These operations are usually active from one month to one year. The private operators attempt to locate the mine site near the highway projects. The Montana Department of Highways often locates the potential source of gravel for the project. The private operators who are contracted for the job are usually responsible for reclamation and are considered the operators of the site under the Open-cut Mining Act. Sources of gravel suitable for these projects often must have quantities of 100,000 cubic yards or more. These mine sites may be up to 50 acres in size. There are still vast deposits of gravel in Montana, however, the choicer, better quality sites are being readily depleted.

Reclamation Problems

Reclamation of most sand and gravel operations is required in Montana. Reclamation plans must be approved by the Montana Department of State Lands prior to mining. These plans must provide for the best possible reclamation procedures available under the circumstances. After mining operations are completed, the affected land must be reclaimed to a productive use. (Montana Department of State Lands 1983) Once a plan is accepted, it is subject to annual review and modification. The Open-cut Mining Act is fairly specific in what is required to be submitted for the reclamation plan. The variability in the types of operations makes each plan different. The specific reclamation practices for

each site should be incorporated into each plan. Even with a sound reclamation law and environmentally acceptable reclamation plans, there are problems and concerns which transcend the legislated safeguards. Reclamation problems occur in both urban and rural mine sites which will be discussed below.

Urban Problems

Principal problems with sand and gravel operations near urban environments are noise, air, water, and aesthetic pollution. Sand and gravel pits have been located around major towns and cities for many decades. In stable populations with little migration, there are fewer complaints because the locals become accustomed to the sites. It is usually when an area experiences growth that the level of notice increases. (Welch 1986)

Sand and gravel operations unavoidably make noise. More recent operations may be some distance from residential areas, however, the older operations may be adjacent to, or surrounded by, the ever expanding suburbs. More recent zoning ordinances may have some jurisdiction over noise at some sites. Often times, the older sites are grandfathered and new zoning ordinances, if any, do not apply. (National Sand and Gravel Association 1977) Noise pollution is only vaguely addressed in the Opencut Mining Act. In the policy, it is stated that one of the purposes of the Act is to protect the health, safety, and general welfare of the people. (Montana Department of State Lands 1983) In reality, there are no critical noise levels established through the Opencut Mining Act or the accompanying Rules and Regulations. When new operations are proposed, it is desirable at that time to have soil stockpiles placed as berms to act as partial sound barriers. It is also possible to require some screening of the mine site with tree and shrub plantings. Both soil stockpile berming and screening with vegetation are also effective against aesthetic pollution.

Air pollution can be a nuisance to downwind neighbors. Some dust pollution is inevitable but there are many things which can be done to keep it under control. Spray bars and dust curtains can be mounted in critical places on processing equipment. Roads and support areas can be watered or paved. (Bureau of Mines 1981) Many times it is not always necessary for the heavy dust generating activities like crushing to be performed on the windy days. It is required that all crushing, cleaning and screening operations, including work performed by mobile units, possess an air quality permit. (Montana Department of Health and Environmental Sciences 1984)

Water pollution is also regulated in Montana. (Montana Department of Health and Environmental Sciences 1979) When water leaves the permit area and flows in-

to "State" waters, a Discharge Permit is required through the Department of Health. Water is discharged from a mine site when gravel is washed using an open-loop sediment pond system. In an open-loop system, water is used to wash the silts and clays from the sand. This water is then retained in a sediment pond for a period of time but eventually flows from the site. A closed-loop system has no direct discharge because the same water is used again and again. Only the amount of water lost through evaporation and processing is replaced into the system. (Montana Department of Health and Environmental Sciences Water Quality Bureau and the Montana Department of State Lands Hard Rock Bureau 1982) It is also possible to have discharge from groundwater which may be encountered during mining. This water is often of good quality and can easily meet discharge standards.

Aesthetic pollution is probably the hardest of all factors to quantify and also has limited corrective measures. There may be little that can be done to shield an operation from view if the site is located at a topographically visual place. Soil stockpile berms and trees are good choices for shielding mine sites while fences and walls are suitable, but usually less desirable alternatives. There are ways in which the mine plan can be integrated into the reclamation plan. It is sometimes possible to hide most of the operation using the natural surroundings until the final stages when reclamation will soon follow. The best method for avoiding needless conflicts is to provide opportunities for public comment prior to commencing the operation and to integrate as many of the known methods for keeping noise, air, water, and aesthetic pollution to a minimum.

Rural Problems

Reclamation problems in rural areas are understandably different from those in urban areas. The major issues associated with mining in rural sites are poor reclamation potentials, multiple operators in a single pit, and conflicts between the landowners, operators, and regulatory agencies. Rural pits tend to be more numerous and smaller in size than urban pits.

Poor reclamation potentials are indigenous to Eastern Montana with its relatively low annual precipitation and associated poorly developed soils. Problems are compounded by the operator's desire to mine in sites which have very little soil or vegetative cover. A site which is more economical to mine because less soil handling is needed is often a more difficult site to reclaim. It may be that costs associated with holding reclamation bonds for extra years and reseeding several times outweigh the short-term gains from operating in a site with low soil stripping costs.

Another problem with rural mine sites results from having multiple operations. Operators often prefer to mine in a site which is already open. These sites may have been opened years ago and are poor sites to mine, however, the incentives to use these sites are great. Multiple operations in the same site makes reclamation liability hard to assess. Each reclamation plan application includes an operations map showing the contracted area. When the boundaries of different operations overlap, there is usually confusion. This confusion makes it possible for reclamation responsibilities to be passed on to later operations. The last operation in the pit may receive an undue proportion of the reclamation burden or a portion of the site may remain unreclaimed.

Conflicts with landowners frequently occur with rural pits. Problems arise when contractors move into a landowner's existing small pit. The contractor has an approved reclamation plan and mines on the site. When the contractor is through mining, the landowner may decide he wants the pit left open. The landowner can't understand why the site has to be closed and reclaimed, but this must be done in order for the operator's bond to be released.

Other conflicts arise when landowners are difficult to satisfy. An operator may have conscientiously tried to reclaim a harsh site and generally satisfy the terms of the reclamation plan. When the landowner is asked for his comments, he is not satisfied with the reclamation. However, the site is still eligible for bond release. Other conflicts arise when the parties have disagreements over contract terms for payments and use final reclamation issues for additional compensation.

Summary

Sand and gravel mining in Montana is regulated by the Opencut Mining Act. There are 114 individual operators mining in over 1000 sites in Eastern Montana. There are three basic types of operators: the County Road Departments, the Montana Department of Highways, and the private operators. The different types of operators and the different conditions for each operation make site-specific reclamation plans valuable tools in reclaiming the affected areas.

Major problems with mining in urban environments are noise, air, water, and aesthetic pollution. Air and water pollution controls can be implemented into common practice with some concerted effort. Noise and aesthetic pollution can be controlled and improved with forethoughtful practices of soil and vegetated screens.

Major problems when mining in rural areas are poor reclamation potentials, multiple operators in a single pit and conflicts between landowners, operators, and regulatory agencies. Physical problems which make a site harder to reclaim should

be known and addressed prior to mining. Once an operation begins, the operators have assumed responsibility to reclaim the site to an approved productive use.

Literature Cited

- Bureau of Mines. 1981. Reclamation and Pollution Control: Planning Guide for Small Sand and Gravel Mines. U.S. Department of the Interior, Minerals Environmental Technology Program, Washington, DC. 143 p.
- Montana Department of Health and Environmental Sciences. 1979. Montana Water Quality Act. Helena, Montana.
- Montana Department of Health and Environmental Sciences. 1984. Montana Air Quality Rules. Helena, Montana.
- Montana Department of Health and Environmental Sciences Water Quality Bureau and the Montana Department of State Lands Hard Rock Bureau. 1982. Settling Pond Handbook. Helena, Montana. 22 p.
- Montana Department of State Lands. 1983. Montana Opencut Mining Act. Helena, Montana. 8 p.
- National Sand and Gravel Association. 1977. Sand and Gravel Operations; A Transitional Land Use. Kenneth L. Schellie (ed). 212 p. Silver Spring, Maryland.
- Veseth, Roger and Clifford Montagne. 1980. Geologic Parent Materials of Montana Soils. Montana Agricultural Experiment Station and USDA-Soil Conservation Service. Bozeman, Montana, Bulletin 721, 117 p.
- Welch, Steve. 1986. Opencut Mining Bureau Chief, Montana Department of State Lands, Helena, Montana, personal communication.