

LAND RECLAMATION IN THE GRAVEL MINING INDUSTRY

By

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ABSTRACT

Gravel is a very valuable natural resource because of its many uses as a construction material. It is the basic component of concrete and asphalt and is used by itself wherever pervious materials are called for. The growth of the gravel mining industry in Southern Alberta is therefore running parallel to the rapid industrial development. The resulting population increase has brought a corresponding increase in the demand for land. Through proper planning, gravel mining sites can be, and must be, restored to a useable state when gravel mining is completed.

INTRODUCTION

BURNCO Rock Products Ltd. is a privately owned Southern Alberta company, active in the mining and supply of gravel as well as concrete and asphalt products. This paper outlines our activities relating to the mining of gravel and reclamation of mining sites in Southern Alberta.

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LAND RECLAMATION IN THE GRAVEL MINING INDUSTRY

Gravel mining and the subsequent reclamation of the land disturbed by the mining, are both extremely important to all of us. The following paper reflects the experiences of Burnco Rock Products Ltd. in the gravel mining industry. Burnco is a privately owned company which, through related companies, has been in business in Southern Alberta since 1912. We are based in Calgary and are a major supplier of sand, gravel, concrete and asphalt products as well as being involved in custom gravel crushing and street construction.

A. HISTORY

Years ago when Southern Alberta was being settled, land was used solely for agricultural purposes. Land that contained gravel deposits was virtually worthless for growing crops and could only be used as poor pasture land. Therefore, in a purely agricultural society, gravel bearing lands were avoided like the plague. Consequently the price of these lands, was far below that of average farm land.

Back in those days, gravel was regarded as a very cheap commodity, mainly because there was little demand for it. Reserves of gravel were considered to be endless. The Municipalities or Highways Departments were about the only users of any significant amounts of gravel, and usually bought this gravel for a small nominal fee. As the gravel bearing lands were virtually useless for agricultural purposes prior to opening the pit, no one was really opposed to opening a gravel pit. Furthermore, no one gave much thought to reclaiming these mined out pits. Over the years these pits became a convenient place to dispose of old abandoned cars, animal carcasses and other garbage or refuse.

Today, unfortunately this is still the vision that many people have of the gravel mining industry in general. This is one of the main reasons why our industry today has so much difficulty projecting a responsible image to regulatory bodies or neighbours of a proposed gravel pit. Reclamation of gravel pits within growing urban centers, even years ago, has never really been a problem because sooner or later these pits were covered by urban development, and therefore reclaimed.

In a period of time some thirty to fifty years ago, Alberta was a much more decentralized society. Calgary for instance, would have had a population of less than 75,000 people. Most of the traffic on rural roadways, sometimes even horse-drawn, was local

traffic between farms or to local schools and churches, or transporting farm produce to a nearby town. Municipal roads in those days, were narrow and not much higher than the prairies that they crossed. They seldom had more than a sprinkling of gravel on them.

Things have changed over the years. Today our society is much more mobile. Children no longer walk to local country schools; they are bused to school in near by towns and cities. Farmer's no longer transport their produce to market with a horse-drawn wagon or a half ton truck; five ton trucks are now common place, not to mention semi-trailer cattle liners. Recent rail line abandonments mean transporting grain for long distances using 20 ton trucks. People now commute to work daily for distances of 30 to 50 miles one-way. In other words, our society is becoming centralized and increasingly mobile. Also, Alberta's economy today is becoming more and more diverse with the development of the Oil and Gas Industry. This has resulted in massive amounts of plant construction. The number of people moving into Alberta to support this development, has resulted in rapid expansion of urban centres. Along with this industrial development, has come the demand for better road-ways to handle the increasing amounts of traffic.

Gravel is extremely important to this development because it is the basic component of concrete and asphalt. Furthermore, when used alone, it is employed in applications ranging from surface treating roadways to acting as a pervious foundation under buildings and roadways.

Alberta's increase in population and industrial development has brought a greater demand for land. Land that is not agriculturally suitable, is now finding a wide variety of other uses. Today, all land is valuable and must be reclaimed.

What is gravel?

The term "Gravel" refers to a well graded mixture of rock particles ranging in size from 0.075 mm on the small side to between 20 and 50 mm on the large side. Most gravel deposits contain rock coarser than this and therefore crushing is required. Some deposits contain excessive amounts of material smaller than 0.075 mm, that is silt and clay and therefore require "washing" to remove these fine materials. Other deposits may be devoid of certain sizes and therefore screening and mixing is required. Gravel refers to a natural product as opposed to a solid rock product that is quarried.

Why is gravel used?

Because gravel contains very little or no impervious material, water is readily transmitted through the gravel. This ability is the reason why gravel is utilized by itself in such a wide variety of applications. These applications range from filter drain materials in earth fill dams to pervious fill materials under concrete slabs and roadways, to a filter material in water treatment plants. This free draining ability is the reason why gravel is placed on roadways and other traffic areas to provide a mud free surface during wet weather. These applications are so basic but yet so necessary. Gravel is also used as an inexpensive filler material for concrete and asphaltic pavements. Gravel accounts for 85% of concrete and 95% of asphaltic products.

How much gravel do we use?

In the city of Calgary, some 10 million tons of gravel are used each year. With a population of around 500,000, this means each and every resident, directly or indirectly consumes about 20 tons of gravel, or a little more than a truck load of gravel each year. Or put in other terms, the construction of an average sized house and garage, would consume about 100 tons of gravel. In other words, gravel is a very widely used commodity.

Locating a Gravel Deposit.

Locating a gravel deposit does not employ sophisticated electronic or seismic instruments such as those used in the Oil and Gas or other mining industries. Locating a gravel deposit utilizes tools such as air photos, surface geology mappings, existing water well and seismic drill log information, as well as studying land forms in the field. Farmers usually have a very good idea of what lies beneath the surface of their lands. Potential gravel deposits are tested by excavating pits with a backhoe or drilling holes using air hammer, rotary or auger type drills.

Acquisition of Mining Rights.

Once a gravel deposit is located, the gravel mining rights may be acquired through outright purchase of the lands. That is, gravel is a surface right and not a mineral right. The gravel mining rights may also be obtained through a lease agreement whereby the landowner is paid a certain royalty per unit of gravel removed from the lands.

B. PERMITS AND APPROVALS

Once a pit operator has acquired the gravel mining rights to a certain property, he is faced with the task of obtaining permits from the regulatory bodies to begin mining. In our case, we operate about 25 gravel pits throughout Southern Alberta. Out of necessity we came up with a relatively standard procedure of applying for permits, one that would satisfy all regulatory bodies. Our submissions are relatively simple, consisting mainly of an enlarged aerial photograph along with a contour plan and profiles, stereo aerial photographs and surface photographs. This is accompanied by a brief written submission outlining our planned activities. This type of a submission has now been adopted by Alberta Environment as a standard because it is so simple and yet so informative.

1) Municipal Approval.

The first step in acquiring a gravel mining permit, is making application to the local municipality for a development permit. This could be to a town, city, rural municipality, county or improvement district. The Municipality will circulate the application to Provincial authorities and the Regional Planning Commission for their comments. The municipality will usually require a security deposit to guarantee reclamation of areas disturbed by the mining process.

2) Provincial Approvals.

Although the Municipal authority circulates your permit submission to the Provincial Authorities, for the sake of expediency we prefer to apply directly to the Provincial Authorities for their respective approvals.

a) Alberta Environment, Land Conservation and Reclamation Division.

Every gravel pit, new or existing, requires development and reclamation (D&R) approval from this division. This approval will specify minimum reclamation standards. D&R approval requires an annual report to be filed outlining the previous years area of operation, the amount of gravel mined, the areas to be reclaimed and the plans for the upcoming year.

This division will act as a clearing house in referring submissions on to other Provincial Bodies for their approval or comments. Some gravel pit operators favour this "One Window" approach to obtaining Provincial approvals. In theory we also favour this approach. This concept has some merit in assisting

small operators, unfamiliar with Government regulations, to sort through the various approval stages which on the surface appears to be a maze. However, in my opinion this promotes a concept of one Government employee approving or rejecting an application that a coordinator has handed to him. In other words, the second individual has no contact with the applicant and therefore must base his decision solely on the application before him. Furthermore, the coordinator is bound to have difficulty urging the second individual to respond quickly to the application. This is especially if both individuals have the same seniority but answer to different directors. We feel that such a system in itself breeds inefficiency.

I personally prefer dealing face to face with individuals in government. In my opinion this promotes a concept of two human-beings discussing the merits or inherent difficulties in a particular application and working out solutions to these.

b) Alberta Environment, Land Assembly Division

This division administers the restricted development area (RDA) and the transportation and utility corridor (TUC) around the city of Calgary. These areas were designed to control development and to dedicate areas for future major roads and utilities. If a proposed gravel mining site falls within these areas, a letter of Ministerial consent must be obtained from Land Assembly. This letter will contain conditions such as the term of approval (usually five years) and will make reference to other approvals.

c) Alberta Environment, Water Resources Division

Management Services, Administration Division

If gravel mining is contemplated in the area of a stream, river or body of water, a permit is required from this division. You will likely be required to maintain a 200 foot undisturbed buffer between the river and the mining area. This is designed to ensure that the river does not change its course through the mining area. Generally mining is not permitted in the bed and banks of the river.

Water Rights Branch

If the diversion of water from a river or other water body is required for a gravel washing facility, a licence is required from this branch. Conditions of approval will specify the point and rate of diversion, the periods of the

year that diversion is permitted and the minimum stream flow that must be maintained in the river. Water rights requires an annual report covering periods and amounts of water both diverted and returned to the point of diversion.

In formulating their approval, Water Resources will obtain input from River Engineering, Fisheries, Tourism, as well as Parks and Recreational Authorities.

d) Alberta Environment, Standards and Approvals Division

Clean Water

Again, if gravel washing is contemplated, a permit is required to construct this washing facility pursuant to the Clean Water Act. In prior years, it was acceptable to divert water from a river to the actual wash plant, then discharge the silt laden wash water into a series of ponds where the silt settled out of the water. Water from the last pond was then allowed to be discharged back into the river provided it was below a certain total suspended solids level. In any new approvals, this discharge of wash water is not permitted, that is, water from the last pond must be recycled through the gravel washing plant. For the old systems returning water to the river, a monthly report is required specifying the amount of water diverted and returned as well as water quality testing.

Clear Air

A permit pursuant to the Clean Air Act is required which specifies the maximum air pollution allowable from gravel crushing plants as well as asphalt and concrete batching plants. This permit requires monitoring of the air discharged by the plants and periodic reporting.

e) Alberta Culture

If the area proposed for gravel mining is undisturbed, Alberta Culture will require that an Archaeologist conduct an historical resources impact assessment (HRIA) be conducted. The purpose of this assessment is to provide an inventory of historical artifacts. Alberta Culture will then determine what mitigative work is required. This work can include archaeological excavations ranging in cost of \$5,000.00 to over \$100,000.00 depending on the number of artifacts located.

f) Alberta Transportation

If a gravel mining operation is proposed within a 1000 feet of a Provincial Highway or within a half mile of a major intersection, a road-side development permit is required from Alberta Transportation. The conditions of approval specify reclaimed levels along the highway. It may also require that the pit operator install acceleration/deceleration lanes at the point of entry to the Provincial Highway, especially if the highway is very narrow and or busy. The cost of such an intersection is about \$100,000.00.

3) Railways

If access to a pit involves crossing a railway, an agreement must be entered into with the railway company and a special crossing installed, plus in some cases raising the telecommunication lines and providing a signalized crossing. Cost could range from \$5,000.00 to \$50,000.00 for such crossings.

4) Summary

In summary, to obtain all of the above necessary permits, you are looking at between six months and a year. This amount of time is just not necessary to approve and process relatively straight forward gravel mining proposals. We can generally live with all the conditions of approval, but we can not live with these excessive time delays in approving the permits.

Some of the major delays occur when one authority will withhold it's approval pending another body's approval. We feel that each regulatory body should be approving a permit when requested to do so, within the limits of their own authority rather than withholding a permit pending someone elses approval. Gravel pit operators can also improve the turn around time by preparing good permit submissions. The submissions only have to be informative and accurate. A good permit submission means that the operator has tested the deposit, knows the magnitude of the deposit and knows what the land will look like when reclamation is completed. Slick-looking, complex submissions that are filled with vague, meaningless technical jargon, are not necessary. They take longer to process and therefore add to delays in obtaining approval.

C. GRAVEL MINING AND RECLAMATION

Now that we have acquired the gravel mining rights as well as all the necessary permits, we are ready to start the mining process.

1) Security Deposits

Companies involved in mining tar sands or coal, commonly need years of preplanning and large sums of front end money before the actual mining ever starts. The gravel mining industry is quite different, in that it is very easy for individuals to get started. An individual can start up a gravel mining operation on leased lands, with a leased loader and a couple of friends with gravel trucks and he is in business. This is one of the reasons why land reclamation in the gravel mining industry is so difficult to control.

Before anyone is allowed to open up a gravel pit there must be some form of security deposited with the municipal authority to guarantee reclamation. This could be a performance bond, a letter of credit or a certified cheque. If an operator cannot produce any of these forms of security, he is likely not financially responsible and should not be opening up a gravel pit. We believe security deposits should continue to be handled at the local municipal level, as this level is more in tune with the particular operator or the particular land being proposed for gravel mining. We feel that the size of the security deposit should be based on the area of land that will be disturbed or the complexity of the reclamation.

2) Stripping

First, all the organic loam is removed from the first years proposed mining area. Using a crawling tractor for removing the loam is not acceptable as invariably underlying clay becomes mixed with the loam. Also, using this method, the loam is usually not pushed far enough from the mining area. Scrapers are the best machines for stripping loam. The loam can easily be carried far enough away from the mining area so as not to interfere with future mining. Scrapers equipped with elevating paddles are slower but can strip thinner layers of loam than conventional scrapers. Loam usually remains in stock piles for several years until the reclamation has started. These piles should be seeded with grass to choke out weed growth or sprayed annually to control the weeds.

The clay overburden covering the gravel deposit is then removed using scrapers. Initial clay strippings usually have to be stockpiled adjacent to the mining area. Subsequent strippings can be placed directly on the mined out floor of the gravel pit. At this point, if you have thought out the entire mining and reclamation process, you can replace the overburden to it's final elevations and therefore only move it once. With earthmoving costs of about a dollar per cubic yard, this can soon add up to be a huge saving of money.

3) Mining

Our gravel mining operations consist of a rubber tired front end loader excavating pitrun gravel from the bank and loading it directly to trucks for sale as pitrun gravel. These loaders may also feed a conventional crushing/washing plant which using conveyors, would in turn stockpile processed materials for future sales.

4) Land Reclamation

Once a large enough area has been mined out, the floor of the pit can be recontoured, using the clay stripped from the gravel deposit, to establish proper drainage. This reclamation should be done in stages as the mining progresses, to avoid the heavy financial burden of undertaking all reclamation at the completion of mining. If the mined area is being returned to farmland, the loam is simply spread over the recontoured pit bottom, and the area is ready to be cultivated or seeded to grassland.

Over the years Burnco has had one of the best track records relating to land reclamation in Southern Alberta. The following are some reclamation projects that we have been involved in over the past years:

1. In the late 1930's and 40's we mined gravel directly from the Bow River at various locations near downtown Calgary. Gravel was drawn from the river bottom using a drag bucket attached to a cable which extended to the opposite side of the river. This provided "washed" gravel to a crusher located beside the river.

Every winter, when the dragging operations were discontinued, the normal action of the river would replenish much of the gravel we removed in the previous mining season. That is, nature did our reclamation work for us. This type of mining of course is no longer permitted.

2. Our mining operations then took place in old river channels in southeast Calgary. All of these mined out areas are now covered by industrial development. This development has basically taken place on the mined out floor of these former gravel pits.

3. We later mined gravel from a half section of land in the Ogden area of southeast Calgary. Here the city set minimum grades for future urban development. We elected to mine below these grades and backfill the area with some 4,000,000 cubic yards of compacted clay borrowed from an adjacent hillside. The residential subdivision of Riverbend, along with some light industrial development is now being constructed on the 15 feet of fill which we placed in this area.

9. In another location we mined an area that was previously undisturbed, that is, it was still covered with native strains of grass. Landscape architects have done some research for us and have located firms which sell native grass and flower seeds. From this experience we find that it is entirely possible to return a mined area to it's former "natural state", despite the fact that the ground will be lowered by the thickness of the gravel deposit.

5) Restricted Development Areas

As mentioned earlier, restricted development areas (RDA's) have been instituted around Calgary and Edmonton to promote orderly development in those areas. Gravel around these centers is a rapidly depleting natural resource. Some deposits are being depleted through mining and utilizing the gravel. More importantly though, many of these reserves are being squandered by urban development being approved on or near the gravel deposits. In other words, gravel mining is second in priority to any other development or land use.

We would like to see the RDA concept applied to the gravel mining industry as well as other forms of development. This concept would promote the orderly mining of gravel deposits prior to utilizing the lands for, say urban or park development. At present, pit operators are forced to "high grade" small portions of a deposit. This does nothing to promote proper land reclamation. At present in the Calgary area alone, three gravel deposits ranging in size from 20 to 75 million tonnes each, are being squandered through short-sighted development plans which do not include gravel mining.

D. Summary

Over the years we have found that through proper preplanning of our mining operations, we have been able to transform a mined out gravel pit into virtually any ultimate land use as we have just illustrated. Anyone with a genuine desire in seeing land reclaimed, can duplicate our track record. However, there are many firms that would rather cut the selling price of gravel by not including land reclamation in their mining plans. Land reclamation must be part of every gravel pit operation, without compromise. Reclamation standards should apply equally to every pit operator whether large or small, or whether the pit operator is a Municipal or Provincial Government body.

We recognize that there are shoddy gravel pit operators in our industry and feel that the gravel mining industry must start policing itself to some degree. We must stop relying on Government to totally solve our problems and police our industry. To this end our industry, possibly by way of the Sand and Gravel Association, could have representatives throughout the Province to pin-point problem areas relating to improper pit operations or poor land reclamation. These representatives could report, in an advisory capacity, to the local Land Conservation and Reclamation Council member. The council member could in turn, draw on the knowledge of this industry representative, for advice in certain difficult reclamation areas.

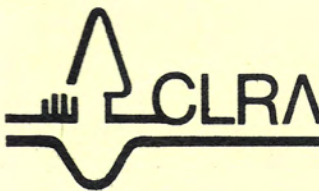
In summary, I hope that my submission has provided you with a better understanding of land reclamation in the gravel mining industry. Thank you for the opportunity of making this presentation.

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INTRODUCTION

Last Spring the Provincial Government's Reclamation Research Technical Advisory Committee presented a two day Reclamation Research Seminar at the Chateau Lacombe. We were surprised by the large turnout and an overwhelming majority of those in attendance indicated the desirability of an Annual Reclamation Conference for Alberta which would focus on Policy and Practice as well as Research and which would include industry, academic and government participation.

These were very sensible suggestions though their implementation would exceed the mandate and manpower of the Reclamation Research Technical Advisory Committee. So various groups were contacted to sponsor and help organize the Conference. Positive responses were received from the Canada Land Reclamation Association (CLRA) The Alberta Government's Land Conservation and Reclamation Council, The Coal Association of Canada and The Oil Sands Environmental Study Group (OSESg).

The CLRA authorized formation of an Alberta Chapter to serve as the umbrella organization with a Program Committee consisting of representatives of the Government and the two Industry groups. Through this Conference and perhaps other functions the Alberta Chapter of the CLRA can fulfill two important roles:

1. To provide an opportunity for members of the Reclamation community to meet, exchange experiences or argue and otherwise improve communications among its industry, government and academic factions.
2. To provide a public forum for reclamation activities, capabilities, issues and challenges.

This was the first function of its kind in Alberta. Special thanks are due the Sponsors, Speakers and the other Members of the organizing Committee: Jennifer Hansen, Malcolm Ross and Al Fedkenheuer. Their talents and efforts made the Conference a success.

One final word on the Speakers: they were given very short notice of the Conference and not only responded enthusiastically but prepared presentations which were of remarkable quality and consistency. We are fortunate to have individuals of this caliber working in the Field of Reclamation in Alberta.

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