# RECLAMATION OPERATIONS AT THE VESTA MINE, HALKIRK, ALBERTA

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## ABSTRACT

Past and present reclamation operations for the Vesta Mine are reviewed. Descriptions of the early attempts at levelling, subsoil and topsoil salvage and replacement, and revegetation are given. Present day levelling, materials handling and land management are briefly discussed. Direct correlation between increasingly stringent government regulations and level of effort in reclamation operations is evident by the evolution of current practices.

## INTRODUCTION

The Vesta Mine is located in east-central Alberta, in the County of Paintearth, near the communities of Forestburg and Halkirk. Coal produced from the mine is destined for Alberta Power Limited's 740 MW Battle River Generating Station. The Vesta Mine supplies approximately one million tonnes of high volatile subbituminous B coal to the station annually.

Lower Edmonton Formation materials of the Upper Cretaceous Epoch underlay the mine area. Overburden materials above the coal seams are very high in sodium and smectitic clays. Surficial geological material consists of varying thicknesses of Wisconsin glacial till. Soils tend to be highly variable - ranging from Dark Brown Solonetz on areas denuded of glacial till, to Dark Brown Chernozems on areas where greater depths of glacial till are present.

Initial coal mining operations in the vicinity of the Vesta Mine first appeared as small underground and strip mines near the turn of the century. The present operations are much greater in size and production capabilities and are suppliers of fuel to the electrical generating industry. Quarrying for gravel and red shale are also important land uses in the Battle River region. Agriculture is still, however, the most extensive land use in the County. All reclamation activities in the recently mined-out lands are therefore, designed to meet an agricultural land use objective.

## OPERATIONS AND PLANNING

Long and short range planning both form an integral part of the Vesta Mine operation. Long range planning enables the calculation of the most economical pit reserves and configuration to meet contractual coal commitments. Short range planning, which is generally less than five years, accounts for the design and implementation of drainage systems, powerlines, haul road construction, and pit layout. Weekly planning meetings are held to ensure that all facets of the operation are running smoothly and according to previously scheduled plans.

The Bucyrus-Erie 1570-W dragline is used as the sole overburden stripping machine. Approximately 8 million cubic metres of overburden are removed annually by the basic turnover cut method to expose the coal. The majority of the mine area is underlain by a single seam of coal, however, a multiple seam operation is required in the eastern part of the pit.

## RECLAMATION

The Vesta Mine is a complex mosaic of reclamation quality and standards, reflecting the regulations and standards imposed during the time reclamation was accomplished. Prior to the enactment of the Land Surface Reclamation Act in 1963, reclamation was not required by operating companies. Immediate post-1963 reclamation consisted of rough levelling of the spoil piles.

The 1963 Act was superseded in 1974 by the Land Surface Conservation and Reclamation Act and its associated Regulations. Spoil pile levelling with seeding directly on the levelled spoil was initially attempted. The result was very poor germination and subsequent seedling survival rate. The period from the inception of the Land Surface Conservation and Reclamation Act to the present saw several innovative, but unsuccessful, levelling and soil materials handling methods attempted. These methods are discussed in the following paragraphs.

In an attempt to reduce levelling costs, a Mormon board was attached to the dragline, in place of its bucket, when levelling was required. This method proved unsatisfactory on older, compacted spoil piles, but showed reasonable success when used to level fresh spoil. The impracticality of changing from bucket to Mormon board and the problems encountered by the dragline when working in the spoil material resulted in the demise of this levelling technique.

The initial attempts at levelling spoil with a crawler tractor (dozer) involved removing the tops of the spoil peaks by making one pass down the centre of the spoil rows. This was followed immediately by seeding. Success was poor, so again the method was abandoned.

Total levelling of the raw spoil piles by dozers was then tried. Minimal cultivation and broadcast seeding followed the levelling process. Revegetation results were sporadic so this technique was abandoned as well.

Eventually the current practice of controlled levelling to create a positively drained and gently rolling landscape was adopted. Drainage from the reclaimed land is directed to established drainage lines which converge into the mine's settling pond systems. These systems have been integrated into the undisturbed Battle River drainage system for eventual discharge. To date, no water has been released from the settling pond systems.

For reclamation at the Vesta Mine, the natural progression following the implementation of levelling was to salvage soil for placement onto spoil areas. The final decision to salvage surface soil material was made about 1970 after repeated failures to revegetate unamended spoil material.

The dragline was initially used to remove glacial till material taken on a 180 degree swing from the side-cut, for replacement on top of the adjacent spoil pile. A dozer was then used to flatten the peak of the till/spoil pile in preparation for seeding. The results over a five to ten year period have indicated that good revegetation, supportive of wildlife, can be established. However, problems did arise from this material handling method. The degree of levelling was inadequate for the standards imposed, the areas were poorly drained, and the post-mining land use objectives were not met. Efforts taken to adequately level the piles were to no avail as most of the non-sodic material was buried in the process.

Since mid-1979 levelled spoil has been covered with approximately one metre of subsoil and topsoil. Scrapers are used to salvage and replace the material in a continuous cycle. Material is hauled from the highwall side of the pit, across the pit to the levelled spoil via a series of cross-pit ramps and temporary roads. Most of the subsoil material is handled during the summer months to minimize the need for expensive winter operations. The use of scrapers ensures the maximum use of the salvaged material, and that the desired thickness of replacement is attained. Spoil levelling is kept current to eliminate the need for stockpiling. Stockpiling is essential in the initial periods of the mining-reclamation sequence but becomes obsolete as the sequence continues.

Topsoil salvage began in 1976 following the abandonment of the dragline subsoil salvage program. Pre-stripped topsoil material was initially spread directly onto levelled raw spoil. Following the implementation of the scraper subsoil salvage program, topsoil material was spread onto levelled areas covered with a blanket of subsoil material. Topsoil areas were then cultivated and seeded using standard agricultural equipment and rates.

The use of bottom (furnace) ash as a soil treatment is being investigated on both pre and post-1963 lands for which topsoil is not available. These lands are characterized by sparse vegetation, extremely poor water quality and an impenetrable surface. Approximately 240 hectares of these orphan spoil areas are being reclaimed by the Vesta Mine. Sponsorship for the project is provided by Alberta Environment, Alberta Power Limited and Manalta Coal Ltd. The overall objectives for the reclamation of these disturbed lands are to improve the aesthetic quality of the area and to provide habitat for wildlife using the materials readily available on site. Alberta Environment is currently examining various surficial treatments to ash amended sites in a series of test plots constructed during 1981. The ultimate test for the ash-treated areas will be their long-term stability and the intensity of management required to maintain the system.

Over the years, revegetation at the Vesta Mine has evolved from the "shot gun" approach of high seeding and fertilizer rates to a carefully planned and proven approach which emphasizes the use of standard agricultural methods common to the mining region. Upon completion of topsoil replacement, the management of the land essentially becomes the responsibility of the local farm contractor. Continuous cereal cropping will be the final step in returning the land to the local agricultural community.

## CONCLUSION

Reclamation has advanced rapidly at the Vesta Mine during the past ten years. The program has evolved from one of unproductive and poorly revegetated areas to one of creating productive and manageable farmland. The research programs currently underway at the Vesta Mine represent a sophisticated and educated

approach to reclamation and some of its unanswered questions. The Battle River Reclamation Research Program and the Plains Hydrology Reclamation Project were initiated to tackle some of the outstanding issues in reclamation. The future of reclamation at the Vesta Mine is dependent upon the results obtained from these research projects and from the results collected from previously reclaimed lands.

It must be emphasized that large mining projects are planned many years in advance and for long periods of time. Major changes imposed by environmental or labour laws can create economic imbalances within a project. These imbalances invariably result in higher costs which are passed down to the consumer. The decade of improvements made in reclamation and environmental quality control must not be so taxing as to discourage development. The coal industry must therefore, strive to achieve greater value for the reclamation dollar.

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# PROCEEDINGS:

# ALBERTA RECLAMATION CONFERENCE

## Edmonton, 1982

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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 where 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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