

Planning and Environmental Constraints and Opportunities for Rehabilitation

Ken Zimmerman and Sarah B. Lowe

Abstract

In Ontario, both industry and the public's interest in pit and quarry rehabilitation has grown with increased environmental knowledge and awareness of the possibilities for valuable after uses. As a result, the Aggregate industry faces new challenges in terms of the role of progressive rehabilitation and more comprehensive after use planning. Rehabilitation can provide additional benefits beyond compliance with Ministry of Natural Resources (MNR) licence and site plan requirements. A successful rehabilitation program can lead to public acceptance and participation as well as a valuable asset following extraction. This requires a comprehensive masterplan, a proven track record and ultimately a landscape that fits with land use policies and public needs. The ultimate objective is to create a new landscape that others view as ecologically, recreationally, educationally or economically valuable. This paper will outline these specific challenges associated with current rehabilitation planning and implementation at five of Dufferin Aggregates' sites in southern Ontario.

Introduction

Dufferin Aggregates has implemented a comprehensive rehabilitation program at its largest operation, the Milton Quarry. The size of the operation and its location within a World Biosphere Reserve have led to a strong company vision to create a long term public and private asset. Work to date has raised the profile of the project and expectations within the community. The rehabilitation vision features a naturalized landscape with conservation, recreation, education, water management, and economic benefits for both public and private uses. An approximately forty two hectare naturalized area created over the last ten years includes wetlands, forested slopes, cliff faces and islands. It includes access to the public via a look out point, which is part of the Bruce Trail side trail system. It is already home to forty species of breeding birds, thirty four species of butterflies, six herptile species and many other wildlife including deer, fox, turtles and snakes. This project is now the standard against which rehabilitation will be measured at other Dufferin sites and the company program as a whole.

The next steps at Dufferin Aggregates are to continue with the Milton rehabilitation master planning process, develop a corporate rehabilitation planning program and broaden this vision to other Dufferin sites. There are

many challenges to overcome during the rehabilitation process.

General Challenges

Planning

Some of the highest quality aggregate resources in southern Ontario are located in areas with significant natural heritage features and very specific and restrictive land use policies. These policies have considerable implications in terms of aggregate extraction, progressive rehabilitation and after use planning.

Large amounts of Ontario's aggregate's resources are located within some of Ontario's most significant landforms including the Niagara Escarpment and the Oak Ridges Moraine. The Escarpment includes a unique combination of geologic and ecologic features extending ~ 725 kilometres from the Niagara River to Georgian Bay. The escarpment has many areas that are biologically diverse with forests, wetlands & streams. The Escarpment was designated by UNESCO as a World Biosphere Reserve in 1990 (Francis, 1990). The Oak Ridges Moraine covers 160 kilometres from the Niagara Escarpment in the west to the Trent River in the east. The Escarpment and Moraine are part of southern Ontario's natural heritage and greenspace

systems. Land use within these areas is highly regulated and restricted.

Some of these areas have their specific provincial plans in place to govern land use and provide direction for resource management. Land uses in the Plan Area are regulated by the Niagara Escarpment Planning and Development Act passed in 1985. The Plan encourages rehabilitation and allows for the retention of cliffs, in keeping with the natural escarpment feature.

In 2002, the Oak Ridges Moraine Conservation Plan divided 190,000 hectares of land on the Moraine into four land use designations: Natural Core Areas (38% of total area), Natural Linkage Areas (24%), Countryside Areas (30%) and Settlement Areas (8%). New aggregate resource extraction is not permitted in the Natural Core Areas. In the Natural Linkage Areas and Countryside Areas, new aggregate resource operations are subject to review and restrictive approval standards (Oak Ridges Conservation Plan).

These regulatory plans have specific requirements to ensure rehabilitation results in landform character that blends in with the adjacent lands. Comprehensive rehabilitation master plans and specific conditions to ensure companies operate and rehabilitate to maintain or improve long term ecological and hydrologic conditions are required for new sites. Due to its infancy, the implications of the new Oak Ridges Conservation Plan policies on existing sites and rehabilitation is not known.

Public Expectations

The Escarpment and Moraine are located in very close proximity to Canada's largest populated centres placing these high quality aggregate resources in high demand. The Escarpment contains four of the top twenty producing quarries in Canada. (Aggregates and Roadbuilding, July/Aug 2002). Many of the largest sand and gravel operations in Ontario are located on the Oak Ridges

Moraine (Aggregates and Roadbuilding, Sept/Oct 2002).

Although aggregate extraction is an interim land use, some operations are active long enough to occupy a large portion of an individual's lifespan or one's memory. Although valuable on a larger community basis, rehabilitation plans that benefit future generations is of less importance to a neighbouring resident. Supported by industry and government initiatives, the public is becoming less patient in waiting to see substantial rehabilitated areas. There is also increasing public expectations for rehabilitated lands to provide further public and private benefits prior to the end of the life of the operation. There are also increased expectations to address long term ownership of the sites prior to the end of extraction. Rehabilitation that can demonstrate a proven tract record as soon as possible can be extremely valuable and help encourage public endorsement and acceptance of the plan.

Physical Challenges

Soil, water, land configuration and land use plans are the traditional challenges to high quality rehabilitation. In Ontario, the availability of water resources (quality and quantity) is currently the major determinate of land configuration and final use options. The protection and management of water resources has become a major issue in Ontario. In terms of recreation and conservation uses, the presence of a surface water body can be an asset but requires effective management. The ideal mix is a combination of a large surface water body with sufficient soil resources to create usable land. Land use configuration issues include the size of the site, the depth of the excavation and relationships with the surrounding topography and natural features.

Soil resource issues include the availability and suitability of sufficient overburden and topsoil to create the desired slopes and landforms. This is a common concern on the Oak Ridges Moraine where overburden is typically fine grained and topsoil is minimal.

This can lead to engineering issues related to the structural stability of high faces. On the Carden Plain, soil resources are limited. Soil Importation or soil enhancement programs are potential solutions to these problems. Negative public perception, soil testing costs, the uncertainty about consistency of the incoming materials and lack of clarity in Ministry of Natural Resources and the Ministry of the Environment regulations have limited the use of imported soils for rehabilitation projects.

Specific Site Issues

Milton Quarry

The Milton Quarry is located behind the brow of the Niagara Escarpment in the Towns of Milton and Halton Hills in the Region of Halton. The quarry produces five to six million tonnes of high quality aggregate annually and has been the largest producing quarry in Canada over the last few years. The existing rehabilitation plan based on MNR site plan requirements includes extensive water bodies with wetlands, islands, wooded upland margins and slopes, open space and many kilometres of cliff faces. The quarry is within the Niagara Escarpment Plan Area (NEPA) and surrounded by rich natural heritage features that require careful protection. Operational and rehabilitation approvals can be required by three local councils, three provincial agencies (MNE NEC, MOE) and the Halton Region Conservation Authority. The site has a long history of use by the Bruce Trail Association with lands around the perimeter and two lookout points.

Challenges include integrating the public's interest and desire to use the site now with an active quarry operation. The rehabilitation process has focused on creating landscape fit in relation to the surrounding natural escarpment features. The next step is to determine both short term and long term public and private uses of the site as part of the master planning process. This will be done in partnership with the Halton Region Conservation Authority and other agencies.

This process will include agreements on water management and public use with possible future ownership of some of the lands.

Acton Quarry

The Acton Quarry is an approximately three million tonne operation located roughly 15 km north of the Milton Quarry in the Town of Halton Hills in the Region of Halton. The existing rehabilitation plan based on MNR site plan requirements is a dry quarry floor with a thin layer of overburden and topsoil and a combination of backfilled and exposed quarry faces. The quarry is also located within the Niagara Escarpment Area and subject to the same land use and regulatory pressures as the Milton Quarry.

Dufferin Aggregates purchased the Acton Quarry in November 2001. Due to growth changes in the industry, the site has seen five different owners over the last ten years. This has led to unique challenges for the operation of the quarry and the master planning process. There is a need to develop consistency and build relationships with the local neighbourhood including residents, government representatives and decision makers. With change in ownership comes different names, faces and plans for the future. The predicted final use of the site is unknown. One of the previous owners had a plan for the site to be used as a landfill when extraction was complete. This proposal was not successful. Partly as a result, the Niagara Escarpment Plan Act now includes a policy to prohibit landfills on the Escarpment.

A master plan process was initiated by a previous owner. Although the process was slowed by the flux in ownership, Town officials and the local neighbourhood have developed expectations based on the interactions with the different operators over the years. One of the first challenges is to catch up on the history of the site and identify these expectations. One of the expectations is public participation in the design of the rehabilitation master plan for the site and an

interest in including Cultural Heritage features (lime kilns)

Mill Creek Pit

The Mill Creek pit is an approximately one million tonne operation in the Township of Puslinch. The site is a joint venture with the University of Guelph as the land owner. The existing rehabilitation plan based on MNR site plan requirements is three large waterbodies (~90 hectares in total) over 10 m deep with wetland areas along the edges. The license conditions include a landscape plan designed to help protect on site forest and wetland features and guide wetland creation.

In this case, the creation of large water bodies was a constraint rather than a opportunity during the licensing process. The site was licensed as part of an Ontario Municipal Board Hearing in the late 1980's. The site and much of the land use in Puslinch Township is agriculturally based. The proposed future land use of the site was to be water based. This change in use was a major focus of the hearing.

Carden Quarry

The Carden Quarry is an approximately one million tonne limestone quarry located on the Carden Plain in the City of Kawartha Lakes ~ 140 kilometres north east of Toronto. The Carden Plain is a 580 square kilometer area of limestone plain with very little overburden. The existing rehabilitation plan based on MNR site plan requirements is a deep lake with 2:1 uniform slopes around the perimeter and minimal usable land. Rehabilitation is physically limited by the lack of soil resources.

Mosport Pit

Dufferin Aggregates' Mosport Pit is an approximately one million tonne sand and gravel operation located in the Town of Clarington. The existing rehabilitation plan based on MNR site plan requirements is a dry pit floor with a thin layer of overburden and

topsoil and 3:1 slopes around the perimeter. The plan includes the establishment of a forested wildlife corridor over part of the site.

Rehabilitation challenges facing the Mosport Pit are typical to other operators and sites on the Oak Ridges Moraine. The overburden available for rehabilitation is fine grained material and topsoil is minimal. Some extremely high faces will be rehabilitated with these fine grained soils. An engineering study prior to construction of the terraced slopes is a site plan requirement. A topsoil importation program to will have to be implemented to provide a growing medium and meet site plan requirements.

In the Mosport pit, the water table is very deep and below the aggregate deposit. As a result, this site is the only site of the five that does not result in the creation of a surface water resource.

Response to the Challenges

Dufferin Aggregates response to the challenges has been to initiate a four-step process that will result in a corporate rehabilitation planning process that can be applied on a site-by-site basis. The process includes a:

1. Conceptual Plan - identify the conceptual after use for each site based on the planning objectives, soil budgets and land/water configurations (i.e. constraints)
2. Rehabilitation and Overburden Placement Plan – to coordinate logistics (timing and placement) between stripping and rehabilitation. This uses large scale maps
3. Construction Drawing– to provide the necessary detailed information to guide the Operations staff who will physically construct the plan. This uses smaller scale maps, and
4. Rehabilitation Cost Study – to validate costs on an annual basis and determine budgeting requirements

Conceptual Plans

The development of a conceptual after use plan or big picture thinking is the first step in the process. This must be coordinated with but not necessarily limited to site plan requirements. Potential afteruses of the site are based on the availability of water and soil resources, the amount of usable land, neighbouring land uses, population growth, and future land use needs in the area. Depending on the site, this may or may not include public participation. In the case of Milton and Acton, the conceptual plan will be expanded into a comprehensive masterplan.

Rehabilitation and Overburden Placement Plan

The creation of an overburden and rehabilitation placement plan is the link between the masterplan and the actual operation. This plan coordinated with a mining plan will help direct the stripping and placement of overburden. It is tied into the phasing requirements of the site plans and determines the sequence of soil placement and ultimately landform creation. A soil budget is developed as part of this process to determine surpluses or deficiencies of topsoil and/or overburden. This maximizes the efficiency of the stripping operation to help eliminate double handling of material and may also accelerate the amount of rehabilitated area through proactive planning.

Rehabilitation Cost Study

The next step is to determine the annual and long term costs of creating the new landscape and develop a rehabilitation budget. Up until 1997, rehabilitation budgeting for the most part was indirectly provided by the MNR. Aggregate producers were charged an eight cent security deposit for each done produced in a given year. These funds would be reimbursed from the MNR when "rehabilitation claims" documenting actual costs were submitted by the operator. These claims were based on the "in the field" costs to rehabilitate land on a site by site basis. The

majority of this deposit was returned to the operators in 1997 leaving the operators themselves directly responsible for budgeting for rehabilitation. The balance of the funds were kept by new joint industry and government initiative called The Ontario Aggregate Resources Corporation (TOARC).

Dufferin's response to this was to complete a rehabilitation cost study for each site based on site plan requirements. This determined current and future rehabilitation liabilities in terms of costs. This study identifies costs for all aspects of rehabilitation: stripping, soil placement, grading, tree planting, seeding, habitat enhancement, engineering and maintenance. This provides overall costs per hectare and costs per tonne of aggregate produced. This allows for budgeting from year to year based on current disturbed area and tonnes of aggregate produced. The study will be validated every 3 years from a financial perspective and following the completion of new master plans.

Construction drawings

Construction drawings will be completed for each rehabilitation and overburden placement plan. These plans provide the detailed information necessary to transform the ideas and concepts presented in the masterplans and overburden placement plans to actual physical rehabilitation in the field. These autocad drawings provide construction specifications to the equipment operators, Site Managers and foreman, and contractors. These drawings include grading and vegetation plans as well as location and details on special habitat enhancement and engineering features.

Summary

For the most part, Dufferin's rehabilitation vision will follow the Milton lead and focus on naturalized landscapes and/or recreational uses for final after use plans. This is largely a reflection of the unique opportunity to utilize a water resource as an asset at each of the sites. Water management has become the most

important physical constraint and opportunity for rehabilitation at Dufferin Aggregates.

Rehabilitation planning requires an understanding of the broader planning policies affecting the creation of the next landscape. The best plans have regard for public need and

interest. Over the course of the next couple of years, Dufferin will implement this four step process as part of a corporate rehabilitation program and result in rehabilitation planning at each of its major sites.

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