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CIELAP Briefing Note: Aggregates

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Aggregate Extraction in Ontario:

Understanding the Issues, Looking to the Future

In Ontario, the term "aggregates" refers mainly to gravel, sand, clay, earth, shale, stone, limestone, dolostone, sandstone, marble, granite and rock.

Aggregates are used in a wide variety of applications, but a majority are consumed in building infrastructure. For example, the Environmental Commissioner of Ontario indicates that over 50% of the aggregates produced in Ontario are used for the construction of roads and highways.

Aggregates are either extracted from pits or quarries. The distinction between a pit and a quarry is determined by the type of material extracted from the site. Sand and gravel are extracted from pits, while crushed stone is extracted from quarries.

Impacts of Aggregate Extraction

The blasting and crushing of rock in quarries can cause localized impacts such as dust, noise and vibration. The trucking of aggregates from the extraction site to where they are needed for construction projects also causes disturbances along the haul route. There are also broader environmental impacts associated with aggregate extraction. In order to access the aggregates, vegetation, topsoil and subsoil must be removed from the site. This process can result in the loss of habitats and reduced biodiversity, or the loss of agricultural land.

The *Aggregate Resources Act*, the primary legislation regulating pits and quarries in the province, requires aggregate producers to undertake both progressive and final rehabilitation. Progressive rehabilitation takes place gradually as aggregates are removed from the site, while final rehabilitation refers to the completed land use change after all aggregates have been depleted. In some cases, former pits and quarries are restored to ecologically significant landscapes, or to agricultural lands, but this is not always the case.

For example, recent research commissioned by the Ministry of Natural Resources (MNR) has shown that woodlands are often transformed into lakes through the rehabilitation process. The same study found that a net loss of agricultural lands may also be occurring as a result of aggregate extraction.

Photo courtesy of the Centre for Community Mapping (COMAP)

Another key concern, particularly with larger operations, is the potential impact associated with extracting aggregate to a depth that extends below the water table. Once the pit or quarry has become deeper than the surrounding water table, groundwater begins to flood the excavated area.

In order to maintain a dry working environment, this water must be regularly pumped out over the lifespan of the operation. The pumping results in a drawdown of the water table in the surrounding area, which can reduce the amount of water in nearby wells, or

An Overview of Current Aggregate Resource Management Issues in Ontario

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impact natural features such as streams and wetlands. More research is required in order to fully understand the effects that aggregate extraction is having on ecosystems in Ontario. In particular, data on the cumulative impact of multiple aggregate extraction operations occurring within a single area is required.

Understanding the need for aggregates in Ontario

Despite the social and environmental impacts associated with aggregate extraction, the importance of the resource cannot be denied. When expressed in terms of per capita consumption, Ontarians use roughly 12-14 tonnes of aggregate per person, per year.

Stone processing equipment at a site near Gravenhurst, Ontario

Currently, there is no clear substitute for aggregates that would entirely eliminate the need for pits and quarries. In some cases the need for "virgin" aggregate extracted from pits and quarries can be reduced through the use of recycled material. For the construction of roads and highways, old pavement can be broken down and reused. Crushed glass and ceramics can also act as a substitute for aggregates in the manufacturing of pavement. Industrial by-products such as ash, slag or mine waste rock can also substitute for virgin aggregate in certain applications.

Roughly 7% of annual demand for aggregates in Ontario is met through the use of recycled material. There is likely potential to use far more recycled material in place of virgin aggregate, but currently, the amount of recyclable material not being utilized is unknown. MNR's recent studies on the state of aggregate resources in Ontario have recommended that a database be developed in order to track recyclable materials. While developing such a database would be a highly positive step, it is unlikely that, even in a scenario where there was close to 100% use of recyclable material, the need for pits and quarries would be fully eliminated.

Looking at the use of recycled material in jurisdictions that are currently

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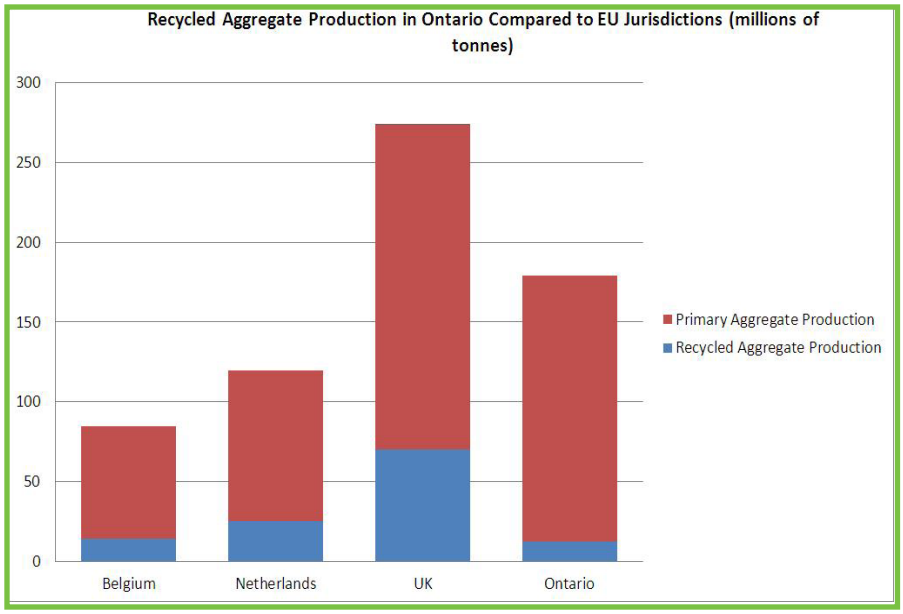

The chart to the left compares the ratio of recycled aggregates produced to the total amount of aggregates produced in Ontario against other jurisdictions considered to be leaders in recycling using 2006 data. It appears that even with improvements, the need for virgin aggregate in Ontario is unlikely to be eliminated by recycling. (Source: UEPG 2006, State of the Aggregate Resource in Ontario Study, 2009)

In Ontario, roughly 7% of annual demand for aggregates is met through the use of recycled material.

considered leaders in the field, it is apparent that virgin aggregate will still be required in Ontario's future.

The long term pursuit of "close-to-market" aggregates, a primary goal in the province's current land use policy framework, has encouraged a situation where roughly 85% of all aggregate extraction activity takes place in Southern Ontario. The resulting overlap of population, conservation, recreational and agricultural interests with aggregate extraction means that new pits and quarries very frequently meet with opposition when they are proposed.

The options for new pit and quarry sites are also constrained by Ontario's geology. Only certain types of aggregates can meet the material specifications for infrastructure projects and these resources must be extracted where the deposits occur.
Taken together, these factors make supplying the fastest growing regions of Ontario with the large quantities of aggregates they require a very complex problem to address.

Key Challenges Associated With Aggregate Extraction

Compliance Monitoring

Some of the most immediate issues associated with aggregate extraction in Ontario are related to monitoring of pits and quarries while they are in operation and their rehabilitation once the aggregates have been depleted.

Before 1997, MNR played a larger role in the oversight of aggregate extraction in the province. In order to ensure operations were in compliance with the *Aggregate Resources Act* and the specific conditions of their approved site plans, MNR aggregate inspectors visited each site annually and prepared 4 year reviews which included input from the municipalities where the sites were located.

In 1996, the *Aggregate and Petroleum Resources Statute Law Amendment Act* was passed, which transferred a significant amount of responsibility for compliance monitoring to the aggregate producers through the Compliance Assessment Report system. Each year, aggregate producers now submit a form to MNR and to municipalities describing the amount of disturbed area on the site, the amount of rehabilitated area on the site, depth of excavation, the total amount of aggregate removed from the site, as well as a range of other operational details.

When the Compliance Assessment Report system was introduced, the number of aggregate inspectors employed by MNR was also cut significantly. Under the current system, aggregate inspectors aim to visit 20% of pits and quarries in the province annually to verify the information submitted in Compliance Assessment Reports. An MNR audit of Compliance Assessment Reports conducted in 2001 found that the reports often contained inaccurate information. A 2007 audit of aggregate pits in the Oak Ridges Moraine Conservation Plan also found that many sites had compliance issues.

While there are surely aggregate producers who do adhere to site plan conditions and provincial legislation under the Compliance Assessment Report system, the lack of frequent and regular provincial oversight means that many problems may also go unnoticed.

MNR has committed to developing a long term strategy for aggregate resource management and completed supporting studies for the strategy in 2009. CIELAP's full report on aggregate resource management can be downloaded from www.cielap.org

Rehabilitation

The system MNR used to ensure that aggregate producers rehabilitated former pits and quarries was also changed in 1996. Prior to the change, MNR maintained an account for each pit and quarry into which producers paid a fee based on the amount of aggregate removed from the site each year. Once MNR verified that rehabilitation of the site had been completed by the producer, they were allowed to access the funds in the account. In the event that rehabilitation did not take place, the funds in the account were then used for rehabilitation purposes. Under the new system, aggregate producers pay an annual fee into a single, larger fund that is used to pay for the rehabilitation of abandoned pits and quarries. While the system has been in place for over 10 years, some citizens and municipalities are concerned with both the amount and quality of rehabilitation taking place. MNR also acknowledged in a 2006 review of rehabilitation practices that much more rehabilitation could be taking place overall.

Looking to the future

Over the long term, issues related to the supply of aggregates will become increasingly important to address. MNR's most recent research into the remaining supply of aggregates available in close-to-market areas suggests that shortages of high quality aggregate extracted from quarries could be experienced over the next 10-20 years unless new quarries are approved.

MNR has commissioned studies over the years that have examined the feasibility of transferring more aggregate production to remote areas of Ontario (the most recent study examined the feasibility of moving aggregates to the GTA from North Bay by rail , or from Manitoulin Island by barge) to reduce pressure on close-to-market areas that have been a long term source of aggregates. MNR's studies have indicated that there could be drawbacks in shifting production to more remote areas, or changing modes of transportation. These include higher costs , increased greenhouse gas emissions, and social impacts along transportation routes. However, both current and past studies have also suggested that use of alternatives such as rail or barge to move aggregates to high demand areas could be appropriate in some contexts.

Other jurisdictions such as the United States and the United Kingdom do move small percentages of aggregates by rail over both short and long distances. For many years, the UK government provided grants for the development of rail and marine infrastructure for the purposes of transporting aggregates.

While alternatives such as rail are unlikely to entirely replace trucking, they may still be appropriate in some contexts for Ontario and could be considered as the province investigates how aggregates will be supplied over the long term. However, a crucial first step will be to address the need to enhance recycling, compliance monitoring, rehabilitation and demand management.

Next Steps

MNR has committed to developing a long term aggregate resources management strategy, although timelines for its completion and implementation have not been established. MNR has also committed to developing an aggregates conservation strategy in collaboration with other provincial ministries. The full studies MNR has commissioned to provide background information for the development of these new strategies are available from http://www.mnr.gov.on.ca/en/Business/Aggregates/2ColumnSubPage/286708.html

CIELAP's full report on aggregate extraction in Ontario is available at www.cielap.org.