

# Life Cycle of a Pit or Quarry

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ONTARIO STONE, SAND  
& GRAVEL ASSOCIATION

# Pits, Quarries and the Environment

Pits and quarries are only located in areas where aggregate is found and close to where it is used. The most environmentally responsible consideration when mining for stone, sand or gravel is to establish a pit or quarry close to where the material is needed, which will minimize the greenhouse gases caused by trucking the product to the construction site. For many Ontarians, this means pits and quarries in their communities – and questions about how they can possibly co-exist with their local environment.

Today, aggregate industry employees are considered professional stewards of the land in which they operate. The industry also employs environmental professionals who focus on ensuring that the industry meets all requirements that are in place to ensure Ontario's environment is protected.

Throughout the life cycle of a pit or quarry, sites are carefully managed and monitored to ensure there is minimal environmental impact. This brochure provides an overview of the activities at each stage in the life of a pit or quarry that ensure operations are completed responsibly.

## Exploration and Site Selection

Aggregate only exists where nature put it. The location of potential aggregate pits and quarries is limited by geology. Other significant natural or cultural features in the landscape further limit potential locations for aggregate operations.

Quarries are located where high-quality bedrock is found close to ground surface, making it feasible to extract because there is less overburden that needs to be removed. Depending on the quality, quarried rock can be used in high-end products like asphalt, concrete or bricks, while lower quality rock may be used for other construction needs such as road base and drainage.

Extracted material from pits includes sand and gravel, deposits formed in moraines, eskers, spillways etc. that are the result of ancient glacial activity. When sand and gravel deposits are evaluated, grain size and quality are important factors to consider. The more 'fine' material that is found mixed in with the sand and gravel, the less desirable the deposit may be. Not all deposits are created equal, which is why the industry takes a great deal of care when selecting new sites.

Once a candidate property is found, a series of studies are undertaken to better understand the site and surrounding environment. The destination, or end use, of the products is known as the 'market'. Having the property close to the market is another factor that the industry takes into consideration when going through the site selection process.



# Licensing and Approval

When a desirable site is located, a wide variety of studies are required to assess the property's suitability. Various studies are required as part of a comprehensive licensing process and can include examination of natural heritage features, nearby land uses, groundwater, surface water, blasting modelling, traffic, endangered species, noise, dust and archaeology. This work is completed to ensure the environment and local community will be protected through the complete life cycle of the operation. These studies can take several years to complete and are used to direct extraction in a way that minimizes impact on the surrounding area.

Hydrogeological (water) technical reports that accompany a licence application, for example, must evaluate if there is potential for adverse impacts to nearby well users, natural environment features and surface water bodies and may include plans for implementation of contingency and mitigation measures.

While Hydrogeology is just one technical report that is needed, part of the impact assessment includes what happens with the natural environment. This is why a natural environment technical report is also required as part of the license application and must determine if there is a potential for the aggregate operation to negatively affect nearby features such as wetlands, fish habitat, woodlands and endangered species. If impacts are identified, proposed preventative and mitigation measures are also outlined. You can see how these reports are integrated in many ways!

The completed studies support the development of detailed site plans that describe the proposed operations in detail. Site plans are the core of an application for an aggregate licence and include documentation of the existing conditions of the property, how the aggregate will be extracted and the final rehabilitated conditions after the material is removed. Throughout the licence application process, the public, Indigenous communities, government agencies and neighbors are involved and consulted. If approved, site plans legally govern the aggregate operations from start through to completion of final rehabilitation.

\*Photos 2, 4, & 5 courtesy of Skelton, Brumwell & Associates Inc. Photos 7 & 9 courtesy of CBM Aggregates. Photos 1, 3, 6, 8, infographic & cover courtesy of OSSGA.



# Opening a Pit or Quarry

Once a licence is granted through the licensing process, the site plans outline in a prescriptive manner how the site is to be prepared in order to ensure that safety and environmental conditions are met. Site preparation is generally designed to assist with noise, dust and traffic control through the construction of berms along the property boundaries, improvements to roads and entrances, and the planting of vegetation. Additional permits may also be required if water is being handled or used on site or a processing plant is being located within the property. Appropriate agencies are involved during this process and ensure that the appropriate review has taken place prior to issuing the required permits.

## Active Sites

Aggregate material is extracted using heavy equipment. The material is mechanically separated into different sizes using screens. Certain products require washing to rinse off the fine particles, which is carried out using a wash plant. No chemicals are used in this process. This processing creates different blends and types of material demanded by the market. Aggregates are shipped via truck to the consumer.

During operations, environmental controls (as defined by the background studies and site plans) are implemented and aggregate producers must adhere to the monitoring and mitigation requirements of their permits. Groundwater and surface water monitoring programs are initiated to ensure there are no impacts from the operation on local water quantity and quality. Noise may be monitored to ensure compliance with sound level limits and dust is mitigated on-site. Quarries typically require blasting of the rock. Blasts are regularly monitored to ensure they are within limits established by the Ministry of the Environment, Conservation and Parks.

Aggregate producers pay fees on per tonne of aggregate material shipped from their site. These fees are paid to provincial and municipal governments to offset wear and tear on the roads, help administer regulation of the industry, and support the rehabilitation of legacy pits and quarries.

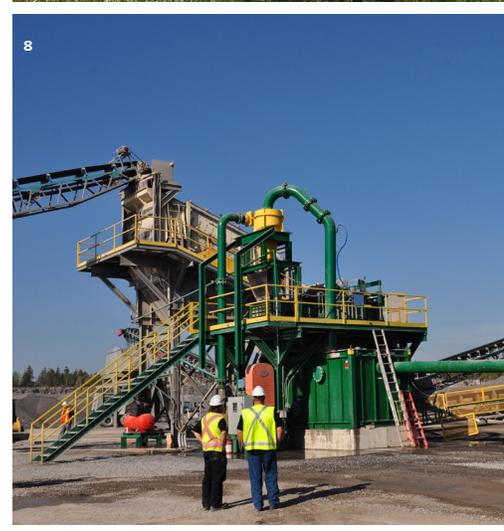
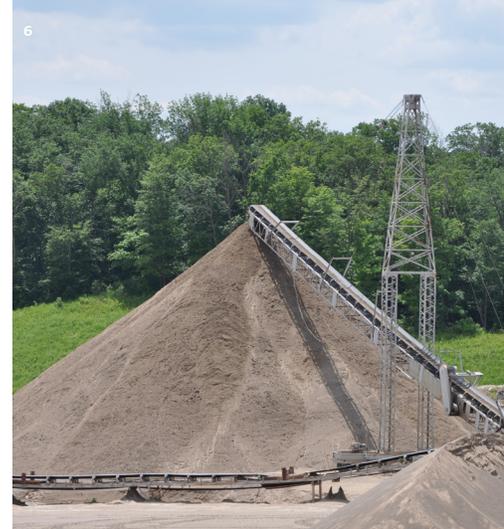
## Rehabilitation

Rehabilitation is an ongoing activity at aggregate operations. Progressively rehabilitating portions of the site as soon as is reasonable is beneficial in many ways. Progressive rehabilitation minimizes the open areas of a pit or quarry, reducing dust and soil erosion. Progressive rehabilitation even reduces costs for the operator because materials placed directly in rehabilitation are only moved once.

The rehabilitation plan approved at licencing determines the end use of the site. After aggregate is extracted it is returned to productive wildlife habitat, wetlands, recreational areas, urban uses, conservation lands, forests or agriculture. The operator is required to establish this new land use before the licence may be surrendered back to the Ministry of Natural Resources and Forestry.

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# LIFE CYCLE OF A PIT OR QUARRY

At every stage in the life of a pit or quarry, minimizing the impact on neighbours and the environment are top priorities.

The industry employs hundreds of environmental scientists, from species-at-risk specialists to hydrogeologists and engineers, who are all focused on upholding the laws that protect Ontario's environment and communities.

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## 1 EXPLORATION AND SITE SELECTION

Stone, sand and gravel (aggregate) exists where nature put it. The location of pits or quarries is decided by geology. Quarries are located where high-quality bedrock exists. Sand and gravel pits are located in areas like moraines and eskers and are the result of ancient glacial activity.



## 2 LICENSING AND APPROVAL

Prior to licence approval, studies are completed to support environmentally friendly development of the site and rehabilitation, while engaging in indigenous/public consultation through the process. Any potential issues are also identified and appropriate mitigation measures designed.



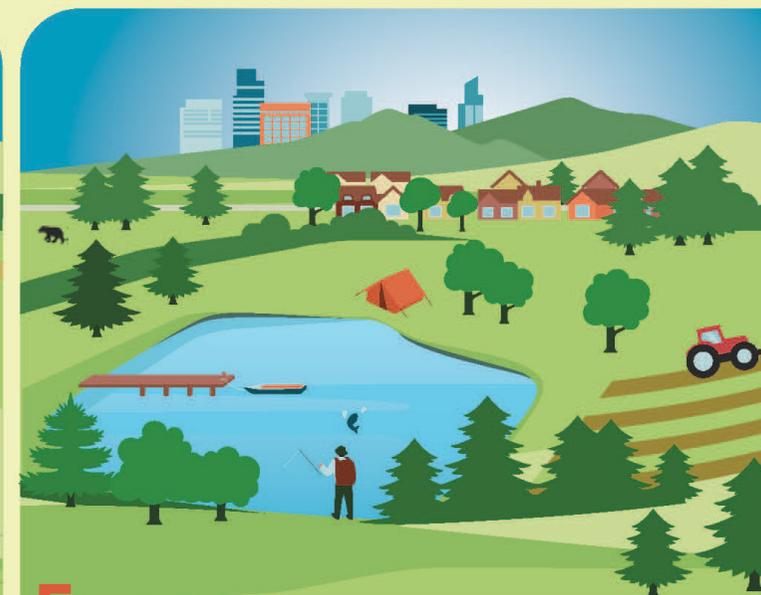
## 3 OPENING A PIT OR QUARRY

Environmental controls must be in place before extraction begins. Berms are constructed to address noise/dust. Monitoring wells may be installed to measure water levels/quality. To operate, sites must comply with permits, 25 pieces of legislation and hundreds of regulations.



## 4 AN ACTIVE SITE

Aggregate is extracted using heavy equipment and processed into different sized rocks. Washing may occur to clean the products, but chemicals are not used. Licensed sites must follow their site plans and government rules and regulations about water, noise, dust and blasting.



## 5 REHABILITATION

Rehabilitation takes place after each phase of the pit or quarry is extracted. After all the aggregate has been extracted, the site is rehabilitated into wildlife habitat, wetlands, recreational areas, urban uses, conservation lands, or agriculture. The licence is then surrendered.