TAILINGS RECLAMATION AND REVEGETATION USING MUNICIPAL DEWATERED BIOSOLIDS

Jeff Newman, Terratec Environmental*, Glen Watson, Vale, Michael Payne, Black Lake Environmental

*Terratec Environmental, 200 Eastport Blvd, Hamilton, Ontario L8H 7S4 Jnewman@terratecenvironmental.com

(905) 544 0444

Site remediation of severely disturbed lands such as mine tailings, strip mines, and logged areas has been progressing in other parts of North America for many years. In Ontario, residuals such as paper fibre residuals have been used for reclamation on a limited scale. Some active sites have implemented temporary solutions such as spreading chopped hay or straw or applying a chemical dust suppressant on tailings to reduce the amount of wind erosion from the surface of un-remediated areas. Although these practices are effective, they are costly, labour intensive and are not an economical long term strategy. An innovative method to address challenges of site remediation and dust control faced by the mining industry has been initiated by a unique partnership between Terratec Environmental Ltd (Terratec) and Vale Canada (Vale).

In 2012, Terratec entered into discussions with Vale to establish a collaborative trial project to utilize municipal biosolids to enhance vegetative growth on the mine tailings at their operation in Copper Cliff, Ontario.

Vale Canada's operation in Copper Cliff, situated within the City of Greater Sudbury, is an integrated mine, mill, smelter and refinery complex. For over 100 years, tailings from the milling operation have been deposited in the Copper Cliff Central Tailings impoundment, a 2,500 hectare (ha) facility. Since the early 1970's, a variety of projects and research trials have been done in an effort to re-vegetate the tailings area. Although there has been notable success, there were and still are large areas of bare or sparsely vegetated tailings which have led to erosion management challenges. Due to the fineness of the tailings wind erosion has been a significant issue when the surface dries. In an effort to control the tailings dust, Vale staff has spread either chopped hay or straw or a chemical dust suppressant. These practices, implemented to limit the effects of the wind erosion have been and are currently still effective but they have a significant cost in material and labour. Terratec and Vale wished to investigate a cost-effective alternative solution that would also provide significant additional environmental and aesthetic improvements such as wildlife habitat and overall improvements in biodiversity. Biosolids are the nutrient-rich by-product from the treatment of municipal wastewater. The nutrients contained in biosolids include nitrogen, phosphorus and organic matter, in addition to essential micro-nutrients like copper, iron, molybdenum and zinc, which are vital to plant growth and soil fertility. Typically, biosolids are spread on agricultural fields as a commercial fertilizer replacement. However, when agricultural areas are not available due to weather or regulatory restrictions, alternative areas of utilization are necessary in order to keep this valuable resource from landfills.

It became apparent that the solution for each company's challenge was creating a partnership with one another. Vale could utilize biosolids from Terratec to establish a permanent vegetation cover on the tailings. Terratec could beneficially utilize this valuable resource for remediation purposes rather than landfilling. By implementing this program, both companies would benefit from innovative techniques to managing their respective challenges.

In 2012, Vale and Terratec proposed the establishment of an initial trial utilizing 2,000 dry tonnes (DT) of dewatered municipal biosolids. Application timing was dependent on the specific project and site suitability. Proposed project objectives were:

- 1. To establish a vegetative cover on the inactive portion of the tailings area to reduce or minimize and, ideally, eliminate wind and water erosion.
- 2. To establish a vegetative cover on the mine tailings to reduce water infiltration through absorption and utilization by the plants and evapotranspiration from the vegetation.
- 3. To establish a vegetative cover on the slopes of the tailings dams to reduce erosion potential.
- 4. To provide a growing media for hay and / or straw production for use in other areas of the tailings for dust suppression and to reduce the importation of purchased hay and straw for dust suppression.
- 5. To reduce the utilization of dust suppressant chemicals currently applied to the tailings.
- 6. To establish a vegetative cover on the mine tailings that would provide natural habitat enhancement and result in overall biodiversity improvements.

The utilization of biosolids is a sustainable environmentally prudent reclamation alternative to conventional practices for the mining sector. Conventional reclamation requires the use of materials that are mined or quarried from neighbouring lands or the use of chemical fertilizers and other soil amendment chemicals. Materials such as sand, clay, and topsoil extracted, are expensive to import and leave the source location "scarred". Considerable resources need to be spent to extract virgin soil and transport it to the mine site. The geographical magnitude of the Copper Cliff tailings operations makes the prospect of using soil from adjacent lands very impractical. Using soil would create large tracts of land that then would need to be repaired and revegetated using methods similar to closure practices for an aggregate extraction location. As a consequence, one problem would be solved at the expense of creating a second problem. By utilizing biosolids, Vale is keeping tonnes of nutrient-rich material out of landfills and providing a growth media for revegetation, revegetation which will provide for increased sustainability, while potentially growing their own erosion mitigating products, and reducing their reliance on imported remediation materials.

Currently, the Vale Copper Cliff Central Tailings Facility consists of an area of approximately 2,500 ha, 1,300 ha are inactive and are available for remediation with biosolids. The remaining area continues to be active for tailings disposal and water control. At the current application rate of 150 DT/ha there is the potential requirement of approximately 195,000 DT of biosolids. This could provide more than 30 years of biosolids utilization at an annual rate of 6,000 DT of material. The success of this project has led Vale to evaluate other sites in the Sudbury area for this type of remediation, ensuring a long term environmentally sustainability rehabilitation program.

In the future, Vale plans to harvest the vegetation from the reclaimed areas to be used to offset the importation of hay or straw from farming areas outside of Greater Sudbury where it is currently sourced. This will reduce fuel consumption for transporting this material and make more straw and hay available to the agricultural community in Northern Ontario.

Vale and Terratec are further developing the program by adding leaf and yard waste from the Greater Sudbury area to increase the quality of the amendment being placed on the Vale tailings operations. This will increase the understanding of how to optimize the mixture to address local conditions and potentially how to take this concept and correct similar problems in other areas of the province, where land reclamation efforts are in need of a cost effective solution.

Vale and Terratec through a unique partnership have developed a model for both the mining and the organics recycling industries in Ontario. They have demonstrated that the environmentally sustainable practice of combining and utilizing organic residuals from municipalities and industries is both economically and environmentally feasible as well as good sense in this age of Reduce, Reuse and Recycle.

41st CLRA National Annual General Meeting and Conference

McIntyre Arena, Timmins, Ontario June 26-29, 2016

PROCEEDINGS



Canadian Land Reclamation Association Association canadienne de réhabilitation des sites dégradés