

2015 British Columbia Mine Reclamation Awards

September 21, 2016, Penticton British Columbia

INTRODUCTION

Good evening everyone and welcome. For those of you that don't know me, my name is Kim Bellefontaine and I am the Manager of Environmental Geoscience and Permitting with the British Columbia Ministry of Energy and Mines. I am also the Chair of the awards sub-committee of the Technical and Research Committee on Reclamation.

I am so pleased to be here this evening to present the Annual British Columbia Mine Reclamation Awards on this momentous occasion of the 40th Anniversary. Forty years is a very impressive milestone, and there are many people here and many who have come before us, who have contributed to this success.

The TRCR established an Annual Jake McDonald BC Mine Reclamation Award, shortly after mine reclamation legislation was enacted in BC. As many of you know, BC has long been a leader in this area. This award is named for Jake McDonald, a former Senior Reclamation Inspector, and pioneering practitioner with the BC Ministry of Energy and Mines. In addition to the major jade award, the committee can also recognize excellence in reclamation through category awards for metal mining, coal mining, sand and gravel operations, quarries, industrial mineral mines, placer mining, mineral exploration and coal exploration.

The awards may recognize work of various scopes and may be the result of a group effort or a single person's activities. These awards are assessed by the awards sub-committee based on:

- quality in research,
- innovation in techniques,
- quality of work undertaken,
- extent of land reclaimed, and,
- work of a high standard that has been conducted over a number of years.

This year, the awards committee received a single nomination. But I am happy to report that it was a very good nomination. I would like to acknowledge the contributions of the other award sub-committee members this year, including current TRCR Chair Jonathan Buchanan, with the Association for Mineral Exploration BC and Wendy Gardner, with Thompson Rivers University.

Last year, due to the incorporation of the Reclamation Symposium with the 2015 Mine Closure Conference in Vancouver, the Annual Mine Reclamation Awards were presented at the December Board of Directors meeting for the Mining Association of British Columbia instead of at an awards banquet like this one. Most of our regular symposium participants were not able to attend this event, and thus we thought a short recap of last year's winners was definitely in order.

RECAP - 2014 METAL MINING CITATION

Last year, the award for outstanding achievement for reclamation at a metal mine was presented to Huckleberry Mines Ltd. for their work to remediate a fishway in Creek M near the Huckleberry Mine.

The Huckleberry Mine is an open pit copper mine located near Houston BC. In 1996 the mine implemented a fisheries habitat compensation plan to offset the anticipated losses of fish habitat associated with the development and operation of the mine. At that time Creek M, located on the south side of Tahtsa Reach in Ootsa Lake, was barren of fish due to two steep gradient reaches that precluded fish from reaching a headwater pond.

The original compensation works were constructed from a series of steps or weirs lined with geotextiles and anchored with rock fill. Fish surveys that were conducted between 2001 and 2011 found that adult rainbow trout were present in the headwater pond and juveniles were present in the lower reaches of Creek M, but subsequent surveys conducted between 2008 and 2011 indicated that the juvenile fish numbers had decreased to record lows. This highlights the complexities that can exist with creating fish habitat.

The decline in fish numbers was attributed to failure of the weirs in the lower and middle fishways, causing juveniles to become stranded in isolated pools and precluding adults from reaching the preferred spawning habitat between the lower and middle fishways.

So Huckleberry undertook more work in 2012 and 2013 to remediate the fishways in the lower reach of Creek M. Construction materials were imported to this remote site via helicopter and boat. Fish salvage was completed prior to construction and stream flows were conveyed around the work area. The work involved upgrading and increasing the 26 original weirs to 40 weirs to achieve the channel grade control that was needed as well as pool-jump specifications required for fish. During the fishway construction the stream banks were armoured with rock salvaged from the original constructed works. This work was conducted by hand due to access restrictions for mechanized equipment.

The initial monitoring of the remediated area in 2013 and 2014 evaluated the stability of the constructed works as well as presence of fish. The structural integrity of the fishways have remained intact through high-flow periods, with no erosion or undermining of the weir structures being observed. During the 2013 fish survey, 39 rainbow trout were captured in Creek M, the largest number of fish observed since 2008. Remarkably, these observations were made even while construction of the middle reach fishways was ongoing. Monitoring programs will continue in the future to confirm the effectiveness of the restoration work, including hydraulic functioning, physical stability, structural integrity, fish distribution and net gain.

Huckleberry Mines Ltd. was also recognized for their hard work in developing and maintaining positive relationships with local First Nations. The Huckleberry nomination was augmented by three separate letters of support from local First Nations including the Cheslatta Carrier Nation, the Nee Tahi Buhn Indian Band, and the Office of the We'suwet'en.

Hiroyuki Tarumi (President), Randall Thompson (Chief Operating Officer), and Marke Wong (Environmental Superintendent) accepted the Metal Mine Reclamation award for Huckleberry Mine on behalf of Huckleberry Mine Ltd.

KEEPER TROPHY - 2014 JAKE MCDONALD MINE RECLAMATION AWARD

Last year's winner of the 2014 British Columbia Jake McDonald Mine Reclamation Award was Valley Gravel Sales Ltd. for outstanding reclamation achievements at the Valley Gravel Mine.

The Valley Gravel mine operation is located on Huntingdon Road in Abbotsford BC, within the Agricultural Land Reserve. Gravel extraction occurred between 1994 and 2013, with reclamation activities beginning in 2010. The overall objective of reclamation for these properties was to return them to an equal or better agricultural capability compared to what existed prior to gravel mining.

The Valley Gravel operation covered an area of approximately 38 acres that was primarily used for hay and pasture prior to gravel extraction. A smaller portion of the property was also used for raspberry production, however this was limited by the topography of the fields and poor soil conditions. Overall the area had a variable agricultural capability rating including areas with ratings that are typically very challenging to improve.

Significant planning went into the reclamation program. The process for reclamation included leveling of the subgrade through a cut and fill process. This required moving quantities of till and materials into place to ensure a grade of 80 to 85 m above sea level. A sloped area in the southeast corner of the property was steepened which enabled an improvement to the overall grade of the field and maximized the flat farmable land area for crop planting. A sand filter layer was then added across the reclamation area to improve drainage and help with creation of a soil profile that is preferable for plant root development. This was then capped with stockpiled topsoil. This topsoil was screened to remove large rocks prior to placement to ensure the final soils could be tilled using farm equipment; an innovative and expensive step to improving capability. Finally, local manure was tilled into the soil to provide an initial nutrient source.

The final result of reclamation activities was a uniformly graded field with gradual slopes and high quality topsoil that represented a significant improvement over pre-mining conditions. To confirm that reclamation would be successful, additional soil surveys and soil chemistry analyses

were completed to assess the quality of the reclaimed area. The information has demonstrated that the agricultural land capability was greatly improved. Prior to mining, only 40% of the area had a Class 3 agricultural capability rating, and subsequent to reclamation, more than 77% of the land area is now classified as Class 2 and Class 3.

Today, the reclaimed area has been successfully growing forage crops. Additionally, a smaller plot of land has supported demonstration plots for various vegetable crops along with a home garden including corn, cabbage and zucchini.

Valley Gravel Sales Ltd was recognized for their well-planned and very well executed and successful reclamation program that greatly improved the agricultural land capability at the Huntingdon Road properties in Abbotsford BC.

Barry McLean (Chief Financial Officer) with Valley Gravel Sales Ltd. accepted the 2014 British Columbia Jake McDonald Mine Reclamation Award for the Valley Gravel mine, and I would now like to call upon him to come forward and accept the keeper trophy.

ANNUAL BRITISH COLUMBIA JAKE MCDONALD MINE RECLAMATION AWARD

On behalf of the Technical and Research Committee on Reclamation, I am very pleased to announce that the recipient of the 2015 British Columbia Jake McDonald Mine Reclamation Award is Thompson Creek Metals Company Inc. for outstanding reclamation achievements at the Mt. Milligan Mine.

The Mount Milligan Copper-Gold mine is located halfway between Mackenzie and Fort St. James, in central British Columbia, approximately 150 km northwest of Prince George. The Mount Milligan project underwent several separate phases of mine planning and feasibility assessment over a 15 year period, including two separate environmental assessment processes.

During those reviews, and in response to concerns from First Nations, regulators and other stakeholders, the original 1993 mine design was significantly modified in several key ways to reduce the mine footprint by more than 1300 hectares; a roughly 48% reduction in mine footprint to its current 1229 hectares of disturbance. This reduction resulted from the relocation of the tailings storage facility as well as the realignment of the tailings dams to avoid key fish habitat. It also confined most of the mining activities and associated infrastructure to a very tight footprint within the King Richard Creek watershed. Although the modified mine design resulted in many positive changes for the project, including the avoidance of impacts to many sensitive habitat areas, the project was still going to impact approximately 9.5 hectares of stream habitat due to construction, infrastructure and alteration of the natural flow regime. So this required the development of an extensive fish habitat mitigation and compensation plan.

The compensation measures developed for the mine focussed at minimizing and mitigating habitat alterations and losses for rainbow trout in the Rainbow Creek watershed; specifically measures to address the shortage of natural overwintering habitat where oxygenated water is needed to support fish through winter freezing conditions. Natural winter fish kills in the area have been documented, when winter time oxygen levels drop to below 3mg/L.

Thus, a key component of the habitat compensation plan was the construction of three large overwintering ponds, covering roughly 3 ha of new habitat. Significant studies on substrate conditions, hydrology and habitat were completed before beginning the work. Fish Stream Engineers carefully sited the ponds to be hydrostatically connected to Rainbow Creek, but also at the same time, to be continually recharged by upslope streams and upwelling groundwater. This was an imperative to minimizing the potential for dewatering during low flow conditions and also to prevent winter kill.

The three overwintering ponds were constructed between 2012 and 2014. Each pond was sized to maximize the amount of overwintering habitat that could be created within the floodplain. Inlet waters to the ponds were directed over cobble cascades to aerate the water year-round, significantly adding to the winter oxygen levels. Outlets to the ponds were designed to promote trout passage both at low flow and during flooding conditions. The pond floors were covered

with 30 cm of smooth cobbles to provide interstitial spaces for insects, amphibians and juvenile fish and clusters of 1 metre boulders were also added to the pond floors to provide additional habitat complexity.

Some of the innovative reclamation techniques used during the work included the collection of the original surface organic mat, preserving it through the construction phase, and then immediately placing it back over exposed areas. The natural seed bank and native roots of willow, scrub birch, rose and other local plants that were already in situ were then able to successfully revegetate the area. Ground cover is now approaching 95% on the 2012 excavations.

To provide additional types of habitat, whole trees, including roots and branches were anchored into the pond floor and placed around the perimeters. While providing habitat under water for fish, these trees are also meant to provide habitat to aquatic insects including several blue-listed dragon flies that inhabit the area. Snags were also “planted” at an angle over the water, providing perching habitat for birds. There have now been observations of duck, geese, grebes and sandpipers using the ponds for nesting. Osprey have also been observed to be utilizing the inverted snags and have built a nest at the site.

For the construction activities, Mount Milligan partnered with local company, Duz Cho Logging, which is owned by the local First Nation, the McLeod Lake Indian Band. The company is well-regarded for its high standards for safety and for its quality workmanship. Duz Cho constructed the ponds and several of the reclamation design aspects came directly from the expertise of the Duz Cho management and crews.

We’re going to show you a very short video clip of some of the construction activities associated with the rehabilitation of a spawning channel near the Powerline overwintering pond. This area is affectionately known on site as “Rumley Riffles”.

Effectiveness monitoring on the overwintering ponds by a third-party monitor confirms that all ponds are functioning as intended. Critical winter oxygen levels are maintained above 3mg/L in

late winter and fish presence in each pond has been confirmed. For the two older ponds, revegetation on the pond edges has had greater than 80% survival after two seasons. Inlets and outlets of the ponds also remain stable and fish passable year-round.

Mount Milligan has also conducted significant other fish habitat restoration activities including placing rock and woody debris in 330 structures along 15 km of Rainbow Creek to enhance habitat. As well 9 culverts have been replaced with free-span bridges in the Nation River watershed, mitigating previous impacts of old logging activities and restoring access to fish to an additional 19.7 ha of habitat.

The work to date at Mount Milligan, highlights that successful reclamation doesn't just happen at the end of mine life – it starts early in the planning process, and sets a stage for future success. Tonight, Thompson Creek Metals is recognized for their exemplary efforts to significantly reduce the impacts to fish habitat at the Mount Milligan Mine through proactive mine planning. The company is also recognized for its careful research, planning and holistic approach to implementing the habitat mitigation and compensation works for the project. The positive relationship and strong partnership with the McLeod Lake Indian Band is noteworthy and also serves as an example to others.

It is now my distinct pleasure to call upon **Wes Chingee (Environmental Technician and member of the McLeod Lake Indian Band) and Daphne Hall (Environmental Advisor)**, both with Thompson Creek Metals Company Inc., to please come forward accept the 2015 British Columbia Jake McDonald Mine Reclamation Award for the Mount Milligan Mine.

CLOSING

That concludes the award presentations for this year. On behalf of the TRCR, I would like to congratulate this year and last year's winners. And I also want to all of the companies and individuals that are so committed and involved with mine reclamation activities throughout the province. We look forward to seeing you next year.