

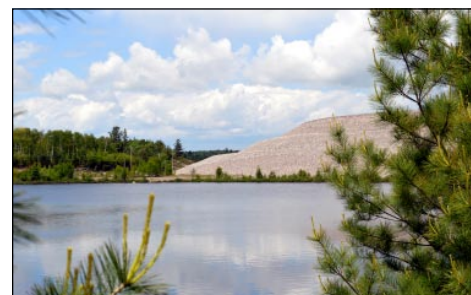
Elliot Lake Dams: Dam Safety and Emergency Response

Dams play an important role in the safe operation of both Rio Algom Ltd. (RAL) and Denison Mines Inc. (DMI) closed mine sites. Most of the tailings management areas are submerged in order to prevent them from oxidizing (reacting) with open air, and a system of dams, berms, dykes and spillways helps maintain the water cover. All dams in the Elliot Lake area are subject to a rigorous program of dam maintenance. The dam maintenance program involves inspecting the dams for any evidence of structural distress including shifting or slumping of the dam, forma-

tion of cracks in the surface, or the effects of erosion such as wind or water. Further, the dams are kept free of any vegetation as penetration of roots can undermine dam stability. Finally, annual geotechnical Dam Safety Inspections (DSIs) by the engineers-of-record are arranged in order to ensure the dams stay within design specifications for all of the above-mentioned risk factors.

Every five to seven years, RAL and DMI also contract an additional safety study by third-party engineers in order to comply with applicable regulations and ensure dam safety. These studies are called Dam Safety Reviews (DSRs) and are systematic reviews and evaluations of all aspects of design, construction, maintenance, operation, and surveillance, along with other factors, processes and systems affecting dam safety. The DSR includes all components of each “dam system” including the dam itself, spillway, foundation, abutments, and even the tailings management area being maintained. The most important aspect, is that the DSR evaluates the system based on current standards. The current standards may be different from the acceptable standards that were in place at the time of original construction. If a system, structure, or process is inadequate, the upgrades are performed as a result of the DSR, so that the Elliot Lake dams are always maintained to the best current practices for dams in Canada.

In addition to the substantial effort that RAL and DMI apply to maintaining the Elliot Lake dams, both companies have focused their efforts in the area of emergency response planning for the sites. In 2016, RAL and DMI have conducted several joint exercises with the City of Elliot Lake and various first responders to improve and better integrate the emergency preparedness of all parties in the event of a potential incident at one of the sites.



Denison Mine - Dam 10

A high water table (close to the surface) at the Pronto TMA serves to reduce acid generation. However, in the eastern portion of the TMA, the saturation extended to surface which hindered traditional direct liming and seeding and as such a successful vegetative cover could not be maintained. To resolve this problem, rock-lined drainage ways were installed in the eastern portion of the TMA during the winter of 1999 and 2000. Then six tonnes/ha of limestone and 500 kg/ha of fertilizer were applied to bare areas in the spring of 1999 and a 30 cm depth of biosolids (in the form of paper mill sludge) were spread over a 20.9 ha area from 1999 to 2001. These measures have been effective in maintaining a 100% vegetative cover following program completion in 2001.

Current activities at the site include seasonal water treatment through a lime treatment plant, removal of vegetation from site dams, inspections of the cover and facility conditions, and environmental monitoring. The site complies with all environmental regulations and licences and has been an excellent example of mine closure done right in Ontario.



Rehabilitated Tailings Area with Biosolids

Inside This Newsletter...

- **Elliot Lake Dams: Dam Safety and Emergency Response**
- **Pronto: A History**
- **Quirke Lake Fire**
- **Water Quality in the Serpent River Watershed**
- **Community Interaction with Closed Mine Sites**
- **Penokean Hills Field Naturalists**
- **Watershed Monitoring Map**
- **Owners and dogs: Responsibilities on closed mine properties**
- **Hiking on Mine Property**
- **Keeping in Touch**

Quirke Lake Fire

On May 24, 2016 at approximately 1 pm, a local resident boating on Quirke Lake noticed smoke in the bush between Quirke Lake and the Denison closed mine site. The resident notified the Elliot Lake Fire Services (ELFS) which immediately initiated its response to the fire. John Thomas, Elliot Lake Fire Services Fire Chief, contacted the Ministry of Natural Resources and Forestry (MNRF) to request support. By approximately 2:25 pm, the ELFS team had arrived at the site to commence their initial attack and by approximately 3:45 pm, the MNRF support team which included a team transported by helicopter, a fixed wing support plane and an MNRF water bomber were at the site. The water bomber began dropping water onto the fire at 3:50 pm and completed its last drop at approximately 4:20 pm and at that time, the fire was substantially out and under control. A total of 61,300 litres of water was dropped onto the fire. The total area burned by the fire was approximately 3 hectares (HA) which is relatively small thanks to the quick action of the ELFS and the MNRF. To give some perspective of the size of the Quirke Lake fire compared to the Fort McMurray fire- the Quirke Lake Fire was 3 ha while the Fort McMurray fire was well in excess of 500,000 hectares which is larger than the area of the Prince Edward Island.

Without the quick responses of the local resident, the ELFS and the MNRF, the fire may have grown in size. The cause of the fire was a tree on a hydro pole line.



MNR Water Bomber with Rooster Rock in background



Drone shot of fire damage

Water Quality in the Serpent River Watershed

Rio Algom Ltd. (RAL) and Denison Mines Inc. (DMI) operate eight water treatment plants in the Serpent River Watershed. At these sites, tailings water is collected in basins or collection channels and directed to the treatment plants where treatment reagents (lime and/or barium chloride) are added to the process water. The treatment reagents raise the pH and remove contaminants from the water by binding to them and forming particles that are settled out of the water in settling ponds downstream of the treat-

ment plants. After the contaminants are removed, the clean water overflows from the settling ponds and is eventually released into the Serpent River Watershed.

Denison Environmental Services (DES) works on behalf of RAL and DMI to perform numerous tasks to ensure that the water released from the former mine sites (now referred to as "tailings management areas") is clean and the environment is protected. Measures include 24/7 monitoring and trending of the water treatment plants via computers

in the plant and regular operator surveillance; daily inspection of the water quality released from the plant; and extensive downstream monitoring.

Every five years, the environmental monitoring data from the tailings management areas and the downstream environment is reviewed by a third party consultant who specializes in water quality and environmental impacts. This review is documented in a report called the "State of the Environment Report" which is submitted to regulatory agencies and, following regulatory comments and approval, is available to the public either at the Elliot Lake library or by contacting the RAL or DES offices in Elliot Lake. The most recent state of the environment report is currently under regulatory review and will be finalized and released later this year; however, some of the highlights are discussed further below.

Water quality in the tailings management areas has continued to improve since the completion of site closure work in the 1990s. In the downstream environment of the Serpent River Watershed, all of the water quality parameters were below the provincial water quality guidelines and most samples were within the normal regional background variability (i.e. there were no detectable impacts from the former mine sites). Overall, the tailings management areas are performing as predicted during closure and the Serpent River Watershed water quality continues to remain better than the government guidelines that were established to protect human health and aquatic life.

Community Interaction with Closed Mine Sites

Submitted by Marg Reckahn, Penokean Hills Field Naturalists

The Penokean Hills Field Naturalists are the stewards of the Sheriff Creek Sanctuary. We have enjoyed many years of partnership with Rio Algom Ltd. (RAL) and the City of Elliot Lake in regards to the Sanctuary. This area is well used by the public, both local and visitors. There is seldom a day that goes by that there are not cars in the parking lot.

The Field Naturalists walk through the Sanctuary every Saturday morning as long as the weather permits. It is wonderful to walk along the well-maintained trails and watch how things change as the seasons change. In the spring, we are able to observe the many water fowl that either stop over here in their migration north or are residents who nest on the ponds. As well as water fowl you can also observe

the various song birds that make this area their home.

The Penokeans keep bird feeders full for the winter season and there are always a lot of birds who feast on the seeds.

For those who are botanists, there is always a varying array of plants to observe. They also change as we go through the seasons. As an example, there is an abundance of the lady slipper only in this area, growing in the Sanctuary.

In the winter we enjoy seeing the tracks of various animals as we make our way around the trails. Some examples are snowshoe hares, mice, squirrels and foxes. Last winter we saw the imprint of where a ruffed grouse had landed and then walked away through the snow.



Bird Sanctuary Beaver Deceiver

If you can come out and join us on a Saturday, you can meet people who are knowledgeable about the Sanctuary, who can help you identify what you see. In the last year, Jim Johnston and friends have installed signs at each juncture of the trails, so you know exactly where you are as you travel through the Sanctuary. There is also a handy brochure that will guide you around the various trails.

Denison Environmental Services, on behalf of Rio Algom Ltd. (RAL) does a great job of clearing dead falls and large debris from the trails and the Penokean Hills Field Naturalists look after the smaller obstacles. This is a rare collaboration that does not happen very often between a mining company and a naturalist club. We have made it work splendidly for many years.

Just remember that you are on mine property when you are in the Sanctuary. Please respect the fact that this is private property and also respect others who like to enjoy this little bit of nature in their back yard.

Safety Reminder

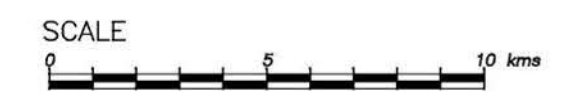
- Removal of any materials from these sites is strictly prohibited.
- Exercise caution and restrict your travel to marked trails and routes.
- Consider your own level of fitness and the limitations of the equipment that you are using.
- Visitors should be aware of wildlife including bears and should always keep their dogs on leash while visiting the sites.



Sherriff Creek Sanctuary Entrance

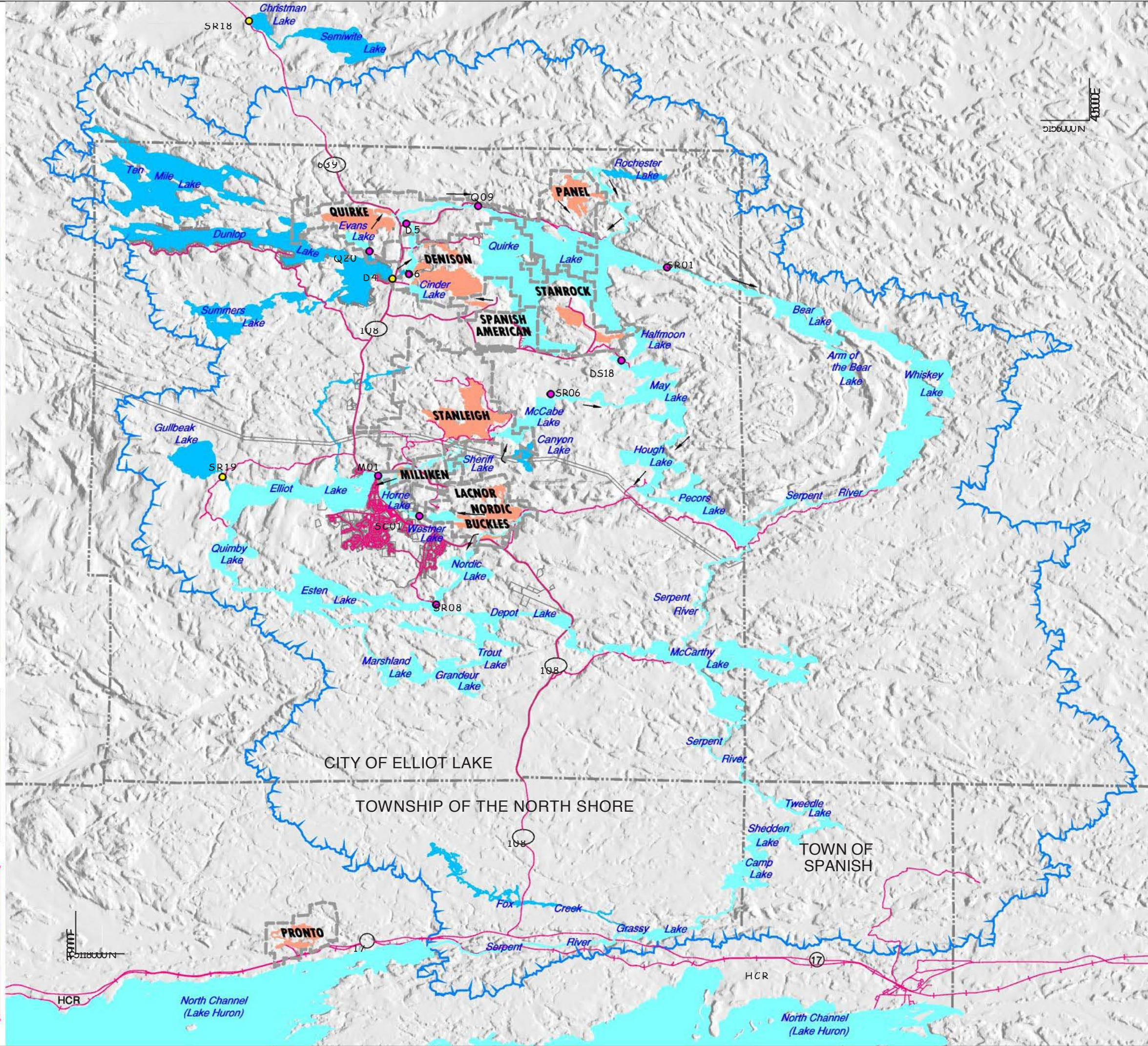
Serpent River Watershed Monitoring Program Cycle 4

October 2015



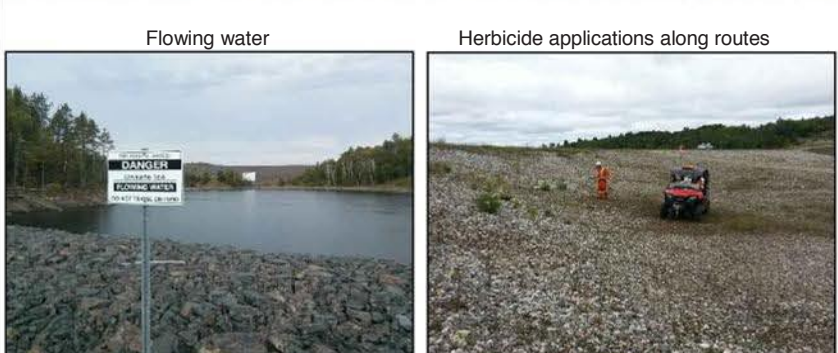
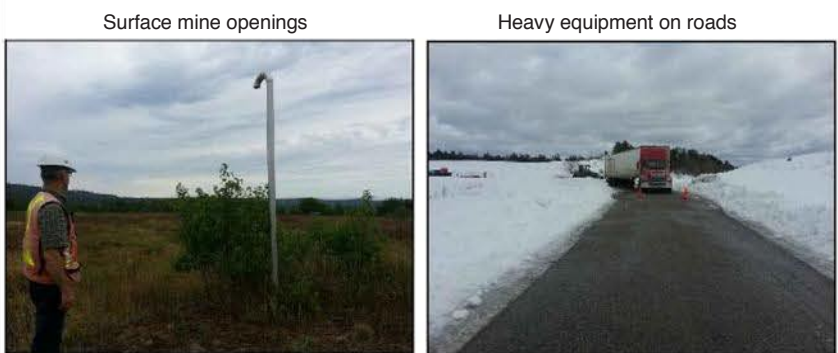
- Legend**
- Public Roads.
 - Railway.
 - Limit of Mine Properties.
 - Tailings Management Areas (TMA).
 - Exposure Lakes (Included in SRWMP).
 - Reference Lakes (included in SRWMP).
 - Water Sample Location (Exposure).
 - Water Sample Location (Reference).
 - Direction of flow.
 - Exterior limit of the Serpent River Watershed.

- Produced under Licence with the Ministry of Natural Resources (MNR) © Queens Printer for Ontario, 2015.
 - The watershed as shown is courtesy of the MNR.
 - No endorsement by this Ministry or the Ontario Government is implied by the use of their mapping products.
 - Additional mapping was provided by The City of Elliot Lake Engineering Department.



Know the Hazards Access at Your Own Risk

Sites are rugged with boulders, protruding objects, covered mine openings and uneven ground conditions. Removal of any materials from these sites is strictly prohibited. Exercise caution and restrict your travel to marked trails and routes. Consider your own level of fitness and the limitations of the equipment that you are using. Visitors should be aware of wildlife including bears and should always keep their dogs on leash while visiting the sites.



IN CASE OF EMERGENCY CALL: 705-461-0466

Owners and dogs: Responsibilities on closed mine properties

Rio Algom Ltd. (RAL) and Denison Mines Inc. (DMI) presently permit public access, at their own risk, to the closed mine sites in the Elliot Lake area. While many closed mine sites throughout Canada do not give permission for public access, we are pleased that walkers and their pets can access these private properties for their pleasure.

Prior to entering any of the closed mine sites, the public is asked to review the contents of the message centres and read the signage on the gates. RAL and DMI employees are routinely required to access the closed sites for maintenance, water treatment and monitoring purposes. Please be aware that if you are walking on the property, you may see our vehicles on site at any hour of the day or night. If there is a work project on any of the closed mine properties, the volume of vehicular traffic entering and leaving the sites will increase significantly. As a safety precaution, additional warning signs will be posted at the entrance gates and public access will be restricted for the duration of the project.

Recently, a safety concern has been brought to our attention by our employees and we would like to address it now, to prevent any incidents from occurring in the future. While driving on our sites, we have encountered dogs running freely on the access roads. There have been many instances where the drivers have had to stop the

vehicle to allow the dogs to vacate the road. We have also encountered dog owners who have chased after their pets, entering the traffic route while the vehicle was approaching. Neither RAL nor DMI want to see a pet/vehicle collision or worse, a person/vehicle collision.

To protect both you and your pet it is imperative that your dog is on a leash, not longer than 2 meters, while walking along the closed mine sites' roadways. We do not consider the leash necessary when your dog is playing in an area away from the roadway. However, when you and your pet return to the roadway, your dog must be on a leash. Please walk on the edge of the road to leave as much room for vehicle traffic as possible. Maintain care and control of your pet at all times.

Another noted concern is that dog faeces has been found in the area of the access gates. The City of Elliot Lake Animal Control By-law No. 01-60 Section 8 states that owners must remove faeces left by their dog (even on private property). Be considerate. Please be considerate and pick up after your pet. Signs have been posted at the access gates to the closed mine sites indicating the requirements for you and your pets. Failure to follow these requests may result in eviction from the properties.

For further information about the animal control by-law, please refer to the City of Elliot Lake website at www.cityofelliottlake.com.

Your cooperation in these matters will help to ensure that vehicle incidents involving your pets are prevented and that the privilege of public access to the closed mine sites will continue in the future.

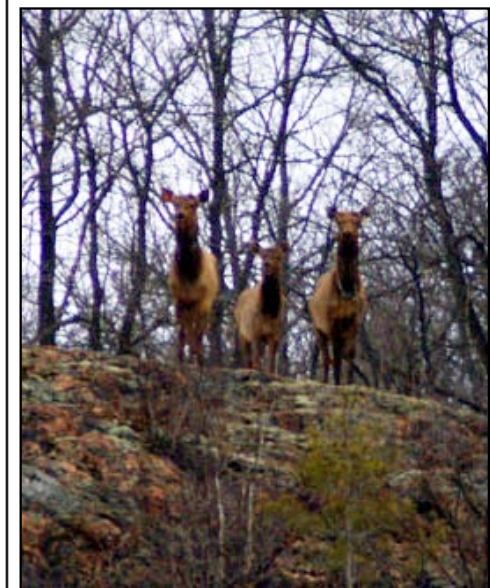
Hiking on Mine Property

Submitted by Astrid Turner, Coureurs de Bois Outdoors Club.

One of the biggest challenges faced by Trail Associations like the Voyageur Trail in Northern Ontario and the Bruce Trail in Southern Ontario is acquiring permission from private landowners for passage over their property. Fortunately for the Coureurs de Bois hiking club and the citizens of Elliot Lake, the relationship between Rio Algom Ltd., Denison Mines Inc. and hikers

has, and continues to be, mutually beneficial. We enjoy almost unlimited access to a wide variety of trails and landscape, and the mining companies have extra eyes to notice anything amiss.

The Coureurs de Bois hiking club enjoys many types of hikes and snowshoe outings on mine property, including Upper and Lower Rochester Falls. (Cont'd on Pg 7)



Three beauties on the ridge overlooking Quirke TMA.



Lower Rochester Falls

Hiking on Mine Property

Continued from page 6.

All four seasons bring different aspects to the hikes;



Fall – Breathtaking colours



Winter - Ice falls along Stanleigh Mine Road



Spring – Emerging foliage



Summer – Spectacular lunchtime vistas. This is Panel Mine Peninsula overlooking Quirke Lake with Rooster Rock on the left in the distance.



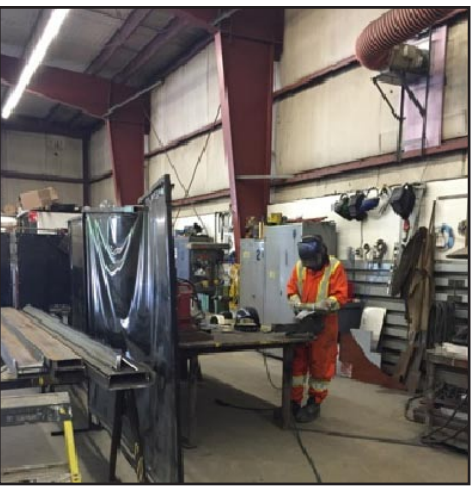
Quirke TMA from the ridge

The Quirke TMA (Tailings Management Areas) is also very popular with the club. The views from the ridge are spectacular and we've spotted elk on a number of outings.

We need to be mindful that access to the TMA's is a privilege, one that we often take for granted. As with any hike, take nothing but photographs, leave nothing but footprints, keep nothing but memories.

Keeping in Touch

You are invited to keep in touch and stay informed about Denison Mines (DMI) and Rio Algom's (RAL) activities in the Serpent River Watershed. Each summer the Nuclear and Mining Museum organizes tours of the mine sites as part of the Uranium Heritage Days festivities (Thank You Darla Hennessey!). Twice annually, both DMI and RAL provide a public presentation to Elliot Lake Council. If you prefer written material, our newsletter is published annually in the Standard and our technical reports on the Serpent River Watershed are available at the Elliot Lake library or by contacting either Janet Lowe at Denison Environmental Services or Debbie Berthelot at Rio Algom Limited. If your group or organization is interested in a presentation on our activities or would like to arrange a group tour of our sites, please complete the response form on the right.



Safety is a prime concern at DES, especially for our workers. This photo shows a DES worker wearing his personal protective equipment.

Response Form



We'd like to hear your thoughts about our performance in the operation, care and maintenance of our closed mine sites. Please call us or send us a note. We'll respond as quickly as possible.

Elliot Lake Closed Mine Site
Operation, Care and Maintenance

Question(s):

Cut out this form and use it to mail your comments to:

I'd like to know more about:

Debbie Berthelot
Reclamation Manager
Rio Algom Limited
P.O. Box 38
Elliot Lake, Ontario
P5A 2J6
debbie.berthelot@bhpbilliton.com

or

Janet Lowe
General Manager
Denison Mines Inc.
1 Horne Walk, Suite 200
Elliot Lake, Ontario
P5A 2A5
JLowe@denisonenvironmental.com

Your name and address (please print):

Telephone: _____
 Fax: _____
 E-mail: _____
 Date: _____

Thank You!