

CANADIAN LAND
RECLAMATION ASSOCIATION
ATLANTIC CHAPTER NEWSLETTER

issue 2 | Fall/Winter 2015



in this issue:

2015 highlights

how can *you* become involved?

pop quiz!

featured project



Michele Coleman

PRESIDENT'S MESSAGE

Welcome to the second newsletter for the Atlantic Chapter of the Canadian Land Reclamation Association. During the ARC 2014 conference in Wolfville, Nova Scotia, we had a conference participant open discussion on what Atlantic Chapter activities were deemed beneficial to its members and what additional activities could be added to enhance the benefits of belonging to the Atlantic Chapter of the CLRA. Increased opportunities for networking, more communications and additional learning opportunities were the overriding requests. Even though ARC was not developed to be an annual event, the majority of members felt that there was great value to meeting at least annually in a conference format and some asked if more frequent events could be planned, such as technical lectures. There was also an inquiry into whether we had considered Webinars so that people could participate without the travelling. The Board of Directors at the Atlantic Chapter has taken those suggestions into consideration in planning the activities for the upcoming year.

Since last October, we have significantly increased our official membership by including membership registration in the conference registration fee. Atlantic Chapter members now receive the benefits offered by the National CLRA organization. These benefits include receiving the membership directory and Canadian Reclamation, the semi-annual national publication of the Canadian Land Reclamation Association. We had the AGM in April in Halifax, and a dynamic regular meeting afterwards that exhibited a lot of energy and enthusiasm for planning the upcoming events. These events included a field trip on August 13 in Bedford, Nova Scotia, the publication of this issue of the newsletter and ARC 2015, which was held in Fredericton, NB on October 20-22. There has also been an up surge in articles from our Atlantic Chapter members published in both 2015 Canadian Reclamation issues, which will be mailed to all of our current members. This increase in article submissions was after an invitation to all members to share their projects at the national level. We plan to continue to increase our networking and learning opportunities because we all benefit from the sharing of information. If there is an event that you are interested in hosting – a field trip, a technical talk, a Webinar or the next ARC- please let us know! We are always interested in new ideas and new energy. Look for information on the upcoming events on the www.atlanticclra.ca website.

Because we had adopted the bylaws of CLRA National, we have to adhere to the specified two year terms for Directors at our AGM. Directors **Virgil Grecian** and **Denis Rushton** had both served out their two year terms. We thank them for their service and contributions and hope that they will continue to be involved in CLRA as members. Denis was a former President of the Atlantic Chapter, has served several terms as a Director and is currently editor of the newsletter. The target for new Directors is members who have been active in CLRA and will be able to provide new energy and ideas to the organization. In order to engage our membership, we solicited nominations and volunteers and then had a membership wide email ballot for the election of three new Directors. Please join me in congratulating **Derrick Mitchell** of Boreal Environmental in St. John, NB, **Mike Parker** of East Coast Aquatics in Bridgetown, Nova Scotia, and **Frank Potter** of Nova Scotia Lands in Sydney, Cape Breton as incoming Directors to the Atlantic Chapter of the Canadian Land Reclamation Association.

Executive 2014

Michele Coleman, President
mcoleman@nbpower.com

Tony Bowron, Vice President
tony.bowron@cbwes.com

Bob Pett, Past President
pettrj@gov.ns.ca

David Hopper, Treasurer & Secretary
dberianh@gmail.com

Board of Directors 2015

Fred Bonner (2nd year term)
fred@eduterra.ca

Bob Rutherford (2nd year term)
bobrutherford@accesswave.ca

Andy Walter (2nd year term)
awalter@strum.ca

Derrick Mitchell (1st year term)
derrick@borealenvironmental.com

Mike Parker (1st year term)
mike@eastcoastaquatics.ca

Frank Potter (1st year term)
frank.potter@novascotia.ca

PUBLISHER'S MESSAGE

Our initial goal was to publish a newsletter three times a year. We now feel that two issues per year is a more realistic goal (Spring/Summer, Fall/Winter). In the future the Spring/Summer issue will be sent out by July 30th and the Fall/Winter issue by December 20th each year.

The intent of the newsletter is to provide a forum to:

- Keep members connected to upcoming events;
- Inform on the status of current conference planning;
- Furnish information about our members;
- Present ongoing reclamation undertakings;
- Remind readers of the availability of scholarships and membership applications; and
- Provide contact information for those currently on the Atlantic Chapter Executive and Board of Directors.

The newsletter can also include anything else that members deem worthy or interesting enough to share with other members. Maybe it is a great shot of an uncommon plant species making use of the habitat on a recently reclaimed site.

If you have something to contribute, send it along so that it can be included in the next newsletter issue. Please send your information to denis.rushton@stantec.com.

Past publications will also be stored on the Atlantic Chapter website. Featured reclamation projects included in the Atlantic Chapter Newsletter will then be published in the Canadian Reclamation magazine, the national publication of the Canadian Land Reclamation Association. This is great exposure for the Atlantic Chapter and we should take advantage of this opportunity. The goal of the newsletter is to provide the vehicle for the CLRA Atlantic Chapter to grow in membership and standing. However, for this to happen it is important that members contribute articles for publication, which they think will help bring this goal to fruition.

WEBMASTER'S MESSAGE

The CLRA/ACRSD National website is www.clra.ca. Presentations from ARC 2014 and ARC2015 are now on the CLRA Atlantic website. This site can be reached through the Atlantic Chapter website www.atlanticclra.ca and then click on the ARC2015 or "ARCives" and "ARC2014" tabs. So if you missed a presentation that you really want see, check out the conference site. If you have any comments or have any material that you would like to see added to the website, please direct this information to: Frank Potter (Frank.Potter@novascotia.ca) or Bob Rutherford (assistant webmaster) bobrutherford@accesswave.ca.



BULLETIN BOARD AND PAST EVENTS

8th Annual Atlantic Reclamation Conference (ARC 2015)

ARC 2015 was held in Fredericton, New Brunswick on October 20-22, 2015 at the University of New Brunswick Wu Conference Center. Over 100 registrants from New Brunswick and Nova Scotia attended the event and selected from among 37 presentations from categories set up as R3 Innovations (Remediation Risks and Restoration), Atlantic PIRI, Remediation Risk and Decision-Making, Fredericton's Picaroon's Roundhouse Project, NB Power's Mactaquac Project, Mine Reclamation Advances, Fresh and Saltwater Habitat Restoration and Management, Vegetation and Wetland Restoration. The special session was a connector event for industry/researchers and funding agencies, sponsored by Genome and Springboard. Day three was a field trip to the Mactaquac Generating Station. Participants consisted of practitioners, consultants, provincial and federal regulators, students and academics with experience in the wide ranging field of land reclamation.

We would like to take this opportunity to thank our sponsors, whose generosity allowed almost 20 students to participate in the event at a significantly reduced registration rate and also allowed the four student presenters to receive a financial scholarship for their presentations. Students were in attendance from UNB, St. Mary's University and the entire Environmental Technology Program from NBCC.

This year, a discount rate was offered for multiple registrants from the same office/organization. Full registration to the conference will cover membership in the national CLRA organization. Presentations which granted posting permissions have been uploaded to the website. Go to atlanticclra.ca and scroll to the ARC2015 Program section, and then click on the highlighted presentation title to download the presentation. Allen Beck (UNB), Allison Dykstra (UNB), Christa Skinner (St. Mary's University) and Carly Wrathall (St. Mary's University) were recognized at the conference as the CLRA Atlantic Chapter scholarship award recipients for 2015.



Presentation during ARC2015 at the University of New Brunswick

if you are any of the following...

- A landowner who is engaged in a reclamation and/or remediation project on your land
- In the business of designing and managing reclamation and/or remediation projects
- A contractor who implements the ground related work associated with reclamation and/or remediation projects
- A regulator, government, or agency that oversees regulatory requirements, and has a vested interest in reclamation and/or remediation
- A specialist who performs roles associated with reclamation and/or remediation projects
- An academic or student looking to learn or teach others
- Simply interested in reclamation and/or remediation

...you should have been present at ARC 2015!



NB Power's Mactaquac Dam

Atlantic Chapter's Summer Tour Event

The Atlantic Chapter's Summer Tour Event was held on August 13th in Sackville Nova Scotia. This was the first of hopefully many annual field trip events. It is proposed that each year an interesting project, which has been completed (or is in the process of being completed), will be chosen and offered to members and/or past CLRA members to attend a tour of these sites.

The floodplain of the Sackville River was mined for construction aggregate for decades, resulting in extensive alterations to the river channel and the riparian wetlands. For the past three years, East Coast Aquatics (ECA), the Sackville River Association, Thalmus Consultants and NSTIR have worked to restore wetland functions and fish habitat. Through a number of physical alterations, ECA has worked to retain water on the landscape for a longer duration, and build organic wetland soils. In-stream works have sought to stabilize the channel alignment and maximize fish habitat.

A CLRA board meeting was then held at the Fireside Restaurant in Halifax at 6:00 p.m., followed by a social (6:30 p.m.). From all accounts the tour was entertaining and very informative.



Left to right: Lee Swanson, NB Department of Environment and Local Government; Derrick Mitchell, Boreal Environmental; Rhett Thompson, Dexter Construction; Yvonne Chabassol, Defense Construction Canada; Andy Walter, Strum Environmental (Tour Organizer); Arielle DeMerchant, NB DELG; Sheila Goucher, NB DELG; Crystale Harty, NB DELG; Roy Hicky, DCC; Michele Coleman, NB Power; Frank Potter, NS Lands; Emma Kinley, Bluenose Coastal Action Foundation; Andy Sharpe, East Coast Aquatics (Tour Leader)



Clockwise from top left: turtle nesting habitat, wetland vegetation, and pickerelweed photos taken during the tour.



Flora and Fauna Quiz!

Think you know all about native plant and animal life in our region?

We've included pictures that we challenge you, the reader, to identify. Answers are included at the bottom of page 16. Please respond to denis.rushton@stantec.com on the number of plants/mammals you identified!

1



*Spotted in
intervale thicket
and small
meadow along
WOT-311,
Petite Riviere,
north of
Edmundston, NB
June 26, 2015*

2



*Found along WOT-
454, Grand River,
NB June 1, 2015*

3



*Found at the
West River
Intervale,
Antigonish, NS
September 24,
2015*

4



*Found in the
woods above the
embankment of
Beaver Brook,
NB (not an
uncommon
mutation or
variation) June 3
2015*

5



*Found at the
West River
Intervale,
Antigonish, NS
2014*

6



*Observed on
abandoned
rail line that
parallels the
left bank of the
Grand River, NB
June 1, 2015*

7



*First year
blooming in
a Halifax
garden
2014*

MEMBERSHIPS

Information on the application for membership can be found at the following link: www.clra.ca/default.aspx?page22.

Annual Dues:

Corporate Membership (\$250 + \$12.50 GST)

Regular Membership (\$75 + \$3.75 GST)

Student Membership (\$15 + \$0.75 GST)

Retirees (\$25 + \$1.25 GST)

Becoming a CLRA/ ACRSD member has its benefits!

- **Access to an Annual Membership Directory** containing contact information for more than 1100 individual and corporate CLRA members involved in land reclamation across Canada
- **Two copies of Canadian Reclamation Magazine** per year – featuring news, project articles, supplier information and much more information pertaining to land reclamation in Canada and around the world
- **Receive notices, calls for papers at discounted registration fees** for National Annual Meetings and Conferences and Chapter events
- **Networking opportunities** at National and Chapter events and linkages with other professional land reclamation associations in the UK, USA, Australia and China
- **Information on new regulatory initiatives** at chapter workshops
- **Discounted rates** for Chapter lunch & learns and workshops
- **Give back to the community.** We are involved in charitable activities. We also fund educational awards and scholarships in land reclamation.

SCHOLARSHIPS

Students who participate in presentations or poster sessions at conferences are eligible for consideration of monetary scholarships. The number of awards and their cash value is determined by the conference organizing committee.

COMMITTEES

There are a number of committees within the CLRA Atlantic Chapter that you, as members, could volunteer to assist those presently involved. These committees include:

Communications Committee

Newsletter

Gathers articles of interest to the membership and publishes this information in a newsletter; to be sent out two times annually (Spring/Summer and Fall/Winter issues). To get involved, contact Denis Rushton at denis.rushton@stantec.com.

Facebook Page

Collates information on upcoming events and posts news on our Facebook Page. To get involved, contact Tony Bowron at tony.bowron@cbwes.com.

Membership and Participation

Updates the Atlantic based membership/participation list to keep people informed on CLRA plans, and sends out annual membership forms. To get involved, contact Michele Coleman at MColeman@nbpower.com.

Website and Webmasters

Keeps the CLRA Atlantic Chapter website up to date (annual ARC conference and archiving of past conference presentations). To get involved, contact Frank Potter at Frank.Potter@novascotia.ca, or Bob Rutherford at bobrutherford@accesswave.ca.

Social Committee

Organizes informal meetings and any other social gatherings that involve the Atlantic Chapter. Typically there are two to three board meetings per year, with social events following those meetings. To get involved, contact Michele Coleman at MColeman@nbpower.com.

Conference Committee

This group is responsible for the planning and organization of the annual ARC conferences. Those wishing to help out with this undertaking can contact Michele Coleman at MColeman@nbpower.com, Tony Bowron at tony.bowron@cbwes.com, Andy Walter at AWalter@strum.com, Frank Potter at frank.potter@novascotia.ca, Diane Praught at dpraught@carboncure.com or Kristin Banks at kbanks@dillon.ca.

FEATURE PROJECT:

Closure of Legacy Waste Rock Piles: Can we achieve treatment to manage residual seepage in the short term?

Company: O’Kane Consultants Inc.

Contacts: Cody Bradley, B. Sc., Geoenvironmental EIT (cbradley@okc-sk.com)

Greg Meiers, M. Eng., M. Geo. (gmeiers@okc-sk.com)

A Bit of Context:

Cape Breton Development Corporation (CBDC) was established as a Crown corporation in 1967 in order to reorganize and rehabilitate the coal industry on Cape Breton Island, Nova Scotia. In 2009, CBDC was dissolved, and its assets and liabilities were transferred to Enterprise Cape Breton Corporation (ECBC), a federal Crown corporation. Under the transfer arrangement, ECBC acquired stewardship obligations stemming from CBDC’s past operations, including land holdings and environmental remediation.

Properties covered under the environmental remediation program stem from mining operations that began in 1685 and include more than 50 underground mines, which produced over 500 million tonnes of coal. The history of coal mining in the Sydney coal fields included 720 individual parcels of land on which there were 95 coal related operations covering more than 1,000 km². Some of the properties required remediation of waste rock piles (WRP) produced from the mining operations. In 2014, the operation of ECBC was transferred to Public Works and Government Services Canada.

Victoria Junction Waste Rock Pile:

The reclaimed Victoria Junction (VJ) WRP is located on the site of a historic coal preparation plant approximately 5 km northeast of Sydney, N.S., and has a footprint of approximately 26 ha and a height of 40 m. The coal preparation plant operated from the mid 1970s to 2000. During operations, the coal preparation plant washed up to 4 million tonnes of raw coal per year, of which 15–20% was placed into the WRP and 3% into fine tailings ponds. Several coal tailings ponds were constructed within the confines of the VJ WRP as required by processing and storage demands and were eventually covered with waste rock. Upwards of 10 million tonnes of potentially acid forming (PAF) waste was placed within the VJ WRP. The site is situated in the Northwest Brook watershed which flows into the Atlantic Ocean approximately 6 km north of the site. Northwest Brook flows from Grand Lake, located approximately 100 m south of the site, around the east side of the WRP and through the wetland to the north.

Have a project to share?

The aim of each newsletter is to include feature reclamation / restoration / remediation projects submitted by Atlantic Chapter members. We hope that these project stories whet the appetite of the membership and become the focal point of future newsletters. If you have a project that you think would be interesting to Chapter members, please submit it to Denis Rushton at denis.rushton@stantec.com.

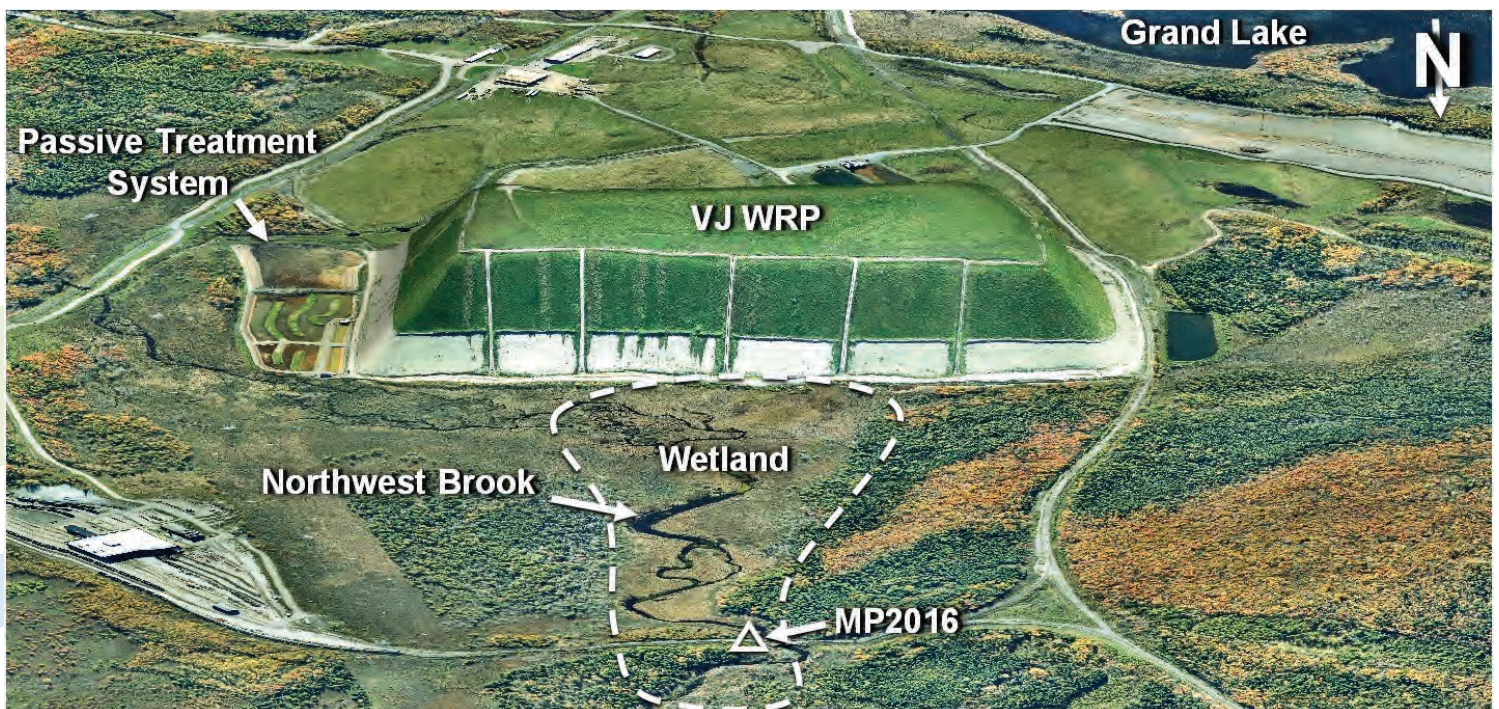
The long-term environmental concern is acid rock drainage and metal leaching (ARD/ML) emanating from the WRP as runoff and basal seepage. Hydraulic gradients in the WRP are downward, driving ARD/ML into groundwater which then flows north into the wetland. There is a reversal of hydraulic gradients in the wetland, allowing ARD/ML to migrate to the surface.

As a result, loading from the pile to the receiving environment can be quantified north of the pile at MP2016. Several reclamation activities have been undertaken throughout the site's history, including: the installation of a groundwater collection system to treat deep impacted groundwater in 2003, placement of an engineered low flux cover system in 2006, and the transition from active to passive water treatment in 2013. In 2010, at the request of ECBC, O'Kane Consultants

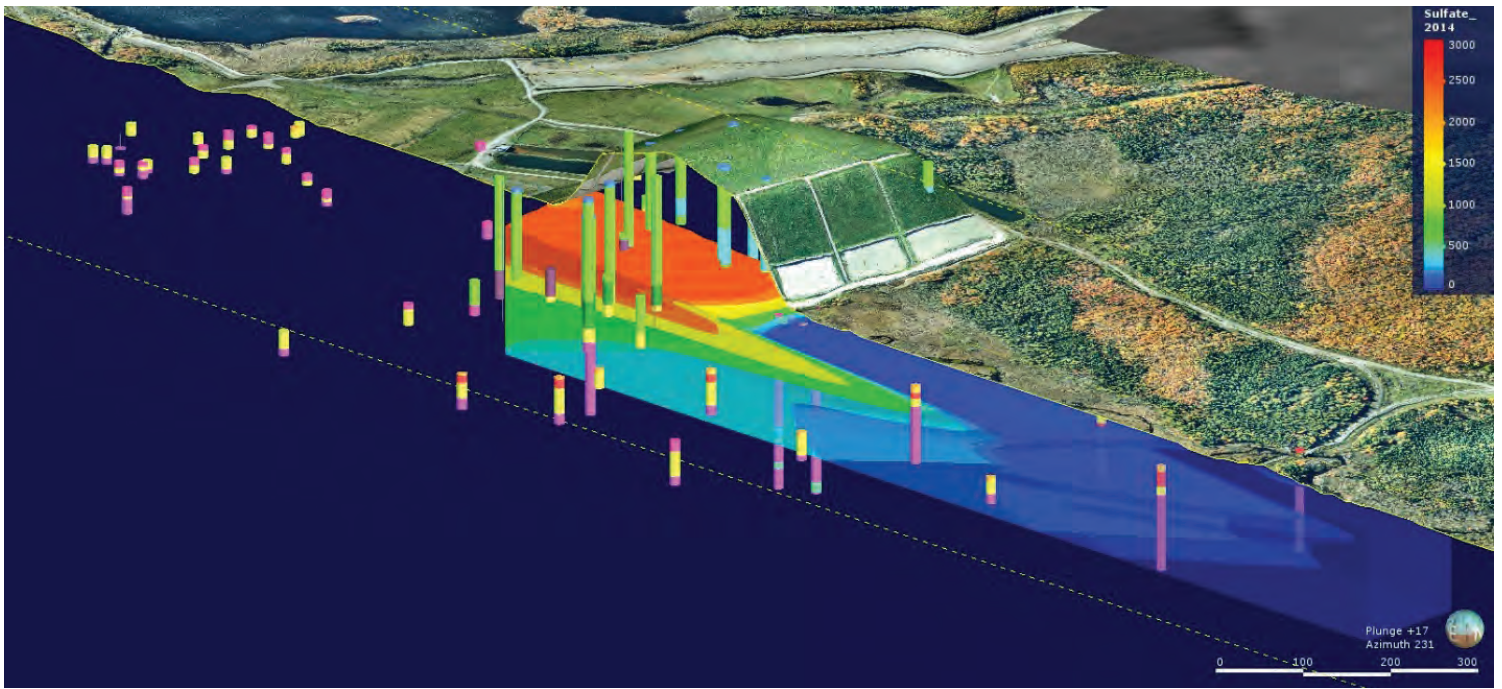
(OKC) initiated a performance monitoring program to inform on long-term predictions of loading to the receiving environment.

Extensive monitoring implemented by ECBC at the site provided the opportunity to develop a conceptual model (i.e. an understanding for site conditions) to inform on loading to the receiving environment. Loading to the receiving environment has evolved over time and is characterized by three distinct periods:

- Phase 1 – pre-cover system with active treatment,
- Phase 2 – post-cover system with passive treatment, and
- Phase 3 – long-term post-cover system with passive treatment.



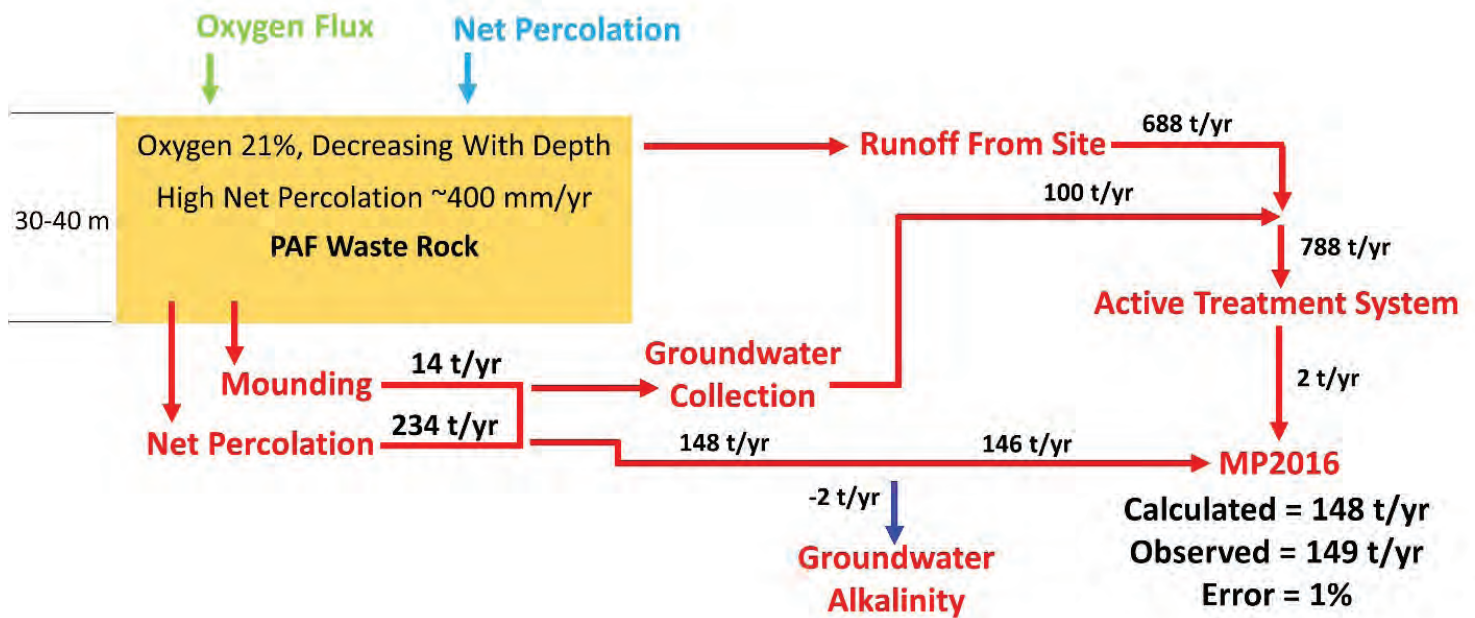
Victoria Junction waste rock pile and surrounding landform (3X vertical exaggeration)



Distribution of monitoring wells and 3D groundwater sulfate plume

Acid load mass balances were developed for each phase, with the first two phases providing the basis for long-term predictions. The load to the receiving environment pre-cover system consists of three sources: basal seepage (groundwater mounding and net percolation) and runoff from the site. The active treatment system is the main sink, acting to reduce load to the receiving environment from both surface runoff and basal seepage. The total calculated acid load in Phase 1 at MP2016 is 147 t/yr, and an error of 1% would suggest that the flow and geochemistry models closely represent

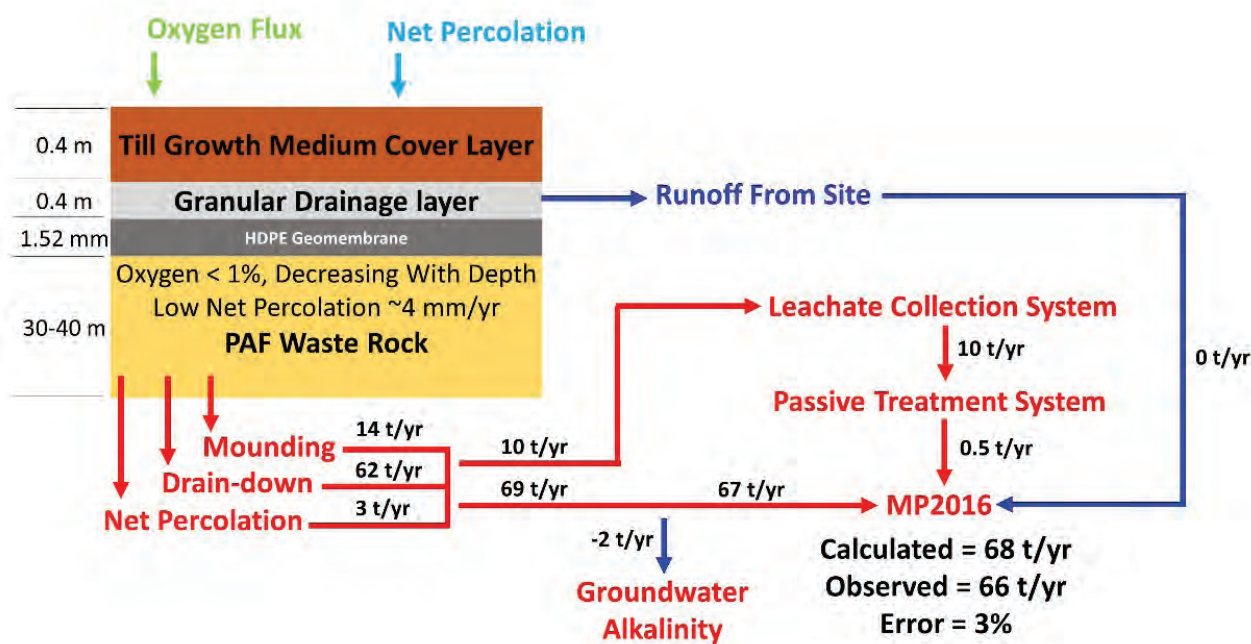
site conditions. The total acid load generated from the site is 936 t/year, of which runoff is the largest contributor at 688 t/year. The active treatment system neutralized 788 t/year, while 2 t/year were neutralized by natural alkalinity in groundwater. In terms of basal seepage, approximately 40% is intercepted by the active treatment system, with the remaining reporting to groundwater flow, which is key in developing an understanding of loading to the receiving environment.



Acid load mass balance pre-cover system with active treatment

The mass balance changes substantially after installation of the low flux cover system and remediation of the site, both in terms of the load produced from surface runoff and basal seepage. The passive treatment system is introduced in this phase and replaces the active treatment system. A drain-down component is also introduced as a result of the decrease in net percolation following placement of the cover system. The total acid load generated from the site in Phase 2 is reduced from 936 t/year to 79 t/year. Approximately 13% of basal seepage is intercepted and treated before being

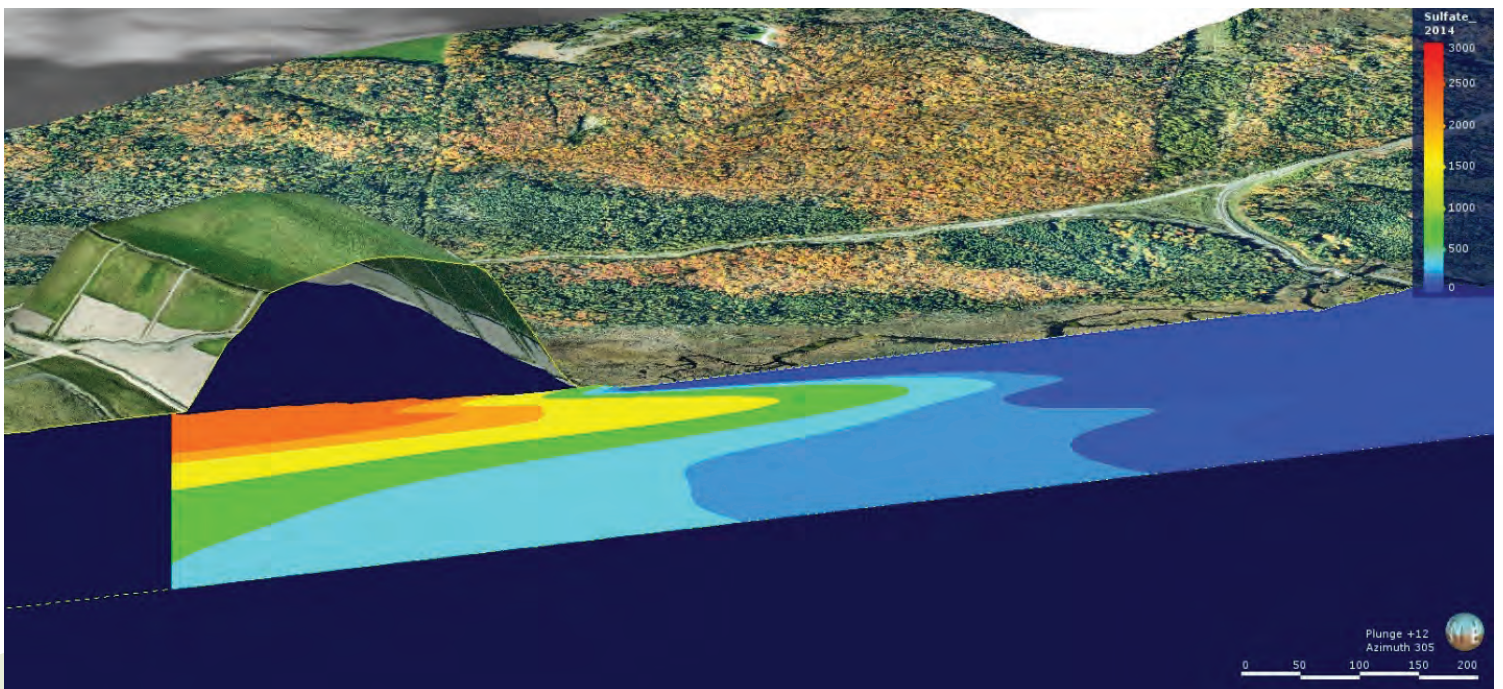
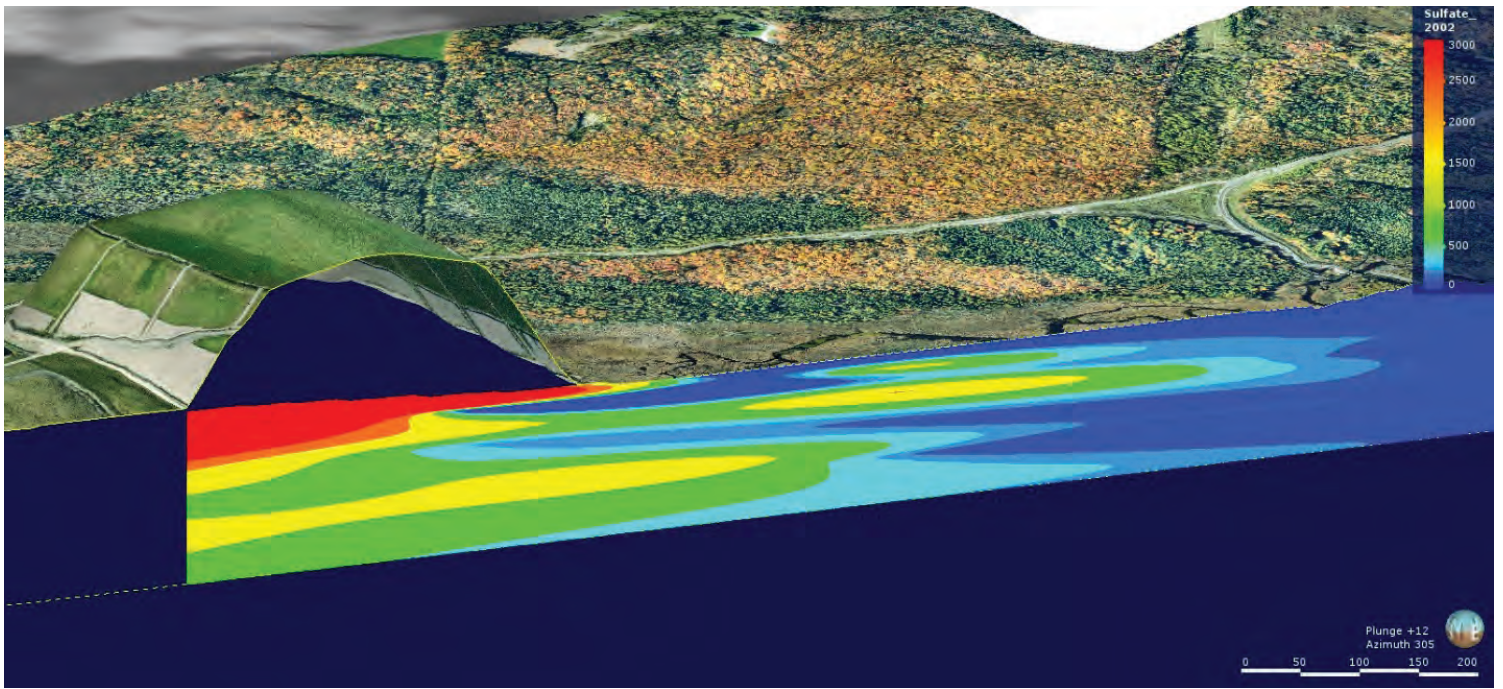
discharged. The total calculated acid load at MP2016 is 68 t/year, compared to the current observed load of 66 t/year. While the total acid load generated from the site was reduced by approximately 92% (936 to 79 t/year), the acid load at MP2016 decreased by approximately 54%. The pre-cover system and current mass balances provide context for the observed water quality at MP2016 in that a proportional decrease in loading was not observed after changes in water collection and treatment.



Acid load mass balance post-cover system with passive treatment

Using the mass balances and conceptual model for pre-cover system and current conditions, a mass balance was developed to predict loadings to the receiving environment 100 years post-cover system. The most significant change in the 100 year post-cover system mass balance is the completion of drain-down. As a result, the load at MP2016 is estimated to decrease from 68 t/yr to 11 t/yr. Results of the acid load mass balance indicate that loading to the receiving environment has decreased substantially following placement of the cover system and will continue to decrease as drain-down diminishes. While an acid load of 66 t/yr is observed at MP2016, net acidity is negative given observed alkalinity in the system. Alkalinity is provided through discharge from passive treatment, an open limestone channel, and naturally from Grand Lake. The contribution of alkalinity from Grand Lake is adequate to neutralize any acidity.

The acid load mass balances provide a strong understanding for loading to the receiving environment as a function of reduced flux /seepage rates, and enabled long-term predictions 100 years post-cover system. Leapfrog Hydro was used to model the groundwater plume and provide a better understanding for how groundwater has evolved in conjunction with reclamation activities. Extensive groundwater sampling was conducted from 2002 to current, which permitted the generation of three-dimensional (3-D) groundwater plume models (sulfate) to illustrate how the groundwater has evolved.



Sulfate groundwater plume pre-cover system (top) and post-cover system (bottom) (4x vertical exaggeration)

Findings:

There has been a steady improvement in water quality over the short term. Groundwater quality improvements observed in the modelled plumes are supported by the acid load mass balances. Pockets of high concentration appear to be dissipating and there is also less impact to deep groundwater as vertical gradients in the WRP have diminished as a result of the decreased flux through the cover system.

The mining industry is frequently challenged with the choice to either collect and treat in perpetuity or undergo reclamation activities to reduce the load to the receiving environment. This decision is often heavily influenced by net present value (NPV). There are many assumptions and variables in a NPV analysis such as discount rate, future cost of lime/polymer, upgrades/maintenance, etc. An NPV analysis was completed for the VJ site to investigate the decision to install the cover system. At a discount rate of 4%, treating in perpetuity and installing the cover system have NPVs of \$11.2M and \$13.8M, respectively.

While the treatment scenario has a lower NPV, one must consider the risk (i.e. probability and impact) of each scenario, both from a financial and environmental stand point. For example, the loads generated from the site under each scenario are significantly different, each with their own unique financial and environmental risks. Under the active treatment scenario, it is important to note that approximately 40% of the basal seepage load was collected and treated before being discharged from the facility. As a result, water quality in the receiving environment would have taken a different trajectory than that observed in cover system scenario. The decision to install the cover system was obviously not solely dependent on NPV. The goal of site closure was to minimize cost while mitigating risk.

It is also important to note that if the discount rate was reduced to say 1%, the difference between NPVs for the two scenarios would be substantially different, with the collect and treat option being substantially higher. The key point to highlight in making this comparison is that hindsight perspective for the VJ WRP closure activities provides a good argument for discount rate being an output from an NPV analysis, and to use this understanding to inform risk, rather than how discount rate is typically utilized (i.e. as an input to NPV analysis).

The VJ site has transitioned from active to passive treatment following placement of a low flux cover system, with continued improvements observed in the receiving environment and continued reduction in loading. Extensive monitoring at the site enabled the development of a conceptual model to inform on long-term performance and impacts to the receiving environment without the use of numerical models. A well-designed monitoring program is critical to the conceptual model and requires sufficient information both spatially and temporally. This case study illustrates the importance and opportunity for using the conceptual model to communicate performance and risk, and ultimately inform management on decisions regarding site practices in order to meet closure objectives.

Answers to Quiz on pages 8

1. Woodchuck (*Marmota monax*)
2. Dark form of Jack in Pulpit (*Arisaema triphyllum*)
3. Foam Flower (*Tiarella cordifolia*)
4. Pink Lady Slipper (*Cypripediumacut*)
5. Yellow Avens (*Geum allepieum*)
6. Varying Hare (*Lepus americanus*). Note three engorged ticks near the nose.
7. Canada Lily (*Litium canadense*)