



# **Minerals South Conference & Trade Show**

**Cranbrook, BC**

**November 7<sup>th</sup> – 10<sup>th</sup>, 2017**

## **Technical Session Program & Abstracts**

# Minerals South Short Course

## Putting the 'Geo' Back in Geophysics (One Survey at a Time)

Frederick A. Cook, *Salt Spring Imaging, Ltd.*

Tuesday, November 7<sup>th</sup>, 8:30am – 4:30pm

### Abstract

The purpose of this 1-day short course is to introduce geophysical techniques to non-geophysicists who are engaged in prospecting for resources (particularly metals). The course will include a brief overview of geophysics followed by a focus on the four techniques that are used most often: gravity, magnetics, electromagnetics and seismic. Numerous examples will be used to illustrate the concepts with the primary objectives being to assist explorationists in deciding what method(s) to use, how to interpret the results, and how to be cautious of possible pitfalls.

SPONSORED BY



**Icebreaker Session: 5:30 PM** The Studio Lounge – Heritage Inn & Conference Centre

**Sponsored by: Eagle Plains Resources Ltd. & TerraLogic Exploration Inc.**

**Free Public Lecture: Doors open @ 6:45 PM** Main Ballroom – Heritage Inn & Conference Centre

7:30: Guy Santucci - "A Brief Summary of Time" Geology and Paleontology of the East Kootenays

8:20: Paul Ransom - Geology of the Sullivan: A monster in the abyss

**Sponsored by: New Age Drilling Solutions Inc. & PJX Resources Inc.**

# Schedule at a Glance

**Technical Sessions: November 8<sup>th</sup> – 9<sup>th</sup>, 8:00am to 4:45pm**

**Heritage Inn & Conference Centre, Cranbrook, BC**

<b>DAY TWO - WEDNESDAY, NOV. 8th</b>		
<b>OPENING PRESENTATION</b>		
<b>Sponsor: Caliper Machine &amp; Hydraulics</b>		
8:00 to 8:30 AM	<p>Welcome from Chamber - Jason Jacob</p> <p>Welcome from Ktunaxa Nation - Chief Joe Pierre</p> <p>Welcome from the City of Cranbrook - Mayor Lee Pratt</p> <p>Message from MLA Tom Shypitka</p> <p>Message from MP Wayne Stetski</p>	
<b>TECHNICAL PRESENTATIONS</b>		
<b>Morning Session</b>		
<b>Sponsor: Klondike Silver Corp.</b>		
Chairs: Fiona Katay & Roger Berdusco		
8:30 AM	British Columbia Mineral Development and Mining, 2017 and Beyond - Working Together	Edie Thome, President & CEO <i>Association for Mineral Exploration (AME)</i>
8:55 AM	Exploration highlights of the Kootenay-Boundary	Fiona Katay, Regional Geologist, Southeast <i>Ministry of Energy, Mines and Petroleum Resources</i>
9:20 AM	Lasers, Drones and Goats - what Geoscience BC did this summer	Bruce Madu, Vice President, Minerals and Mining <i>Geoscience BC</i>
9:45 AM	MapPlace 2: tools for prospecting	Yao Cui, Senior Geomatics Geoscientist ( <i>BCGS</i> ) co-authors: Gabe Fortin, Sarah Meredith-Jones, and Steven Zhao, <i>British Columbia Geological Survey</i>
10:10 to 10:45AM	<b>Coffee</b>	<b>Sponsor: Margaux Resources Ltd.</b>
10:45 AM	Copper Mountain, 90 years on and still looking good! How mineralization, metal prices, and evolving exploration and mining technology conspire to prolong mining	Peter Holbek, VP Exploration <i>Copper Mountain Mining Corporation</i>
11:10 AM	Coal Exploration techniques and Resource Estimation	David Thompson, Chief Geologist <i>CanAus Coal Ltd.</i>
11:35 AM	Challenges of Mining through Historical Underground Workings	Sarah Smith, Geologist <i>Teck Coal Limited</i>
12:00 to 1:00 PM	<b>Lunch</b>	<b>Sponsor: SGS Canada</b>

<b>Afternoon Session</b>		<b>Sponsor: Eagle Mapping Ltd.</b>
Chairs: Bob Morris & Kerry Bates		
1:00 PM	A Summary of 2017 British Columbia Geological Survey Activities and Core Programs	Gordon Clarke, Director, Mineral Development Office, <i>Ministry of Energy, Mines &amp; Petroleum Resources</i>
1:25 PM	Implementation of the New Regional Mine Reclamation Bond Calculator	Heather Cullen, Regional Director, North Central/Northeast, <i>Ministry of Energy, Mines &amp; Petroleum Resources</i>
1:50 PM	Orogenic gold mineralization of the eastern Cordilleran gold belt of British Columbia: Structural ore controls in the Cariboo, Cassiar and Sheep Creek mining districts	Murray Allan, Research Associate, <i>Mineral Deposit Research Unit (MDRU), University of BC</i> co-authors: Dave Rhys, <i>Panterra Geoservices</i> ; and Craig Hart, <i>MDRU-UBC</i>
2:15 PM	Orogenic gold in the Kootenay Arc - Margaux Resources' Sheep Creek and Bayonne properties	Linda Caron, VP Exploration <i>Margaux Resources Ltd.</i>
2:40 PM	Gold in the Historic Alder Gulch District, Montana: Implications for Gold in Metamorphic Terranes, Purcell Group and Southern BC	Mike Dufresne, President, <i>APEX Geoscience Ltd.</i> co-author: Andrew Turner, Principal, <i>APEX Geoscience Ltd.</i>
3:05 to 3:25 PM	<b>Coffee</b>	<b>Sponsor: Rosen Lake Sand &amp; Gravel</b>
3:25 PM	Greenwood Precious Metals Project - New Hope for an Old Camp	Matt Ball, Chief Geologist and COO <i>Golden Dawn Minerals Inc.</i>
3:50 PM	Gold Potential on the Zinger Property	John Keating, P.Geo, President & CEO <i>PJX Resources Inc.</i>
4:15 PM	Atlantic Gold Corporation – Successful Development of the Moose River Consolidated Project	Tracey Meintjes, Principal <i>Moose Mountain Technical Services</i>
4:40 PM	Ixtaca – Advancing a Project through Uncertainty	Tracey Meintjes, Principal, <i>Moose Mountain Technical Services</i> co-author: Jesse Aarsen, Mining Engineer, <i>Moose Mountain Technical Services</i>
5:05 PM	<i>Meeting adjourned</i>	

**Cocktail Hour: 6:30 – 7:30 PM** Main Ballroom – Heritage Inn & Conference Centre

**Sponsored by: Moose Mountain Technical Services**

**Banquet: 7:30 PM** Main Ballroom – Heritage Inn & Conference Centre

**Entertainment by:** Don Glasrud

**Sponsored by: Rokmaster Resources Corp./ BGC Engineering Inc. / Geoscience BC**

**Entertainment Sponsored by: New Age Drilling Solutions Inc.**

## DAY THREE - THURSDAY, NOV. 9th

### TECHNICAL PRESENTATIONS

#### Morning Session

**Sponsor: College of the Rockies**

Chairs: Chuck Downie & Tom Kennedy

8:00AM	Welcome Message & Announcements	Chuck Downie, VP Exploration and Director <i>Eagle Plains Resources Ltd.</i>
8:05 AM	Mining Builds Communities	Bryan Cox, President & CEO <i>Mining Association of BC (MABC)</i>
8:30 AM	Geology and Mineralization of the New Afton Porphyry Cu-Au Deposit, British Columbia	Devin Wade, Senior Exploration Geologist <i>New Gold Inc.</i>
8:55 AM	Block Cave Mining at New Afton	Marty Henning, Senior Geologist <i>New Gold Inc.</i>
9:20 AM	A view of mining and exploration from the Mid 1950s to Present	M. A. "Mo" Kaufman <i>Geologist and Prospector</i>
9:45 to 10:10 AM	<b>Coffee</b>	<b>Sponsor: Margaux Resources Ltd.</b>
10:10 AM	Revett-hosted Silver-Copper Deposits in Northwest Montana	Steve Petroni, General Manager <i>Hecla Silver Valley Inc.</i>
10:35 AM	Porphyry Potential in the southeast Okanagan: CuAu (aka Chenier) Property update -- Geology, Geochemistry, Geophysics	Bob Thompson, President, <i>RITM Minerals Corp.</i> <i>co-authors: Fred Cook, and Renee Hetherington</i>
11:05 AM	Cariboo Express: Exploring Opportunity at Lac La Hache	David Brett, President & CEO, <i>EnGold Mines Ltd.</i> <i>co-Author: Rob Shives, VP Exploration, EnGold Mines Ltd.</i>
11:30 AM	Structural Controls on Mineralization and Implications for Resource Modelling at the Gibraltar porphyry Copper-Molybdenum Deposit, South-Central, BC	Sue Bird, Principal, <i>Moose Mountain Technical Services</i> <i>co-author: Chris Gallagher, Geologist, TerraLogic Exploration Inc.</i>
11:55 to 12:55 PM	<b>Lunch</b>	<b>Sponsor: Antofagasta Minerals</b>

<b>Afternoon Session</b>		<b>Sponsor: Klondike Silver Corp.</b>
Chairs: Mike Kennedy & Farren Billey		
12:55 PM	Tantalum and Niobium - Geology, Resources, and the Supply Chain – Implications for Prospectors	George Simandl, Specialty Metals and Industrial Minerals, <i>British Columbia Geological Survey</i> <i>co-authors:</i> Richard O. Burt, Consulting Metallurgist; David L. Trueman, Consulting Geologist; Suzanne Paradis, Research Scientist, <i>Natural Resources Canada</i>
1:25 PM	Prospecting the Subsurface with Seismic and Magnetotellurics	Fred Cook <i>Salt Spring Imaging, Ltd.</i>
1:55 PM	The Pakk property: A deeper look for a sedex deposit	Ted Sanders <i>Geophysical Consultant and Prospector</i>
2:20 PM	Silvana Mine - A New Beginning - 2017 Update	David Makepeace, Senior Geological and Environmental Engineer <i>Micon International Ltd./Klondike Silver Corp.</i>
2:45 to 3:00 PM	<b>Coffee</b>	<b>Sponsor: VAST Resource Solutions Inc.</b>
3:00 PM	Cambrian-hosted sedex deposits in southern British Columbia: setting, controls and deposit models	Trygve Höy, <i>Geoscience BC</i> <i>co-author:</i> Don Sangster, <i>Geological Survey of Canada</i>
3:30 PM	Geology and Update on the Pend 'Oreille Mine	Eoin Cross, Project Geologist <i>Teck Resources Limited</i>
3:55 PM	Unlocking Hidden Treasures in the Duncan - a New Zinc-Lead-Silver Mine in the Kootenays	John Mirko, President, CEO & Director <i>Rokmaster Resources Corp.</i>
4:20 PM	Iron Range 2017 Project Update	Mike McCuaig, Project Geologist <i>TerraLogic Exploration Inc.</i>
4:45 PM	Thank you remarks, <i>meeting adjourned</i>	Jason Jacob, President, <i>East Kootenay Chamber of Mines</i>

# Technical Session Abstracts

## **British Columbia Mineral Development and Mining, 2017 and Beyond - Working Together**

Speaker: Edie Thome, President & CEO, *Association for Mineral Exploration (AME)*

### Abstract

AME represents more than 4500 members with interests in the mineral exploration, development and mining sector, in BC and globally.

Since 1912, AME has promoted British Columbia's mineral development and mining sector as a leading destination for domestic and foreign investment. The mineral endowment of BC is extensive, and despite well-developed geological databases and world class industry expertise, there remains much that is unknown regarding our mineral potential. Realizing the potential of this mineral endowment requires collaboration between citizens, industry, government and Indigenous peoples. AME is committed to supporting innovation, building public understanding of the role BC's minerals play in our low-carbon future, and ensuring the responsible development of BC's mineral resources for the benefit of all citizens of BC.

Throughout the most recent BC provincial election, AME and its partner organizations (the Mining Association of BC and the Mine Suppliers Association of BC) actively promoted the 'Vote Mining' initiative resulting in all three major parties endorsing responsible mineral development and the goals of the Vote Mining campaign. We are encouraged by the current government's expression of support for our sector, and the role it plays in building good, long term jobs and sustainable communities across British Columbia. With the recent change in the Government of BC, AME's non-partisan advocacy and interactions with government are critical to ensuring our industry's interests are considered in public policy decisions.

To help guide our efforts, AME is continues the strategic planning process that will focus the high level goals of the association for the next number of years. In undertaking this planning, AME will seek input and perspectives from a broad range of British Columbians, including Indigenous peoples, the public, industry associates, government staff and elected representatives and of course, our members throughout BC and beyond. This plan will be centered on ensuring that responsible mineral development and mining remains a vital component of a diverse provincial economy, ensuring prosperous livelihoods, and the socio-cultural well-being of all British Columbians. We look forward to hearing from you.

### Bio

Edie Thome joined the Association for Mineral Exploration (AME) as President & CEO on June 19, 2017. Edie has a wealth of experience in government relations, permitting and public affairs as well as

on-the-ground experience working with stakeholders, First Nations, elected officials and land owners on projects in the resource sector. Through her work, she is familiar with advocacy efforts at both the provincial and federal levels and, specifically, how the legislative and regulatory framework can support or hinder productive, responsible resource development within British Columbia and Canada.

Most recently, Edie was Director - Environment, Permitting and Compliance, Aboriginal Relations and Public Affairs at BC Hydro, responsible for permitting and compliance, Aboriginal relations and public affairs for the Site C Clean Energy Project. Prior to that, she worked in risk management, environment, operations and customer service for BC Hydro. Her management experience also includes 4½ years as Vice President, Customer Service, Airport Operations and Corporate Communications for Harmony Airways.

Edie brings a keen understanding of leadership in an industry association, gained through her service since 2014 as Chair of the Board of the Canadian Hydropower Association (“CHA”), a national, non-profit organization, comprised of nearly 50 members - spanning hydropower producers, manufacturers, developers and engineering firms to individuals. Like AME, CHA leverages the strength and skills of a diverse and accomplished membership to achieve the goals set forth in its strategic plan.

#### About AME:

AME is the lead association for the mineral exploration and development industry based in British Columbia. Established in 1912, AME represents, advocates, protects and promotes the interests of thousands of members who are engaged in mineral exploration and development in British Columbia and throughout the world. AME encourages a safe, economically strong and environmentally responsible industry by providing clear initiatives, policies, events and tools to support its membership.

## Exploration highlights of the Kootenay-Boundary

Speaker: Fiona Katay, P.Ge., Regional Geologist - Southeast, *Ministry of Energy, Mines & Petroleum Resources*

### Abstract

The Kootenay-Boundary Region, in the southeast corner of the province, offers a variety of mining and exploration opportunities accessible by well-developed infrastructure. The region contains portions of the Rocky Mountain fold and thrust belt, the Purcell Anticlinorium, the Kootenay Arc, Slide Mountain and Quesnel terranes, and uplifted metamorphic core complexes. Five operating metallurgical coal mines in the Elk Valley account for the majority of Canada's coal production, and exports. Several mines produce industrial minerals including silica, magnesite, gypsum, graphite, and phosphate. Placer mining occurs throughout the region, and several small operations produce aggregate, sand and gravel, and dimension stone. Exploration for base metals and precious metals, in addition to industrial minerals and coal, continues to be an exploration focus for the region. Exploration activity increased in 2017 over 2016, as renewed investment funding entered the mineral exploration sector.

Coal seams are exposed along strike for about 175 km in the Rocky Mountain Front Ranges in north-south trending synclines and westerly-dipping thrust faults. Some of the thickened sections of the coal-bearing Mist Mountain formation permit open-pit mining. Several mines operate in the Elk Valley, and a few other projects are moving towards Environmental Assessment approval. Upturned clastic sequences of the Rocky Mountains also host a variety of easily mineable industrial minerals. Several sections also have potential for structurally-related MVT and REE mineralization.

Intracratonic rift systems that have been infilled by marine sediments, such as the Belt-Purcell, have long been recognized as a favorable environment for the formation sea floor hydrothermal Zn-Pb-(Cu) sulphide, or SEDEX, deposits. Exploration for these targets, and associated polymetallic vein targets continued to be a focus in the lower sections of the Purcell Anticlinorium, while sediment-hosted copper has begun to be targeted in the upper basin-fill sequences.

The Kootenay Arc is a 400 km long, curved belt of sedimentary, volcanic, and metamorphic rocks that lies between the Purcell Anticlinorium to the east, and the Shuswap-Monashee complex and the Quesnel terrane to the west. In the Kootenay Arc, exploration continued for stratiform sulphides and replacement-style base metals, including VMS and MVT mineralization.

Within the accreted island arc terranes of Quesnellia, exploration continues for precious metal and polymetallic vein, shear-hosted, stockwork and breccia deposits, replacement-type base metals, skarn, porphyry, and massive sulphide deposits.

Throughout the region, later-stage metallogenic episodes occur in the Late Jurassic-Early Cretaceous, mid-Cretaceous, Late Cretaceous, and Paleocene-Eocene and Late Eocene, and can be related to changing convergence rates, subduction geometries, and convective heat transfer. Precious and polymetallic, epithermal and orogenic vein, breccia, shear-hosted, skarn, and replacement deposits are further targets for exploration.

### Bio

Fiona joined the BC Geological Survey in 2012, and is currently the Regional Geologist for the Southeast region with the Ministry of Energy, Mines & Petroleum Resources. Bringing rocks of all sorts home, starting from an early age, she continues to do so in her paid career. In her current role, she liaises with industry and government on mineral and coal projects, and hopes to fill the boots of a “regional expert” within the next 10-50 years, or so. She has worked in exploration for over 20 years, and has proposed and managed multi-year exploration projects, including mapping, drilling, 3D modeling, resource evaluation, and grade control projects. In addition, she consulted as a geomorphologist for a brief stint, doing archaeological field assessments and GIS.

## **Lasers, drones and goats - what Geoscience BC did this summer**

Speaker: Bruce Madu, Vice President, Minerals and Mining, *GeoscienceBC*

### Abstract

Geoscience BC had a very busy 2017 with many project launches and data releases in support of solid earth science that helps build a stronger economy and inform better resource management decisions. This summary presentation will highlight many projects including new airborne geophysical surveys, halogen element and water testing techniques to make exploration easier, greenhouse-gas sniffing drones to detect fugitive emissions and fundamental regional geological interpretations across the province.

### Bio

Bruce Madu is the Vice President, Minerals and Mining, Geoscience BC in Vancouver, British Columbia, Canada. Over the past 28 years he has worked in public service positions throughout the province as a professional geologist and held senior positions in minerals, land and water management.

In his current capacity at Geoscience BC, he leads the generation of earth science information in collaboration with First Nations, the resource sector, universities, governments, and communities. As Geoscience BC is a publically-funded organization, this information is delivered to the public to encourage investment and enable informed land use decisions for the benefit of all British Columbians.

## **MapPlace 2: tools for prospecting**

Speaker: Yao Cui, M.Sc., P.Geo., Senior Geomatics Geoscientist, *British Columbia Geological Survey*

Co-authors: Gabe Fortin, Sarah Meredith-Jones, and Steven Zhao, *British Columbia Geological Survey*

### Abstract

MapPlace 2 is a geospatial web service developed by the British Columbia Geological Survey staff to efficiently display, search, report, and generate custom results from multiple province-wide geoscience databases, maps, mineral tenures, and survey parcels. Some of the applications and user interface are designed specifically to enable research and analysis in mineral exploration and prospecting. MapPlace 2 works in commonly available web browsers, requires no plug-ins, and rapidly retrieves and display large geoscience datasets and third party topographic maps and imagery. With an intuitive interface, MapPlace 2 is easy to use. This presentation will highlight some of the updates, tips, and upcoming new features in MapPlace 2.

### Bio

Yao Cui is a Senior Geomatics Geoscientist, leading a geospatial group at the British Columbia Geological Survey to work on processing, integrating, managing, producing, and delivering geoscience data. One of Yao's main responsibilities is the provincial digital geology database and maps. He has developed a Geospatial Frame Data (GFD) model to simplify and streamline the integration of digital geology, and Graph theory based algorithms to support high performance queries and delineation of catchment basins for geochemical modelling. He is also the lead on developing the new MapPlace 2 geospatial web services.

Prior to joining the BCGS in 2008, Yao spent over 20 years working in uranium and gold exploration and mining, geochemistry, environmental health, and geospatial technology.

**Copper Mountain, 90 years on and still looking good! How mineralization, metal prices, and evolving exploration and mining technology conspire to prolong mining**

Speaker: Peter Holbek, VP Exploration, *Copper Mountain Mining Corporation*

Abstract

## **Resource Estimation for Coal in the Crowsnest Pass Area**

Speaker: Dave Thompson, P.Geol., Chief Geologist, *CanAus Coal Ltd.*

### Abstract

The Crowsnest coalfield lies within the Kootenay Group of sedimentary strata which is characterized by complex folding and thrust faulting. Finding coal occurrences is relatively easy, but properly defining economic coal resources is a difficult task. This presentation will outline some of the techniques used by exploration teams to identify, quantify and qualify a metallurgical coal deposit in BC.

### Bio

Dave has over 17 years' experience as a geologist in both exploration and mining, mostly in metallurgical coal. He is currently responsible for all aspects of exploration and resource definition for CanAus Coal Ltd. Previously, Dave was Exploration and Resource Manager for Peace River Coal and Cardero Coal, based in northeastern BC.

## **Challenges of Mining through Historical Underground Workings**

Speaker: Sarah Smith, Geologist, *Teck Coal Limited*

Co-authors: Chris Lane, PGeo, Senior Geologist, *Teck Coal Limited*, and Vicki Thomson, PGeo., Senior Geophysicist, *Teck Resources Limited*

### Abstract

Coal Mountain Operations (CMO) is an open cut coal mine owned and operated by Teck Coal Ltd. CMO is located in the South East corner of British Columbia, with operations based between 1500 to 2000 meters above sea level. During the last 4 years of mining, CMO has intercepted and mined through historic underground workings (UG) that date back to the early 1900's. Mining through UG presents a set of unique challenges relating to safety and coal quality.

Probe drilling, historic maps, geophysics, and employee communication/engagement all proved to be useful tools to help mitigate the risks of mining through UG. The site was able to safely operate by undertaking a number of initiatives including the development of a safe work plan, job safety analysis processes, and employee engagement. In addition to safety, CMO has shown that the presence of UG can alter the qualities of the coal due to oxidation, historic fires, and contamination related to UG infrastructure/processes. Further coal quality and safety complexities related to historic ground support (timbers and rails) were present throughout the mining process. This material needed to be removed from the coal before processing could begin in order to reduce downtime in the plant and reduce the potential for safety related issues with wood contamination in final product.

Throughout the many challenges related to UG at CMO, mining through the workings was completed successfully without any reportable injuries and maximum recovery of coal reserves.

### Bio

Sarah Smith, GIT, is currently a project geologist working at Teck Coal Limited. She graduated from University of Canterbury in New Zealand (NZ) with a BSc Geology, and a Post Grad Diploma in Engineering Geology. Previously worked in NZ on a hard rock tunneling project and is currently working in Short Range Geology at Coal Mountain Operations.

## **A Summary of 2017 British Columbia Geological Survey Activities and Core Programs**

Speaker: Gordon Clarke, M.Sc., P.Ge., Director, British Columbia Mineral Development Office,  
*Ministry of Energy, Mines & Petroleum Resources*

### Abstract

The British Columbia Geological Survey (BCGS) generates pre-competitive geoscience data, advises government, attracts global investment, monitors industry activity, provides confidential geological expertise to companies and individuals and is the custodian of online geoscience and assessment work databases. The BCGS is divided into three sections, the Cordilleran Geoscience Section, the Resource Information Section and the Mineral Development Office. The BCGS consists of 29 staff with an operating budget of \$3.9 million (2016/2017). Work is often carried out with partners and in 2017 this included the Geological Survey of Canada, the Geological Survey of Japan, Geoscience BC, the Mineral Deposit Research Unit (University of British Columbia) and the University of Victoria. In 2017, programs included ongoing regional mapping and compilation, exploration methods investigations (till geochemistry and apatite as an indicator mineral, specialty metals research) and deposit studies on gold systems and Ni-Cu-PGE mineralization. BCGS activities are documented in the Geological Fieldwork publication released every January. Industry activity is summarized by the BCGS every year in the British Columbia Coal Industry Overview and the Provincial Overview of Exploration and Mining in British Columbia publications that are also released every January. Sections of the Provincial Overview of Exploration and Mining in British Columbia are written by Regional Geologists who belong to the Ministry of Energy, Mines and Petroleum Resources, Health, Safety and Permitting branch.

### Bio

Gord has over thirty years of experience working in mineral exploration and mining. He was a principal owner of Aurora Geosciences Ltd. (formerly Covello, Bryan and Associates Ltd.) before working as senior mine geologist and superintendent of exploration for Diavik Diamond Mines Inc. After leaving Diavik in 2007, he held public company officer positions as President and Vice President Exploration for North Arrow Minerals Inc. and Vice President Exploration for Elgin Mining Inc.

Gordon is the Director of the Mineral Development Office where he is responsible for the promotion of British Columbia's mineral and coal resources. He provides information and assistance to industry stakeholders. Monitors and tabulates current industry activities. Co-ordination of the geoscience outputs of the Regional Geology offices.

## **Implementation of the New Regional Mine Reclamation Bond Calculator**

Speaker: Heather Cullen, Regional Director, North Central/Northeast, *Ministry of Energy, Mines & Petroleum Resources*

### Abstract

The purpose of the project is to provide Regional Mines Inspectors with a defensible and consistent means of assessing the reclamation security requirements for regional mines, with the intention of ensuring it represents an accurate reflection of the cost of reclamation by the Province. Previously, each regional mines office had its own method of calculating reclamation securities resulting in inconsistencies. To achieve this, the Ministry has developed a spreadsheet- the Regional Reclamation Bond Calculator- to help calculate the cost of reclamation activities based on established unit costs. The bond calculator applies to exploration, placer, sand and gravel and quarries; not major mines. Where the calculator is being utilized, applicants, agents and operators are made aware of how the bond requirements are derived. This often prompts more detailed conversations between the inspector and the applicant, resulting in greater awareness of reclamation requirements and options to potentially reduce reclamation liabilities.

The Ministry is moving from a pilot implementation to implementation across the Province over the winter. The Ministry will continue to work with stakeholders to improve the accuracy and the fair and consistent use of the bond calculator tool.

### Bio

Heather is currently the Regional Director for the North Central/Northeast Region for Ministry of Energy and Mines. She is a Registered Professional Forester that has worked for in Natural Resource Sector agencies for past 30+ years, and in MEM for the past 5 years.

Heather has called Prince George home for her whole working career, but has worked across the province on numerous projects. Her current priority project is leading the development of a clear and consistent approach to reclamation bonding for regional mines.

## **Orogenic gold mineralization of the eastern Cordilleran gold belt of British Columbia: Structural ore controls in the Cariboo, Cassiar and Sheep Creek mining districts**

Speaker: Murray Allan, Research Associate, *Mineral Deposit Research Unit (MDRU), University of BC*  
Co-authors: Dave Rhys, *Panterra Geoservices*, and Craig Hart, *Mineral Deposit Research Unit (MDRU), University of BC*

### Abstract

Orogenic gold systems in Northern Cordillera span nearly the entire width of the Cordilleran orogeny, and in a wide range of collisional tectonic settings, from forearc settings to those inboard (east) of the accreted peri-cratonic terranes. Vein-hosted gold mineralization in the Cariboo, Cassiar, and Sheep Creek districts comprise British Columbia's "eastern Cordilleran gold belt", in which gold is structurally linked to Jurassic to Cretaceous collision of the Intermontane terranes with the ancient North American margin. In all three districts, fold and thrust geometries and penetrative ductile strain fabrics are consistent with orogen-normal shortening and orogen-parallel extension. Quartz vein geometries and shear sense are kinematically compatible with their formation during progressive shortening under the same general stress regime. New  $^{40}\text{Ar}/^{39}\text{Ar}$  and U-Pb data help constrain the timing of vein formation to 149 to 134 Ma in the Cariboo district, 143 – 129 Ma in the Cassiar district, and ~133 Ma in the Sheep Creek camp. Collectively, geochronological data and structural field observations indicate that veins and mineralization formed diachronously in response to long-lived collisional strain. In general, however, gold mineralization formed in low strain brittle environments toward the terminal stage of orogen-normal shortening, and thus signals the transition from collisional orogenesis to orogenic collapse. Kinematic data from the Cassiar and Cariboo also indicate collisional deformation was accompanied by northwesterly, orogen-parallel escape of thrust-bound elements of the Slide Mountain terrane.

### Bio

Murray Allan is a Research Associate at the Mineral Deposit Research Unit (MDRU) of The University of British Columbia, where he has been working alongside industry, government and academic geologists on metallogenic problems in the Northern Cordillera since 2010. He leads MDRU's Yukon-Alaska Metallogeny Project and BC Orogenic Gold Project, and previously managed MDRU's Yukon Gold Project, which established the metallogeny of new gold discoveries during Yukon's "Second Gold Rush" of 2009-2011. Murray's current research focuses on the geology and ore controls of gold camps such as Cariboo, Cassiar, Sheep Creek, and the Klondike, as well as recent discoveries such as Coffee and White Gold. Murray embraces a multi-disciplinary and multi-scale approach to solving exploration and metallogenic questions, with an emphasis on regional data integration, field mapping, structural geology, geophysical interpretation, geochronology, fluid-rock interactions, geochemistry, and petrography.

## Orogenic Gold in the Kootenay Arc – Margaux Resources' Sheep Creek and Bayonne Properties

Speaker: Linda Caron, M.Sc., P.Eng, VP Exploration, *Margaux Resources Ltd.*

### Abstract

The Sheep Creek and Bayonne properties are part of a larger land package that Margaux Resources Ltd. is actively exploring in the Salmo area of southern B.C. The company's project straddles the deformation zone at the boundary between the accreted Quesnel terrane and sediments that were deposited off the western margin of ancestral North America. That deformation zone is referred to as the Kootenay Arc and it hosts a wide range of mineralization styles and ages, including Kootenay Arc lead-zinc deposits, tungsten skarn, gold skarn, and orogenic gold veins. The Sheep Creek and Bayonne properties are examples of orogenic gold veins.

The Sheep Creek Camp is one of the largest orogenic gold vein systems in British Columbia with historic production of 736,000 oz Au at an average grade of 0.43 oz/t Au. It is underlain by late Proterozoic to Cambrian sediments that have been folded, in response to compression that accompanied terrane accretion, into two tight north-northeast trending, overturned anticlines and an intervening syncline. Veins are almost exclusively developed within competent quartzite units and are concentrated at the crest and/or on the limbs of the anticlines. Over 50 veins are known in the camp, of which 34 are past-producers. The veins have an average width of about 1 m, but can reach widths of more than 2 m. Historically the veins were developed over a vertical range of up to about 500m and over similar strike lengths. There has been limited exploration in the camp since mining ceased in the mid 1950's. Through a series of option agreements, Margaux has consolidated the property for the first time in since the discovery of veining in the late 1890's and is planning a fall 2017 drill program on the property.

The Bayonne property is located about 12 km east of Sheep Creek and has historic production of 42,000 oz at an average grade of 16.0 g/t Au. In some respects, the Bayonne property is similar to Sheep Creek. It hosts a number of gold-bearing orogenic veins and the veining is the same age and style as at Sheep Creek. One of the main differences between Bayonne and Sheep Creek is the host rocks. At Bayonne, the entire area occurs within a large granodiorite intrusion that is part of the Jurassic Nelson Plutonic Suite. Unlike the different sedimentary layers at Sheep Creek, that intrusion has a consistent response to the build up of stress, so veins aren't constrained by any particular rock layer and may potentially have greater strike length and greater depth extent than at Sheep Creek.

While production at Sheep Creek was from 34 separate veins, all of the historic production, and the vast majority of historic exploration and development work on the Bayonne property, has been on the Main vein and a splay of that vein, the A vein splay. The Main vein has been traced on surface and in underground workings for a strike length of 950 m and over a vertical distance of up to 240 m and remains open on strike in both directions as well as to depth. The A vein splay has a known strike length of 550 m and has been traced over a vertical distance of up to 180 m. It too remains open on strike to the southwest and to depth. There has been essentially no modern exploration on the Bayonne property. Margaux's fall 2017 drill program represents the only significant work program on the property in 35 years.

## Bio

Linda joined Margaux Resources as Vice President of Exploration in early 2017. She has over 30 years of experience in the mineral exploration industry and is well known for her extensive work in Southern British Columbia. Prior to joining Margaux Resources, she was the senior geologist for Kinross on their Grizzly-Greenwood gold project. Linda attended the University of British Columbia, where she obtained a B.A.Sc. in Geological Engineering (Mineral Exploration Option), and the University of Calgary where she received a M.Sc. in Geology. She is a Professional Engineer registered in the Province of British Columbia.

## **“Gold in the Historic Alder Gulch District, Montana.” Implications for Gold in Metamorphic Terranes, Purcell Group and Southern BC?**

Speakers: Michael Dufresne and Andrew Turner, APEX Geoscience Ltd.

### Abstract

Since the initial discovery of gold (Au) in Alder Gulch in 1863, total placer gold production from the drainage has been estimated to be on the order of 2.5 million ounces, with some estimates as high as 10 million ounces (early gold production figures were not recorded). Even at the lower estimate, Alder Gulch remains perhaps the most impressive single drainage placer gold discovery in North America. In contrast, total lode (bedrock) gold (+/- silver) mining production from several small mines and prospects located at the head of Alder Gulch, from which the Alder Gulch placer gold was undoubtedly eroded, has been estimated at only 170,000 ounces. This order of magnitude discrepancy between placer and lode gold production within the district has resulted in the lode gold potential of the area drawing significant interest from numerous junior exploration and major mining companies between the early 1980's and the middle 1990's. These companies conducted several major exploration campaigns in the region with total expenditures in excess of US\$25 million (all currency figures refer to US dollars). However, since the downturn in gold prices in the late 1990's and the passing of the Montana law banning cyanide leaching of open pit ores in 1998, little exploration has been conducted in the district and the authors consider the area massively under-explored and, in particular, under-drilled.

The Virginia City (including Alder Gulch) Mining District is the southernmost mining district of some five mining districts that flank the Tobacco Root Batholith (TRB), which is a moderate sized, northwest trending granitic (quartz monzonitic) dome of Late Cretaceous to Early Tertiary age. The Tobacco Root Batholith appears to be a satellite intrusion related to the larger Boulder Batholith to the northwest that hosts, amongst other districts, the world class Butte copper mining district. The TRB intrudes an uplifted block of complexly deformed and metamorphosed Archean (Proterozoic? Purcell?)-aged rocks that are the host rocks of the VCMD and are overlain regionally by a variety of folded and thrusting Paleozoic sedimentary rocks and Tertiary volcanic rocks. The Alder Gulch lode deposits are hosted by the Archean (Proterozoic? Purcell?) age Cherry Creek Formation, which was described by Hess (1967) as consisting of metasedimentary rocks which went through amphibolite to lower granulite grade metamorphism resulting in a variety of coarse grained quartz-feldspathic gneiss, mafic gneiss, finer grained pelitic schist, amphibolite, minor graphitic schists, marble and abundant pegmatite dykes throughout.

### Bio

Mr. Dufresne received his B.Sc. in Geology from the University of North Carolina at Wilmington in 1983 and his M.Sc. in Economic Geology from the University of Alberta in 1987. He is a registered Professional Geologist (P.Geol.) with the Association of Professional Engineers and Geoscientists of Alberta (APEGA) since 1989. Mr. Dufresne is the President and a principal of APEX Geoscience Ltd. He has worked as a consulting geologist for over 30 years conducting and directing exploration programs for junior and major exploration and mining companies encompassing a variety of commodities and deposit

types including diamond, gold (placer and lode), base metal, uranium and industrial minerals in Alberta, British Columbia, Yukon, Nunavut, Quebec, the Northwest Territories (NWT) and internationally. Mr. Dufresne has authored numerous Technical Reports and a number of Valuation Reports for public companies for early to advanced exploration stage projects including resource work for a variety of commodities and deposit types. He has additionally published extensively on the mineral potential of Alberta, as well as the Yukon and Northwest Territories and was first author of "Diamond Potential of Alberta" Alberta Geological Survey Bulletin 63. Mr. Dufresne was personally involved with and part of the exploration teams responsible for the discovery of the George Lake – Goose Lake gold deposits, Nunavut, the Three Bluffs gold deposit, Nunavut, and the Perseverance gold deposit, in the Coolgardie area of Western Australia.

Since 2012, Mr. Dufresne and the APEX team have conducted a number of property visits, property evaluations and constructed/executed a number of exploration programs, resource estimates and NI 43-101 Technical Reports for a number of USA based projects in Nevada, Arizona, Utah, Idaho and Montana. Mr. Dufresne has been involved in numerous assessments of a number of Nevada based Carlin and Epithermal volcanic hosted gold deposits and projects.

## **Greenwood Precious Metals Project - New Hope for an Old Camp**

Speaker: Matt Ball, Ph.D, P.Geo., Chief Geologist & COO, *Golden Dawn Minerals Inc.*

### Abstract

Golden Dawn Minerals Inc., a Vancouver junior company, began working in the Greenwood Camp in 2010 on the Tam O'Shanter project. After defining a low grade disseminated gold resource at TOS, the Company re-focussed exploration on the vein-type May Mac silver deposit in 2015. Based on exploration success and investor appetite, the Company then expanded holdings to include the Greenwood Gold project in 2016. With a vision to secure future feed for the Greenwood mill, the Company then acquired Kettle River Resources in 2017. Total holdings now stand at over 11,000 hectares generally located between Grand Forks and Greenwood, covering several historic mines, including the Lexington-Grenoble, Golden Crown, and May Mac mines, and the Greenwood Process Plant. The Company is actively exploring the May Mac, Golden Crown and Kettle River properties, and is re-opening the Lexington mine and Greenwood Process Plant. The aim is to produce gold, silver and copper initially from the Lexington and Golden Crown mines with contributions from the May Mac mine. The Company will also continue exploring for additional resources to feed the plant. This presentation will discuss the geology of a selection of deposits and provide an update on current activities.

### Bio

Dr. Ball is the COO & Chief Geologist for Golden Dawn Minerals Inc. Dr. Ball has worked as a geologist for over 30 years worldwide on exploration and mines . He was formerly COO at the Bralorne gold mine in B.C. Dr. Ball has practical experience and knowledge of lode and epithermal gold-silver, porphyry copper-gold and related skarn deposits, all of which occur in the Greenwood area.

## **Gold Potential on the Zinger Property**

Speaker: John Keating, CEO, President & Director, *PJX Resources Inc.*

### Abstract

Compilation of historical data has defined data gaps that have been filled by mapping, prospecting, geophysics and geochemistry. This work has uncovered the possible secret to gold distribution and deposition on the Zinger Property.

### Bio

Mr. Keating has over 30 years of experience in the mining and exploration industry. He conducted early and advanced stage exploration with Noranda and was a global commodity analyst for gold, silver, and base metals with the Federal Government of Canada. During the last 10 years, Mr. Keating was president and chief executive officer for Black Bull Resources and Golden Chalice Resources. Mr. Keating holds a Bachelor of Science (Geology) from Concordia University.

## Atlantic Gold Corporation – Successful Development of the Moose River Consolidated Project

Speaker: Tracey Meintjes, Principal, *Moose Mountain Technical Services*

### Abstract

Atlantic Gold Corporation acquired and consolidated the Touquoy, Beaver Dam, Fifteen Mile Stream and Cochrane Hill gold deposits in 2014. A PEA for this Nova Scotia based project was completed in 2014, followed by a Feasibility Study in 2015, and start of construction in 2016. First production was achieved in October 2017. This presentation will review the development of the MRC project and some of the aspects that made it so successful in such a short period.

### Bio

Tracey is a Principal at Moose Mountain Technical Services with over 20 years of experience in metallurgy, minerals processing, and mine planning in North America, South America, Europe and Africa. Tracey has worked on a broad range of projects including gold, silver, copper, lead, zinc, coal, uranium, and rare earths. He has been involved with the Moose River Consolidated Project as a consultant since its acquisition in 2014. His experience and expertise includes:



- Metallurgical Testwork
  - Process Engineering and Optimization
  - Process operations
  - Mine Engineering
  - Financial Modeling
- 
- NI 43-101 Qualified Person
  - Project Commissioning and Start-up.

## **Ixtaca – Advancing a Project through Uncertainty**

Speaker: Tracey Meintjes, Principal, *Moose Mountain Technical Services*

Co-author: Jesse Aarsen, Mining Engineer, *Moose Mountain Technical Services*

### Abstract

The Ixtaca deposit was a blind discovery in eastern Mexico in 2010. From that time until now the project has advanced from initial exploration through to published PFS and permit application. This talk will focus on the unique geologic characteristics of the Ixtaca deposit along with the various strategies used by the company to advance the project despite low gold prices and industry reduction in available capital.

### Bios

Tracey is a Principal at Moose Mountain Technical Services with over 20 years of experience in metallurgy, minerals processing, and mine planning in North America, South America, Europe and Africa. Tracey has worked on a broad range of projects including gold, silver, copper, lead, zinc, coal, uranium, and rare earths. He has been involved with the Moose River Consolidated Project as a consultant since its acquisition in 2014. His experience and expertise includes: metallurgical testwork, process engineering and optimization, process operations, mine engineering, financial modeling, NI 43-101 Qualified person, project commissioning and start-up.

Jesse Aarsen is a licensed professional mining engineer with over 17 years of combined experience in operations and consulting. He has been involved with operations in Western Canada, and internationally as a consultant on various engineering studies.



- Senior Mine Engineer
  - NI 43-101 Qualified Person
  - Short range, long range planning
  - Engineering project manager
- 
- Building block models, gridded seam model
  - Equipment fleet analysis

## **Mining Builds Communities**

Speaker: Bryan Cox, President & CEO, *Mining Association of BC (MABC)*

### Abstract

B.C. has a global reputation as a leading jurisdiction for mining with rich, diverse mineral deposits in every corner of the province. As British Columbia continues to be a world leader in environmental stewardship and sustainability, our metals and minerals will play a critical role in contributing to society's transition to a low carbon economy and communities across B.C. will continue to benefit from a strong and growing industry.

### Bio

Bryan Cox is the President & CEO of the Mining Association of British Columbia (MABC). As the preeminent voice and advocate for the mining industry in B.C., Bryan represents the industry's interests in the areas of health and safety, First Nations and community engagement, sustainability and competitiveness.

Bryan joined MABC as Vice President of Corporate Affairs in 2014, bringing with him a wealth of experience in government relations, public affairs, and stakeholder engagement. Mr. Cox has been an invaluable member of the MABC team since his arrival and he has been a strong industry advocate on key policy matters related to the fiscal and regulatory regime in British Columbia.

Prior to joining MABC, Bryan spent seven years in the brewing industry in progressively senior roles including Vice President, Western Canada at Canada's National Brewers, where he was responsible for managing the regulatory and public affairs agenda for Canada's largest brewers across the four western provinces.

Before joining the private sector, Bryan spent several years in senior roles with the Government of British Columbia.

Bryan is the Chair of the Mining Sector Advisory Group at the BC Industry Training Authority and on the Steering Committees of Mining for Miracles, the B.C. Centre of Training Excellence in Mining, and the British Columbia Business Council's NEXT Leaders Council.

## **Geology and Mineralization of the New Afton Porphyry Cu-Au Deposit, British Columbia**

Speaker: Devin Wade, Senior Exploration Geologist, *New Gold Inc.*

### Abstract

New Afton is located in a belt of 200-205 Ma alkali porphyry Cu-Au-Ag deposits situated in the Quesnel volcanic arc. The deposit is classified as an alkalic porphyry copper-gold deposit related to the intrusion of a narrow monzonite stock that is associated with the Cherry Creek monzonite phase of the Iron Mask batholith. Mineralisation occurs as discontinuous copper sulphide stringer veinlets and disseminations hosted within the edge of the intrusive bodies and within intermediate to mafic volcanic rocks belonging to the Triassic Nicola Group Formation immediately adjacent to monzonite intrusions. At New Afton there are six principal lithological units: crystalline and polymictic fragmental volcanic rocks and monomictic intrusive breccias, picrite, diorite, monzonite, sedimentary rocks and major faults. The alteration model is comprised of six domains; biotite-dominant potassic, potassium feldspar-dominant potassic, phyllic, outer propylitic, calcic and carbonate flooding. The resulting alteration pattern represents a core of texture-destructive potassic alteration with localized calcic or calc-potassic alteration haloed by outer propylitic alteration and overprinted vertically and laterally by phyllic alteration. Biotite-dominant potassic alteration is coincident with a majority of copper, gold and silver mineralisation within the deposit. Mineralization comprises three separate ore type domains including hypogene, secondary hypogene and supergene. The structural interpretation comprises four major steeply-dipping SW, SE, E and SSE-trending sets of faults that are responsible for controlling the monzonite stock emplacement and pathway for hydrothermal fluids release.

### Bio

Devin Wade, New Gold Senior Exploration Geologist, has 15 years of experience working for juniors and majors in gold and copper porphyry, intrusion related and epithermal systems in China, Chile, Africa, and within the western Cordillera including Alaska and British Columbia. He's been involved with regional and C-Zone exploration at the New Afton mine since 2013.

## **Block Cave Mining at New Afton**

Speaker: Marty Henning, Senior Geologist, *New Gold Inc.*

### Abstract

New Afton copper-gold-silver block cave mine is located 10 kilometres from the regional hub of Kamloops. The New Afton Mine occupies the site of the historic Afton Mine, a previous operation of Teck Resources Limited (“Teck”), and includes an open pit, underground workings, historic support facilities, a new concentrator and recently constructed tailings facility. New Afton began commercial production ahead of schedule in July 2012 the designed throughput was 11,000tpd and over the past 5 years of optimization and expansion the current through put is 17,500tpd.

By the end of 2016 New Afton produced approximately 366M pounds of copper and 440,000 ounces of gold and 1M ounces silver, Mineral Reserve reported in the 2016 estimate states A&B-Zones contain 35M tonnes grading 0.51 g/t Au, 2.1 g/t Ag and 0.78% Cu and C-Zone contains 25M tonnes grading 0.72 g/t Au, 1.8 g/t Ag and 0.78% Cu.

Production blocks of New Afton follow the southwest plunge of the deposit with East Cave situated 350m beneath the historical Afton open pit to the C-Zone production located 1.2Km below surface. During cave development/growth the micro-seismic and Time-Domain Reflectometer system tracks the rate of fracturing and initial cave back growth. After the cave has reached surface, geological and geochemical markers are used to determine where the ore columns are located within the alkaline porphyry system. Systematic draw control of the production blocks is used to: manage cave development and growth, manage low grade and waste segregation, reduce mill feed grade variability, minimize dilution entry and achieve metal production targets.

### Bio

During the first part of Marty Henning’s career as an exploration geologist he mastered the art of trundling on the hills of BC. After trundling veins, VMS and porphyry rocks, he joined the New Afton Mine during project construction and over the past 7 years he has been working on converting mine engineers, metallurgists and finance personnel to be becoming geologists, one day at time.

## **A view of mining and exploration from the Mid 1950s to Present**

Speaker: M. A. “Mo” Kaufman

### Abstract

The mid 1950s mining scene; a brief mention of major companies and major discoveries.

- 1) Murphy’s Law on Steroids; quirky discovery stories of the giant New Mexico uranium deposits, and a major failed mining development brought back to life.
- 2) The weird Discovery of the Vekol Hills Porphyry Copper deposit in Arizona.
- 3) Discovery of the Giant Resolution Copper Deposit in Arizona.

### Bio

M. A. “Mo” Kaufman

A. B. Geology Dartmouth College

M. S. Geology and Mining Engineering University of Minnesota

1955-1965: Military Service 1957-1958: Work with Kennecott Exploration, Kermac Nuclear Fuels, Falconbridge Ltd and Hunting Geophysical survey Corp Ltd.

1966-1969: Contract exploration for joint venture ;Freeport Exploration and Copper fabricating company partner.

1969-1990: Co-founder and principal of Perry, Knox, Kaufman Inc. Our company designed and carried out exploration projects for major mining and oil companies, as well as partaking in development projects. We discovered and worked on early development of the DeLamar silver gold mine in Southern Idaho, and the Trinity Silver mine in Nevada, as well as advising on the Candelaria Silver mine development in Nevada.

1990 to present: Operate as an individual prospector in B.C.

## Revett-hosted Silver-Copper Deposits in Northwest Montana

Speaker: Steve Petroni, General Manager, *Hecla Silver Valley, Inc.*

### Abstract

Hecla Mining Company, through its recent acquisitions of Revett Mining Company, Inc. and Mines Management, Inc., owns the Troy, Rock Creek and Montanore Revett-hosted silver-copper deposits located in northwestern Montana. The Troy Mine produced silver and copper ore between 1981 and 2012. Rock Creek and Montanore are development-stage projects that are currently being permitted. These strata-bound silver-copper deposits are hosted by the Mesoproterozoic Revett Formation of the Ravalli Group of the Belt Supergroup. The host horizon in the Revett Formation is composed of metasediments in which sulfides occur as fine-grained disseminations, clots or as thin veinlets. Hayes et al. (2012) proposed the genetic model of the Spar Lake (Troy) deposit as precipitation of Cu-sulfides through a reaction zone and mixing of oxidized and metal-bearing basinal brines with a sour (i.e., H<sub>2</sub>S-bearing) natural gas trap in the host metasediments.

At the Troy Mine, economically significant silver-copper mineralization occurs within a number of distinct stratigraphic quartzite sub-units. The Upper, Middle and Lower Quartzites are located within the upper member of the Revett Formation and the “A”, “C” and “I” beds are contained in the lower member of the Revett Formation. In plan view, the stratiform deposit measures approximately 2,300 meters long by 550 meters wide.

At Rock Creek, the stratigraphy in the vicinity of the deposit is nearly identical to that found at the Troy Mine. Mineralization occurs primarily within quartzite units of the lower member of the Revett Formation and subordinately within siltite and argillite sub-units of the lower and middle Revett Formation. The bulk of the mineralization is confined primarily in the “A” and “C” beds, but locally there may be up to four vertically stacked, potentially minable layers. The Rock Creek deposit forms an oblong body measuring at least 4,900 meters long by 2,200 meters wide and averages 8.2 meters thick.

At Montanore, silver-copper mineralization occurs in essentially two tabular stratabound deposits hosted in the lower member of the Revett Formation. The deposit is bounded on the west by the regionally extensive Rock Lake Fault with an apparent offset on the order of 600-800 meters. The Montanore deposit is confined to the sub-horizontal west limb of a syncline and is stratabound in the quartzite dominant “A” and “C” beds of the lower Revett stratigraphy. The deposit varies from 250 meters up to 1,050 meters wide and averages 10.7 meters thick.

Historic production at Troy and the existing resources at Troy, Rock Creek and Montanore are shown in Table 1. These estimates highlight the significant mineral potential of the Revett-hosted, stratabound silver-copper deposits. Several other smaller deposits also occur within the region that are not included in the estimates.

**Table 1: Production and Mineral Resources of Troy, Rock Creek and Montanore Deposits**

<b>Production and Resources</b>						
		<b>Tonnes</b>	<b>Silver</b>	<b>Copper</b>	<b>Silver</b>	<b>Copper</b>
<b><u>Property</u></b>	<b><u>Category</u></b>	<b><u>(000)</u></b>	<b><u>g/tonne</u></b>	<b><u>%</u></b>	<b><u>Oz (000)</u></b>	<b><u>Pounds (000)</u></b>
Troy <sup>1</sup>	Production	39,200	48	0.62	60,500	531,000
	Meas. + Ind.	83,700	41	0.52	110,300	955,000
Rock Creek <sup>2</sup>	Inferred	88,500	52	0.67	147,960	1,310,000
Montanore <sup>2</sup>	Inferred	101,800	56	0.68	183,300	1,460,000

<sup>1</sup> Revett Mining Co. resource estimate, dated March 30, 2015. Estimate based on \$24.69/oz Ag, \$3.35/lb Cu, \$29.99/ton NSR cut-off, 65% of remaining resource tonnes contained in pillars

<sup>2</sup> Hecla Mining Company resource estimate dated February 22, 2017. Estimate based on \$21.00/oz Ag, \$3.00/lb Cu, \$33.00/ton NSR cut-off, 15-foot minimum mining thickness, and includes mining restriction reductions due to permit constraints

**Bio**

Steve Petroni is a geological engineering graduate of Montana Tech and has 40 years’ experience conducting and managing minerals exploration programs around the world. He is currently General Manager, Hecla Silver Valley, Inc. based in Coeur d’Alene, Idaho where he manages exploration and corporate development programs in the western US. Steve has held previous exploration management positions with Apollo Gold Corporation, Pegasus Gold Corporation, Western Energy Company and Teton Exploration, and he has held an operations management position with Goodrich Aerospace. Steve is a Certified Professional Geologist and is a Registered Member of the Society for Mining, Metallurgy and Exploration (SME). He also serves on the Board of Trustees for American Exploration and Mining Association (AEMA). Over the years, he has worked on precious metals projects in numerous countries around the world. Steve and his wife, Laurie, reside on Hayden Lake in Idaho.



## **Porphyry Potential in the southeast Okanagan: CuAu (aka Chenier) Property update -- Geology, Geochemistry, Geophysics**

Speakers and co-authors: Bob Thompson, Fred Cook, and Renee Hetherington

### Abstract

The CuAu (aka Chenier) Cu Porphyry Property is characterized by strong alteration (potassic, albitic, propylitic), chalcopyrite and magnetite as vein fillings, soil geochemical expression, and nested magnetic- and electrical conductor anomalies consistent with a buried porphyry deposit.

The Property is located on the Okanagan Plateau, 35 km east of Oliver in the Okanagan Valley, and 15 km south of Beavercreek in the West Kettle River valley; the Tuzo porphyry prospect is 5.5 km north of CuAu. This is a poorly exposed and under explored region dominated by igneous complexes ranging in age from early Jurassic to early Tertiary. This 150 Ma time interval of episodic igneous activity produced a complex network of intrusions whose detailed history has yet to be deciphered using modern age-dating and mapping techniques.

Brenda Mine is the closest (past producing) Cu porphyry deposit (161 mt: Cu equivalent cut-off grade of 0.3%) located 35 km west of Kelowna; however, when the estimated 30 to 70 km of lateral, west side down, movement across the early Tertiary south Okanagan Valley extension fault is restored, Brenda mine becomes more-or-less aligned with CuAu Property.

CuAu is an early stage porphyry prospect boasting excellent road access, proximity to logistical centers, low exploration costs, and significant upside potential.

### Bio

Bob's career started with the BC Department of Mines under the mentorship of Jim Fyles, but the election of Dave Barrett prompted him to flee to the GSC in Calgary. For 30-odd years he conducted mapping projects in northeastern BC, Yukon, Queen Charlotte Islands, and southcentral BC. Despite a year in Ottawa on special assignment to the Deputy Minister at EMR, he managed to escape the bureaucracy and remain a "certifiable" field geologist. For the past 10 years he and his wife Renee have operated a private exploration/consulting company and have enjoyed professional partnerships with Fred Cook and Colin Dunn.

## **Cariboo Express: Exploring Opportunity at Lac La Hache**

Speaker: David Brett, MBA, President & CEO, *EnGold Mines Ltd.*

Co-Author: Rob Shives, P.Geo, VP Exploration, *EnGold Mines Ltd.*

### Abstract

David will provide an update on EnGold's copper-gold-silver exploration project located near Lac La Hache BC. The 18,275 hectare (70.5 square mile) Lac La Hache Property covers multiple drilled prospects including recently discovered Copper Skarn Zone, Aurizon Gold-Silver-Copper Zone, the Spout Magnetite-Copper Deposit, the Berkey Porphyry Prospect, and numerous other significant mineral occurrences. Collectively, these deposits, prospects and showings indicate the presence of a large, alkalic porphyry-copper system, similar to several other mines and deposits.

### Bio

David Brett, MBA, joined EnGold as President & CEO in October, 2017. David got involved in the mining industry initially in the 1960s & 70s prospecting, staking claims and doing all manner of "bush rat" work throughout BC and the Yukon, mainly with his father Guilford Brett. Since the mid 1980s, David has been involved in leading and managing junior exploration and production companies. He is former President & CEO of Cusac Gold Mines Ltd. (operator of the Table Mountain Gold mine near Cassiar for many years), current President & CEO of Pacific Bay Minerals Ltd. (uranium in Quebec & Argentina and more recently BC Jade & gold), former CEO of Inomin Mines Inc. (Newfoundland), and has had other public company roles. David teaches Venture Finance at the MBA level and is very active in his community.

## **Structural Controls on Mineralization and Implications for Resource Modelling at the Gibraltar porphyry Copper-Molybdenum Deposit, South-Central, BC**

Speaker: Sue Bird, P.Eng., Principal, *Moose Mountain Technical Services*

Co-author: Chris Gallagher, Geologist, *TerraLogic Exploration Inc.*

### Abstract

The Gibraltar calc-alkalic Cu-Mo porphyry deposit, located ~40km North of Williams Lake, BC, has been in operation for almost 40 years beginning in 1972. As of December 31, 2016, the deposit has a Measured and Indicated Resource of 1.03 billion tons at 0.25% Cu and 0.008% Mo.

A major program of drilling, oriented core, pit mapping, and structural mapping over the past two years has resulted in several major updates to the geology and grade models at Gibraltar. Copper mineralization is hosted in the Late Triassic Granite Mountain Batholith (GMB) and has a similar age, geological setting, and metal association as the Highland Valley Mine to the south. It is considered unique due to its association of ductile deformation with mineralization. The bulk of Cu-Mo mineralization is hosted in cm-scale sheeted quartz ± chlorite ± sericite sulphide veins and discrete m-scale ductile shear zones. Host rocks have been deformed by D1 north-verging thrust events, deformation of which has resulted in a pervasive tectonic foliation (S1). D2 brittle deformation resulted in ~North – South striking sub-vertical dextral and normal faults, and an S2 sub-vertical crenulation cleavage and south-east plunging lineation (Mostaghimi, 2014). This later event rotates S1 clockwise and offsets existing mineralization up to 125m resulting in distinct structural Domains that have a significant influence on the final distribution of mineralization at the mine.

The mapping of major faults and additional controls on mineralization, have been used to create distinct Domains for use in block modelling of the deposit. A combined structural control / gradeshell approach has been taken to honor both the geology and the grade distribution for a simpler and more accurate representation of the orebody as it will be mined. Classic statistics and geostatistics have also been used to determine which boundaries to include and what type of boundary to model – soft, firm or hard. These decisions have been based on Contact Plots and Swath Plots across each boundary as well as on changes in mean grade and variography in each potential Domain. Known structural orientations have been used to help determine directional properties of the mineralization for use in variography and search ellipses used in interpolation.

Overall the deposit exhibits diverse geologic relationships from East to West including:

- o relative timing and style of mineralization
- o geochemical zonation (higher temperature Cu-Mo to Pb / Zn base metal enrichment)
- o alteration and vein chemistry

Careful analysis of this zonation will allow future work to vector towards higher temperature domains of the deposit and possibly higher grade / different styles of mineralization.

## Bios

Sue Bird is a Geologic and Mining Engineer with two decades of experience in the mining industry, including resource estimation, mine planning, cash flow analysis, and geotechnical engineering. She has been involved in projects from scoping level to strategic planning. Sue has worked in operations at Elk Valley Coal as a long range mine planner and resource modeller. Consulting work has includes long range planning using Q'Pit and MineSight at both operating mines and PEA level studies. She has been the Resource QP on several deposits including porphyry copper, epithermal gold, and poly-metallic deposits. Sue has a Master's in geotechnical engineering and has worked on stability issues of both underground and open pit mines using Itasca and other software. She also spent five years researching the factors contributing to the economics of porphyry Cu-Mo-Au deposits throughout the world.

Chris Gallagher joined TerraLogic Exploration Ltd. in 2003 after completing his Masters in structural geology and tectonics at Carleton University. Since then he has been instrumental in developing TerraLogic's current exploration methodology, data management systems, and analysis programs. Working with TerraLogic over the past decade has exposed him to a wide variety of deposit types in many different geologic terrains. This diverse experience has allowed him to develop an extremely flexible geologic data management system that aids in grassroots to advanced exploration programs applicable to almost all deposit types ranging from REE exploration to SEDEX to porphyry systems.

Chris also has a strong interest in integrating technology with exploration, 3D visualization and modelling and resource calculations. His recent focus has been on whole rock geochemistry, alteration mapping and the development of QAQC systems for oriented core work.

## Tantalum and Niobium - Geology, Resources, and the Supply Chain – Implications for Prospectors

Speaker and co-authors: Simandl, G.J.<sup>1,2</sup>, Burt, R.O.<sup>3</sup>, Trueman, D.L.<sup>4</sup> and Paradis, S.<sup>5</sup>

<sup>1</sup> Specialty Metals and Industrial Minerals, British Columbia Geological Survey, BC, Canada

<sup>2</sup> Adjunct Professor, University of Victoria, Victoria, BC, Canada

<sup>3</sup> Consulting Metallurgist, Elora, ON, Canada

<sup>4</sup> Consulting Geologist, Richmond, BC, Canada

<sup>5</sup> Research Scientist, Natural Resources Canada, Sidney, BC, Canada

### Abstract

Tantalum (Ta) and niobium (Nb) are strategic materials. Tantalum is used largely in capacitors for automotive electronics, smart phones, and computers, as well as in aeronautical turbine blades, chemical industry, glass lenses, and as medical implants. The main uses of Nb are in High-Strength Low-Alloy (HSLA) Steels and super alloys for the aerospace industry. Both Ta and Nb carbides are increasingly used as protective coatings on metal parts exposed to corrosive and abrasive environments, reducing the need for expensive alloys.

The world's main Ta resources are in pegmatites (e.g., Wodgina, Australia), rare element-enriched granites (e.g., Abu Dabbab, Egypt), peralkaline complexes (e.g., Nechalacho [REE, Nb, Ta, Zr], Canada), weathered crusts overlying the previously mentioned deposit types, and in placers. Some Ta is recovered from tin slags. Nb resources are mainly found in carbonatites, carbonatite complexes, and peralkaline intrusions. Deposits with the highest Nb potential occur in weathered crusts that overlay carbonatite complexes (e.g., Catalão I and II, Brazil). Brazil currently accounts for 90% of the global Nb mine production with another 9% coming from the Niobec Mine, Canada. Concentrates from most carbonatites are used to produce ferroniobium; Ta not being recovered. The Ta and Nb content of some carbonatites or carbonatite complex-related deposits (e.g., Upper Fir deposit and Crevier dyke, Canada) is of the same order of magnitude as that of pegmatite ores; however, concentrates from pegmatites have commonly a higher Ta<sub>2</sub>O<sub>5</sub>/Ta<sub>2</sub>O<sub>5</sub> + Nb<sub>2</sub>O<sub>5</sub> ratio. Historically, 10-12% Ta<sub>2</sub>O<sub>5</sub> in Nb concentrates have not been treated in 'western' smelters because of the hydrofluoric acid cost. The 2008 economic downturn, resulted in reduced use and lower prices of Ta<sub>2</sub>O<sub>5</sub>, causing several mines in Australia and Canada to close down. The resultant Ta shortfall has been filled by artisanally produced columbotantalite from Central Africa. The Tantalum-Niobium International Study Center (TIC) indicates that the current Ta resource base probably exceeds 300,000 tonnes of contained Ta or greater than a century of world supply at the current rate of use. The United States Geological Survey estimates Nb 'reserves' (non NI-43-101 compliant) at >4.3 million tonnes of contained Nb. At least 17 undeveloped carbonatite complexes outside of Brazil have NI-43-101 compliant Nb resource/reserve estimates (e.g., Aley carbonatite and Upper Fir, British Columbia, Canada). More than 280 Nb- and 160 Ta-bearing occurrences are known in Canada alone and more resources will be discovered as a variety of geophysical and geochemical methods were recently optimized for specialty metal exploration. Deposits satisfying all technical and economical parameters, amenable to mechanized production, in mining-friendly jurisdictions, outside of environmentally sensitive areas, and near infrastructures are most likely to be developed. In ranking of grass root level Ta-Nb exploration projects, the mineralogy, textures and grain size, and chemistry of Ta-Nb minerals are indicative of deposit type. This in combination with the Ta<sub>2</sub>O<sub>5</sub>/Ta<sub>2</sub>O<sub>5</sub> + Nb<sub>2</sub>O<sub>5</sub> ratio of the concentrate,

and presence/absence of detrimental impurities are important parameters for ranking deposits according to their development potential.

## Bio

George J. Simandl, Ph.D., P.Geo., Critical Metal and Industrial Mineral Specialist

From 1978 to 1990 George held exploration and applied research positions with Iron Ore of Canada, Atomic Energy of Canada, Canada Talc Industries, and as an independent geological consultant. In 1990 he joined the British Columbia Geological Survey (BCGS) as an Industrial Minerals Geologist and became the Industrial Minerals Specialist in 1998. Since 2004, his responsibilities also include critical and specialty metals.

George has been active in variety of professional organizations such as the Canadian Institute of Mining and Metallurgy (e.g., Secretary and Treasurer, Vice-president, President, special publications representative, and member of the environmental committee for Industrial Mineral division). He has also organized or been a committee member for several Forums on the Geology of Industrial Minerals. He co-edited Industrial Minerals in Canada (CIM-Special Volume 53), Industrial Minerals with Emphasis on Western North America, and the proceedings of Critical and Strategic Materials (Victoria, 2015). He is credited with more than 200 technical, market-oriented, and scientific papers.

In addition, George is a Science Leader of the Specialty Metal component of the Targeted Geoscience Initiatives 4 and 5 (a joint effort between Natural Resources Canada and BCGS) and an adjunct professor at the University of Victoria where he supervises graduate students in the domains of ore deposits and exploration methodology.

## Prospecting the Subsurface with Seismic and Magnetotellurics

Speaker: Frederick A. Cook, *Salt Spring Imaging, Ltd.*

### Abstract

Application of seismic reflection profiling coupled with geologic information and magnetotelluric (MT) data in southeastern British Columbia can help to target concentrations of sulphide mineralization in the subsurface. Seismic profiles provide detailed images of stratigraphic and structural variations and magnetotelluric results provide images of electrical variations that, in some cases, may be associated with concentrations of some metals. In a GeoScienceBC project, existing MT data have been reprocessed with two-dimensional (2D) inversion, and the results are combined with the seismic and drill hole information to determine how electrical conductivity varies throughout the Purcell anticlinorium in southeastern BC. In a more focused, property-scale approach, these techniques have been used along Meachen Creek near St. Mary Lake. In this area there is a seismic amplitude anomaly near the Lower Aldridge – Middle Aldridge contact, the approximate stratigraphic position of the Sullivan massive sulphide deposit about 25 km to the north. This result led to the acquisition of a short magnetotelluric profile across the anomaly in 2017 that has images of near surface electrical conductors as well as a prominent electrically conductive ‘conduit’ that appears (in 2D) to intersect the seismic anomaly and may represent a pathway for metal migration in this area.

### Bio

**Frederick A. Cook**, BSc, MSc, PhD, P. Geo, Professor Emeritus, *Department of Geoscience, University of Calgary*

Dr. Cook is a Professor Emeritus in the Department of Geoscience at the University of Calgary and President of his company, Salt Spring Imaging, Ltd. He obtained a BSc (Geology, 1973) and MSc (Geophysics, 1975) from the University of Wyoming and a PhD (Geophysics, 1981) from Cornell University. He worked as an exploration geophysicist at Continental Oil Company from 1975-1977 and joined the University of Calgary in 1982. Dr. Cook's research has focused on applying geophysical and geological techniques to studying the structure and tectonic evolution of continents, particularly in the Canadian Lithoprobe project from 1984-2005. In Lithoprobe, he was the Director of the Lithoprobe Seismic Processing Facility (1987-2005), Transect Leader for the Lithoprobe Southern Canadian Cordillera Transect (1985-1995) and Transect Co-Leader for the Lithoprobe Slave-Northern Cordillera Lithospheric Evolution (SNORCLE) Transect (1995-2005). In 1995, he initiated a research program that focused on applications of high resolution geophysical techniques in exploration for gemstone deposits. This work resulted in the first successful discovery of pegmatite-hosted gemstones using ground penetrating radar. Dr. Cook has published more than 125 articles in scientific journals and books and has presented more than 40 invited lectures around the world. In 2011 he was awarded the J. Tuzo Wilson Medal of the Canadian Geophysical Union.

## **The Pakk Property: A Deeper Look for a Sedex Deposit**

Speaker: Ted Sanders, Geophysical Consultant and Prospector

### Abstract

The Pakk property is located on the southwest flank of the Hall Lake Block of Purcell Supergroup sediments north of the St. Mary Fault. The block is a broad anticline and hosts the Sullivan deposit on the northeast flank. Geology work and drill-core analysis by the Pakk group of geologists has shown that the Pakk property, west of the Pakk Fault, shows strong indications of being a sub-basin. Available geophysical and geochemistry data suggests the property may be host to a buried Sedex deposit beneath Middle Aldridge Formation sediments.

The 1995 St. Mary Airborne Mag/EM Survey contains two Mag anomalies of interest. The first is a low amplitude, but long wavelength (indicating a possible deep source), anomaly located in an area of Middle Aldridge Formation rock. This Mag anomaly correlates with the location of a cluster of conductors identified in a 1994 UTEM survey and forms the primary area of interest for this prospect.

The second anomaly of interest is a broad Mag high associated with Lower Aldridge rock and covers a large area east of the L. Aldridge - M. Aldridge contact (LMC) and the solitary Mag anomaly. This Mag anomaly correlates with a large area having elevated conductance on EM maps from the same airborne survey. Similarly, the Sullivan area shows large magnetic and EM anomalies in L. Aldridge rock south of the ore body. Located in upper strata of the L. Aldridge just below Sullivan Horizon, the large Mag anomaly east of the Pakk property is now inferred to be a mineralized Sedex dispersal zone anomaly. Conceivably, the source of this broad Mag anomaly is the same as the solitary Mag anomaly – a Sedex deposit at or near Sullivan Horizon, buried beneath 500-800 metres of Middle Aldridge rock.

An RGS geochem sample acquired from a creek exiting the basin where the solitary Mag anomaly is located shows very high precious, base and ore pathfinder element concentrations relative to a population of 82 samples acquired within the area defined by the St. Mary mapsheet (082F09). The sample was acquired very near the Sinclair Fault and, combined with the other notable geoscience data, adds a key piece of information to this compilation of geoscience work.

Future work on the Sinclair claim will be focused on a small area where an airborne 56 KHz EM anomaly is located (this frequency responds to only the top few metres of stratigraphy). This EM anomaly is located within the area of interest defined by the solitary Mag anomaly. The possibility that a diapir or diatreme containing mineralization may reside here has not been ruled out, and a ground Mag/VLF survey should identify where the shallowest conductive sources are located.

### Bio

- Employed by Chevron Canada for 7 years (Potential Fields Division).
- Geophysical technologist/consultant for 18 years.
- An independent prospector since 2010.
- Created the East Kootenay Gravity Database (2012-13), now property of Geoscience BC.

## **Silvana Mine - A New Beginning - 2017 Update**

Speaker: David Makepeace, Senior Geological and Environmental Engineer, *Micon International Ltd.*

### Abstract

Klondike Silver Corp. has an extensive land package in the Slocan Mining Camp which encompasses 68 past producing mines including the Silvana Mine. The Silvana Mine operated from 1970 to 2013 and produced approximately 510,964 tonnes grading 476 g/t silver, 5.6% lead and 5.2% zinc. It was the second biggest producer in the Camp.

In the last 2 years Klondike Silver has begun the process of re-activating the Silvana Mine and Mill and to bring the operation into the 21st century. The mine has an active mine permit and the 3 tailings ponds are licenced under the government. Necessary improvements to the operation have been on-going to comply with provincial requirements and include geotechnical ground support for the underground workings, reviewing and upgrading the tailings pond system and rip-rapping Carpenter Creek. The mine has re-established a connection with power, phone and internet service.

Exploration has included a LIDAR survey for accurate topographic control of the entire Slocan Mining Camp, which is now complete. All the old mine records and drill hole logs along the 7 kilometers of Main Lode that Klondike Silver controls have been scanned, digitized and are now in a 3D mine model. The LIDAR and 3D model will be combined to provide a powerful tool to interpret the western extension of the Main Lode which the Company refers to as the Silver Mile. This 1.5 kilometer area shows incredible mineral potential based on the surface geochemical surveys, limited surface and underground drilling and underground sampling and mapping so far. Due to the extremely rugged terrain and short surface exploration season, the Company has opted to explore this area from the western Silvana underground workings and eventually the Carnation rehabilitated underground workings, so that exploration can continue year round.

The probability is very high that the underground drilling program anticipated for late 2017 and throughout 2018 will provide sufficient mill feed to put the Silvana operation back into production."

### Bio

Mr. David Makepeace works as a senior geological – environmental engineer for Micon International Ltd. He holds a B.A.Sc. (Hons) degree in Geological Engineering from Queen’s University and a M.Eng. degree in Environmental Engineering from University of Alberta. He is a Professional Engineer in British Columbia and Alberta.

He has 37 years of experience in the mining industry having worked in mineral exploration and mine operations in both underground and open pits. Mr. Makepeace worked at the Silvana Mine for Dickenson Mines Ltd. from 1983 to 1989 ending up as chief geologist and engineer. During this time he was a vice-president of the Chamber of Mines of Eastern BC. Mr. Makepeace is part of Klondike Silver Corp’s Technical Advisory Team tasked with re-opening the Silvana Mine and other mines in the Slocan Mining Camp.

## **Cambrian-hosted sedex deposits in southern British Columbia: setting, controls and deposit models**

Speaker: Trygve Höy, *Geoscience BC*

Co-author: D. F. Sangster, *Geological Survey of Canada*

### Abstract

The Kootenay Arc and Monashee complex massive sulphide lead-zinc deposits contain many characteristics of vent-distal SEDEX deposits. The Kootenay Arc deposits are within Early Cambrian carbonate rocks while the highly deformed and metamorphosed Monashee deposits are within a dominantly calcareous, thin-bedded paragneiss succession that has been assigned ages that range from early Proterozoic to middle Paleozoic. Kootenay arc deposits have been previously classified as SEDEX, Irish-type or carbonate-replacement, while those in the Monashee complex, as metamorphosed SEDEX or Broken-Hill Type. A number of the Kootenay arc deposits have been mined in the past, and several of the Monashee deposits are undergoing renewed exploration interest.

Based on a review of recent literature, new age dates, re-interpretation of isotopic data, and a comparison of the stratigraphic and structural setting of these two deposit groups, we suggest that:

- (1) the deposits are all within correlative early Cambrian sedimentary successions, and
- (2) the deposits are synsedimentary, similar to classical SEDEX deposits.

These "conclusions" have considerable implications regarding the generally accepted terrane models for southern British Columbia. They define an important Cambrian metallogenic province that expands considerably the area of potential for SEDEX discoveries, from the classical Kootenay arc setting, through the Monashee "complex" into "correlative" rocks to the west.

### Bios

Trygve Hoy received his BSc from the University of BC, a Master's Degree from Carleton University, and his PhD from Queens University, working under Dr. Ray Price and D. Carmichael on the structural history and metamorphism of the central part of the Kootenay Arc. He worked for the BC Geological Survey until 2001, mainly studying deposits and tectonism in southeastern BC. Since then he has been consulting for various exploration companies, largely in southern British Columbia, and these past few years has been regional mapping in the Boundary and Okanagan districts for Geoscience BC.

Don Sangster received his PhD from the University of BC in 1964 and worked for the Geological Survey of Canada in Ottawa until 1997. He was President of the Society of Economic Geologists (1994-1995). He is a recognized authority on SEDEX deposits, having written numerous definitive papers on these and other related subjects, and actively continues with mineral deposit research.

## **Pend Oreille: Geology and Exploration Update**

Speaker: Eoin Cross, Senior Project Geologist, Teck Resources Limited

### Abstract

Teck Resources Limited (Teck), through a subsidiary, owns 100% of the Pend Oreille Mine (POM), which is an underground Zn-Pb operation, located near Metaline Falls, Washington, USA. Under Teck's ownership, the operation began commercial production in early 2004. In February 2009, POM was placed on care and maintenance with the mine restarting operations in December 2014. Since then, exploration and mine development efforts have focused on delineation and exploitation of the Yellowhead Zn-Pb horizon. Production in 2017 is projected to be between 35,000 and 40,000 tonnes of zinc in concentrate (Teck 2016 AIF, February 2017).

Despite a rich history of mining in the Metaline district, consensus on the origin and genesis of the district's ore deposits has proven controversial. The Cambro-Ordovician Metaline Formation is host to two distinct styles of stratabound Zn-Pb mineralization. Josephine-style mineralization consists of coarse-grained sphalerite and galena concentrated in silicified dissolution breccia near the contact of the Metaline Formation and overlying Ledbetter Shale. Yellowhead-style mineralization consists of finer-grained pyrite, sphalerite and galena hosted within banded dolomites and dissolution breccia near the base of the Upper Metaline sub-formation. Associated gangue mineral phases include dolomite, calcite and quartz.

Sulphide mineralization and adjacent wall rock alteration exhibit complex textural variability attributable to solution collapse and sheet cavity development. These porosity-enhancing events occurred during burial diagenesis in response to repeated basinal dewatering along high-angle structures tapping favorable carbonate stratigraphy. Carbonate gangue phases constrain the relative timing of mineralization and commonly form a more extensive halo to the mineralizing system.

### Bio

Eoin Cross, P.Geol, graduated from Trinity College Dublin, Ireland in 2009 with a BA in Natural Sciences (Geology). Upon graduating, he joined Teck as an Exploration Geologist exploring for Irish carbonate hosted Zn-Pb deposits across the Irish Midlands. During this time, Eoin's experience was broadened by international secondments to Teck's Highland Valley Copper Mine, BC and Red Dog Operations, NW Alaska.

In 2016, Eoin relocated to Vancouver, BC where he now holds the title of Senior Project Geologist working at Teck's Pend Oreille Mine, Washington, USA.

## Unlocking Hidden Treasures in the Duncan - a New Zinc-Lead-Silver Mine in the Kootenays

Speaker: John Mirko, President, CEO & Director, *Rokmaster Resources Corp.*

### Abstract

The Duncan Lake Project is a new story in the zinc sphere with both a proven team and quality world class asset. Rokmaster has 100% ownership; Teck's mineral tenures of interest over the Project discovery area expired in 2015. Teck retains a small (<300hectares) claim tenure over their old 1957 area 2.5KM south of the new project discovery.

Between 1989-1997, Cominco discovered higher grade strataform zinc-lead mineralization in 12 holes drilled on the Project discovery area. Open on strike - down dip, on plunge – along both limbs of Duncan Anticline. Mineralized intersections include: 10.42% Pb/Zn over 7.3m, 12.5% Pb/Zn over 7.5m, and 11.4% over 4.8m.

### *Tonnage and Grade Target Potential:*

“900 meter strike length of the structure has the potential to host 5 MMT of 11.5% Zn and 1% Pb in No.7 Zone and 2 MMT of 7% Zn and 0.3% Pb in the No.8 Zone. If the known mineralization is projected 2,100 m north (in the persistent plunge direction) to Jubilee Point, there is room for 16 MMT at 10% Zn” (Cominco-D.Moore,1997) and (R.A. (Bob) Lane, 2016.

At the time of their exploration shutdown (due to low metal prices, its own new Red Dog Mine production supply and Teck's takeover of Cominco) Cominco's Canadian team had recommended the next stage of work total +17,000 meters of additional drilling – including wide step outs to the north along Jubilee Point (2 phases in 20 holes). Rokmaster's exploration target is wedge off existing holes and step out drilling to Jubilee Point, targeting >10MMT @ >10%Zn+Pb\* (not including other Ag+Au+Cu targets).

The Duncan Lake Project has only ever been second stage drill tested, demonstrating a major find with outstanding potential. Rokmaster's team now has the ability to realize this opportunity. Fully drill permitted, moderate drilling is needed to outline a possible economic resource between 7-10MMT. Using Cominco's exploration target of 16M metric tons at +10% zinc, an in-ground gross value at today's zinc price of \$5 billion might be quite achievable. The Zinc market is tightening with increased metal prices due to rising demand and shortage Zinc prices are at a 7 year high, while concentrate (LME) supply is at an all-time low.

### *Moving Forward*

- Extend and wedge off select historic holes to intersect anticline crest areas of thicker mineralization.
- New drill hole testing on strike to north and south of historic holes, for additional resource definition.
- Fast Track – underground drilling – ramp access: 2 years.

- Small Stage I Mine – estimated permitting target: 2-3 years.
- Possible initial production Target – 4 years.
  - re-evaluate Cominco’s 1997 “economic sensitivity analysis” for a 10 MMT deposit @ 10% Zn Eq. (note: 10% Zn = +-\$260.00 gross in ground metal value)
- Possible concentrate Sales- Teck Resources’ Trail Smelter or swaps.

The project is road accessible, Teck Resources’ Trail Smelter (Pb/Zn/Ag/Au) is only 150km away by paved highway, with 15km to industrial power, roads, rail (100km by road or 40km by water), jet airports (1.5 hour by car), labour, water and workforce.

### Bio

Mr. Mirko has 40 years of experience in the mining industry and is currently the President and CEO of Rokmaster Resources Corp., and the President of Canam Mining Corporation. From 1986 to 2010, Mr. Mirko was the founder, President, CEO and Director of 4 public mining companies and a founder and Director of 3 others. He has been self-employed since 1977 as a contractor and consultant involved in the exploration, development and construction of numerous mining projects in 11 countries, and the commercial production of mineral concentrates and products from five of those projects. In 2008 he was a recipient of the “E. A. Scholtz Medal for Excellence in Mine Development” from the Association for Mineral Exploration of British Columbia and in 2009, the Mining Association of British Columbia’s “Mining and Sustainability Award” for the MAX Mine. He is a member in good standing of the Society of Economic Geologists, Inc., the Canadian Institute Of Mining, Metallurgy and Petroleum, and the Prospectors and Developers Association of Canada.

## **Iron Range 2017 Project Update**

Speaker: Mike McCuaig, Geologist, *TerraLogic Exploration Inc.*

### Abstract

The Iron Range Property is located 1 km NE of Creston in SE B.C. It overlies the same stratigraphy that hosts the world-class Sullivan sedimentary-exhalative deposit in Kimberley, 65 km to the North East. The Property also covers the Iron Mountain Fault Zone (IMFZ), a deep-seated regional fault containing significant iron oxide and iron sulphide mineralization. Originally staked in 1897 for its iron potential, Eagle Plains immediately staked it when the overlying Crown Grants expired in 1999. Eagle Plains has since focused on exploring for both SEDEX Ag-Pb-Zn and iron-oxide-copper-gold (“IOCG”) mineralization. The presentation will provide an overview of the Iron Range Project and an update on recent exploration activities.

### Bio

Mike has spent the last 7 years as a project geologist and manager on exploration programs in both British Columbia and the Yukon focusing on gold and base metal systems. Mike has worked with TerraLogic Exploration since 2008.

# TECK COAL LTD.

## COAL MOUNTAIN OPERATIONS

### FIELD TRIP

**Friday, November 10<sup>th</sup>:** 8:00am (departure) to 4:00pm  
(return to Cranbrook)



Coal mining in southeast BC dates back to the 1800s, with coal discoveries reported in the Elk Valley around 1845. The first underground mine opened at Coal Creek in 1897, and other underground mines sprung up and operated intermittently into the 1960s. Open pit mining began in 1968, when Kaiser Resources brought large-scale equipment into the area, marking the beginning of a new era in coal mining.

The Coal Mountain mine initially operated intermittently until 1948 as an underground mine known as Corbin. Re-opening in 1974, it was operated by a variety of companies until 2004, when the five Elk Valley mines consolidated into the Elk Valley Coal Partnership. In 2008, Teck Coal Ltd acquired the majority of the interests in the partnership, and now operates the mines. Coal Mountain is nearing the end of its reserve life, and is expected to be shut down in 2018.

The mineable coal seams are in coastal plain rocks of the Mist Mountain formation, where structurally thickened and exposed sections permit open-pit mining. Today, the Elk Valley coal mines produce approximately 27 million tonnes of clean metallurgical coal annually, and account for ~70% of Canada's total coal exports.

\*You may register for the Field Trip (\$50.00) at the registration desk until Thursday Nov 9<sup>th</sup>, 12:00pm.

**SPONSORED BY – Teck Coal Ltd.**