Exploration and Mining
British Columbia 2012

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Information documents of various types are available at www.empr.gov.bc.ca or the BC Booth.
Outline

- Industry Overview
- Coal
- Copper-Gold-Molybdenum
- Gold-Silver
- Zinc-Copper-Lead-Silver-Gold
- Nickel
- Specialty Metals

Dave Grieve has retired!
Forecast Mineral and Coal Production $7.4 Billion

- Coal: 65%
- Copper: 18%
- Molybdenum: 3%
- Lead: 1%
- Silver: 1%
- Aggregate: 4%
- Industrial Minerals: 6%
- Gold: 2%

MEMNG 2012 Estimate
Active Mines

- 10 Major Coal Mines
- 8 Major Metal Mines
- Several smaller or intermittent producers
- Numerous aggregate and industrial mineral mines
Mines Under Construction
Coal
East Kootenay Coalfields

- Coal Mountain
- Elkview
- Line Creek
- Greenhills
- Fording River

- ~24 Mt met. coal destined for seaborne export
- Major expansions underway
- All are in alpine terrane
Peace River Coalfields

• Perry Creek
• Brule
• Willow Creek
• Trend

• Produced ~5.5 Mt of met. coal
• Very active area for transactions and exploration
Quinsam
Hillsborough Resources Limited

- Underground thermal coal mine
- 480 Kt production
- Marketed to cement and energy plants
Coal Evaluation and Exploration

- Line Creek and Swift – Teck
- Bingay – Centermount Coal
- Roman Mtn and Horizon Ridge – Anglo
- Quintette – Teck Coal
- Getting – Cdn Kailuan Dehua Mines
- Murray River – HD Mining
- Bullmoose River and Wapiti – Cdn Dehua
- Suska – Xstrata and JX Nippon
- Raven – Compliance Energy Corp.
- Crown Mountain – Jameson Resources
- Marten-Wheeler – Teck Coal
- Coal Creek – Crows Nest Pass Coal Mining
- Basin – Coalmont Energy Corp

Record levels of expenditure
Carbon Creek
Cardero Resources Corp

- Proposed 4.1 Mt/y mine
- Feasibility study anticipated

Photo courtesy of Coal Hunter Mining

121 Mt (P+P) / 468 Mt (M+I) coal

Huguenot
Colonial Coal International Corp

Updated resource estimate

189.4 Mt (M+I) / 194.7 Mt (Inf.) coal

Photo courtesy of Coal Hunter Mining
Arctos Anthracite
Fortune Minerals Ltd / POSCAN

- Updated feasibility study completed
- Anthracite grade coal
  - PCI product
- Cash cost of @128/tonne FOBT
- Updated reserves estimate
  - 124.9 Mt (P+P) coal
  - 194.7 Mt (Inf.) coal
• Update and improve access to the coal exploration database
  • COALFILE
  • Coal MINFILE

• Audit Coal Exploration Assessment Reports (2002 to present)

• Enhance the BC Geological Survey connection with the coal exploration industry
Copper-Gold-Molybdenum
(Porphyry-related)

Gibraltar Pit
BC is blessed with geology favourable for Cu-Au-Mo mineralization
Copper Mountain
Copper Mountain Mining and Mitsubishi

• Copper mine
• In 2\textsuperscript{nd} year of 17 year mine life
• Increased mining rate to optimize operation
  • 35,000 t/d mill
• Multi-year exploration program commenced

211 Mt at 0.36 g/t Cu, 0.1 g/t Au, 1.4 g/t Ag (P+P)

Photo courtesy of Copper Mountain Mining
Highland Valley
Teck Highland Valley Copper Partnership

- Copper-molybdenum mine
- 120,000 t/d mill rate
- New mine plan to 2026
  - $475 million mill upgrade underway

674 Mt at 0.29% Cu, 0.008% Mo (P+P)
**Rateria**

Happy Creek Minerals Ltd

- Copper-molybdenum-rhenium project
- Bulk sample from Zone 1 and drilled Zone 2

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**Getty Copper**

Getty Copper Inc

- Pre-feasibility study completed
- Recent Titan 24 IP survey

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Airborne geophysical survey at West Valley property

*Photo courtesy of Happy Creek Minerals*
New Afton
New Gold Inc

- Gold-copper mine opened September 2012
- Canada’s first block cave mine at 11 000 t/d
- $765 million capital cost

47.9 Mt at 0.9% Cu, 0.64 g/t Au, 2 g/t Ag

Opened with a blast
Ajax
KGHM Ajax Mining Inc

- Proposed expansion of historic copper-gold mine to 60 000 t/d
- Proceeding through environmental assessment
- Extensive baseline studies on air and water quality, dust, and vibration, etc.

503 Mt of 0.27% Cu, 0.17 g/t Au (P+P)

Image courtesy of KGHM Ajax Mining
Images courtesy of Kamloops Daily News
Gibraltar
Taseko Mines & Cariboo Copper

- Copper-molybdenum mine
- Near end of most recent $325 million upgrade
  - ~$700 million total
- Soon to be 2nd largest base metal mine in Canada

802 Mt at 0.3% Cu and 0.008% Mo (P+P)
New Prosperity
Taseko Mines Ltd

- Proposed 70 000 t/d copper-gold mine
- Modified to address Federal assessment requirements
- Environmental Impact Statement submitted
- $1 billion+ capital cost

831 Mt at 0.23% Cu, 0.41 g/t Au (P+P)

Photo courtesy of Taseko Mines
Mount Polly
Imperial Metals Corp

- Copper-gold-silver mine
- 20,000 t/d
- Mine life to 2023

- Assessing underground potential of Boundary zone

87.3 Mt at 0.29% Cu, 0.3 g/t Au, 0.41 g/t Ag (P+P)

Wight Pit decline to Boundary Zone

Photo courtesy of Imperial Metals
Woodjam
Gold Fields Horsefly Expl. Corp.

- Copper-gold-molybdenum project
- 36,623 m drilling in 2012
- Southeast zone resource estimate

145.5 Mt at 0.33% Cu and 0.06 g/t Au (Inf.)

Discovery of Three Firs zone

Southeast zone Discovery outcrop

Photo courtesy of Consolidated Woodjam Copper
Use of indicator mineral to search for base and precious metals

- surficial mapping, ice-flow history, trace element analyses and bark biogeochemistry (Ferbey et al)

Minerals of interest include epidote, apatite, magnetite, and others.

- Highland Valley, Gibraltar, Mt Polley, Woodjam porphyry deposits sampled to date
Fox
Happy Creek Minerals Ltd

- Tungsten-molybdenum project
- Drilled Ridley, BN, BK zones
- BN zone result:
  - 14.8 m of 4.0% WO₃

Lac La Hache
GWR Resources Inc

Spout copper-magnetite-gold-silver skarn resource released:
- 23.4 Mt of 2.2 Mt magnetite, 54 Mkg Cu, 1013 kg Au, 24 500 kg Ag (I+I)

- Drilled gold-rich Aurizon South zone
- Increased land holdings

Photo courtesy of Happy Creek Minerals
Endako
Thompson Creek Metals & Sojitz Corp

- Molybdenum mine
- New 50,000 t/d mill commissioned
- Current planned mine life through 2028
- In pit mining suspended
  - Processing ore stockpiles
  - Mining expected again mid-2013
Huckleberry
Imperial Metals & ‘Japanese Consortium’

- Copper-gold-silver-molybdenum mine
- 20,000 t/d operation
- Mine life to 2021

Main Zone Optimization Plan
- Access to 39.7 Mt of 0.343% Cu below pit
- New potential at Main Zone Deeps
Ootsa
Gold Reach Resources Ltd

- Drilled Ox and Seel deposits
  - 45,147 m
- New resource estimate expect.
- Discovery of West Seel Porphyry
  - 817 m @ 0.2% Cu, 0.21 g/t Au + Mo and Ag

215 Mt of 0.17% Cu, 0.13 g/t Au + Mo and Ag
(Seel deposit, Inf)
Mount Milligan
Thompson Creek Metals

- Copper-gold mine under construction
- $1.5 billion project
  - Over $500 million spent in 2012 by Q3
- 60,000 t/d, 22 year life
- Start up late 2013

531.8 Mt at 0.20% Cu, 0.34 g/t Au (P+P)
Tchentlo/Choo
Freeport-McMoRan

- Copper-gold project
- Discovered in 2006
- PEA study underway
- 15 000 t/d proposal

Kwanika
Serengeti Res.

- Copper-gold project
- Discovered in 2006
- PEA study underway
- 15 000 t/d proposal

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<tr>
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<th>Central zone</th>
<th>South zone</th>
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<td>244 Mt at 0.23% Cu, 0.21 g/t Au (Ind)</td>
<td>240 Mt at 0.20% Cu, 0.09 g/t Au, 0.007% Mo (Inf.)</td>
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- Serengeti Resources as operator
- Drilled several targets around prospective Hogem batholith
• Waiting feasibility study results
  • 12 year mine life

10.3 Mt at 1.35 g/t Au, 0.52% Cu, 3.09 g/t Ag (High Grade sector)

JD project
• Tower Resources drilled 18 holes

Mex project
• Gold Fields drilled
• part of the “Toodoggone” project

Kemess Underground
AuRico Gold Inc

Toodoggone Region

Photo courtesy of Northgate Minerals
Power to the Northwest

R/W clearing Northwest Transmission Line

Power line to region may benefit many proposed mining projects
Red Chris
Imperials Metals Corp.

- Copper-gold mine under construct.
- $443 million
- First project to connect to new NW power line
- Extensive mineralization outside current pit design
  - Resources >1.2 Bt (M+I)

302 Mt at 0.36% Cu, 0.27 g/t Au (P+P)
BCGS Dease Lake bedrock geological mapping project
  • Open File 2012-04 (Logan et al.)

Magmatism and Metallogeny of the Hotailuh Batholith
  • Open File 2012-06 to be released (B. van Straaten, J. Logan & L. Diakow)
Schaft Creek
Copper Fox Metals Inc

- Copper-gold-molybdenum project
- Feasibility study released
  - 130,000 t/d over 21 years
  - $3.24 billion cap. ex.
- Teck to consider options
- Ongoing drilling and exploration

1229 Mt of 0.26% Cu, 0.19 g/t Au, 0.017% Mo, 1.69 g/t Ag (M+I)

Quartz-bornite vein, pervasive K-feldspar

Photo courtesy of Copper Fox
Galore Creek
Teck and NovaGold Resources Inc

- Large drill campaign this year
  - Geological and geotechnical
- Redesigned project
  - $5.2B
  - Relocated facilities, road and tunnel route
  - 95 000 t/d mill
  - 18 year mine life
- NovaGold to divest

528 Mt 0.6% Cu, 0.32 g/t Au, 6.02 g/t Ag (P+P)

Photo courtesy of NovaGold
Kitsault
Avanti Mining

- Proposed molybdenum mine
  - $837 million capital cost
  - 40,000 t/d for 16 years
- Former mine serviced by road and power
  - Operated 1967-72, 81-82
- Environmental assessment near process decision

321 Mt at 0.071% Mo, 4.8 g/t Ag, 236 g/t Pb (M+I)
KSM and Snowfield

Seabridge Gold Inc and Pretium Res Inc

- Gold-copper-molybdenum project
- KSM 2012 PFS
  - 2.2 Bt reserves, 52 year mine life
  - 130,000 t/d throughput
  - $5.3 billion cap ex.
  - Open-pit and u/g scenario
- Epithermal-style discovery at Camp zone
- Deep Kerr zone drilling
  - 470 m of 0.9% Cu and 0.3 g/t Au (from 20 m)
Gold-Silver
(veins, breccias, disseminated)

Photo credit: Bralorne Gold Mines Ltd
Brucejack
Pretium Resources

- Bulk to bonanza-grade gold-silver
- 105,769 m drilled this year
  - 41 intervals with uncut grades over 1000 g/t
  - Focus on Valley of the Kings
- U/g rehab. and expansion

2013 Work
- Feasibility study
- Bulk sample VOK

SU-452
0.5 m grading
41,582 g/t Au
27,725 g/t Ag

16.2 Mt at 16.4 g/t Au and 14.2 g/t Ag (Ind.)
Blackwater
New Gold Inc

- Major gold silver discovery
- May be the *world’s largest* exploration project in 2012?
- ~247 500 m drilled
- $125 million program
- PEA completed
- 60 000 t/d open-pit
- Entered Environmental Assessment process

267 Mt of 0.88 g/t Au, 4.3 g/t Ag (Ind.)

Lapilli tuff (garnet replace. of clast)

Image courtesy of: New Gold Inc
• Bulk-tonnage gold explored intensively since 2012

• Many similarities to mineralization at Blackwater
  • gold-enriched epithermal system that formed approx. 72 million years ago
  • 24,513 metres drilled up to mid-2012.

112 Mt of 0.44 g/t Au, 2.1 g/t Ag (Inf.)

Image courtesy of Amarc Res.
Bralorne Gold Mine
Bralorne Gold Mines Ltd

- Milling ~80 t/d from stockpile and u/g resources
- Active developing BK-3
- Evaluating 200 t/d expansion

Bralorne Gold Mines Ltd
Blackdome/Elizabeth
Sona Res Corp.

- Long awaited 5 km road permit issued
- Connection of mine and new ore from Elizabeth
Shasta
Sable Resources Ltd

- N. of former Kemess mine
- Ore processed at Baker mine

Dome Mountain
Gavin Mines Inc

- U/g gold project
- 5000 tonnes of ore shipped
- Working toward on-site 250 t/d mill

- Operates from May to October
- Sustained at <20,000 tonnes of ore/y
- Currently have two years of ore left

Image courtesy of Gavin Mines
QR Mine & Bonanza Ledge
Barkerville Gold Mines Ltd

- QR gold mine restarted in December with existing resources
- Awaiting 73 kt/y of ore over 4 years from Bonanza Ledge

Cariboo Gold Quartz

- Proposed gold mine
- Elevated gold resource estimated released in 2012

Tech. disclosure concerns require more work

19.9 m of 83 g/t Au

BC Vein on Barkerville Mtn
Yellowjacket
Yellowjacket Resources Ltd
• Idle gold mine in historic Atlin placer camp
• 400 t/d mill using gravity concentration

Engineer Mine
BCGold Corp.
• Past gold producer
• Bulk sample concentrated on site yielded 2112 g Au.

• Evaluating plans to resume mining
• Completed RC drill program

Photo courtesy of Yellowjacket Res. Ltd
Photo courtesy of BCGold Corp
Spanish Mountain
Spanish Mountain Gold Ltd

- Shale-hosted gold and silver: a new style of deposit in central BC
- Prefeasibility study completed
  - 40,000 t/d operation for up to 15 years
  - Capital cost of $755.9 million.
  - LOM cash cost of $774/oz Au
    - 2.8 million oz Au
    - 1 million oz Ag

216.2 Mt of 0.46 g/t Au and 0.68 g/t Ag (M+I)
Greenwood Camp  
Grizzly Discoveries

• Historical camp known for prolific skarn and vein-style mineralization
• Targeting gold near intrusive rocks
• Close to Kinross’ concentrator in Washington

[Image of Greenwood Camp location]

Kenville  
Anglo Swiss Res

• Tested southerly extensions of veins at the past producing Kenville Mine.
• Intersected vein extensions as far as 800 meters to the south.

[Image of Kenville location]

2011 Photo courtesy of Apex Geoscience
Zinc-Copper-Lead-Silver-Gold
(VMS, SEDEX, Stratabound, Veins)
Myra Falls
Nyrstar N.V.

- Zinc-copper-lead-silver gold mine
- Successfully replacing reserves since 1966
- Approx. 500 Kt/y mined
- Long term mine plan under consider.
- Testing muon geotomography
  - using solar rays to produce an upward looking 3D gravity image (density shadows)
Treasure Mountain
Huldra Silver Inc

- Small-scale silver-lead-zinc mine opened in May
- Mining high-grade veins
- Ore is trucked to concentrator at old Craigmont site

33,000 t of 828 g/t Ag, 4.16% Pb, 3.8% Zn (Historical)
Sullivan time: Sullivan Deeps hole # 1 (2004 – Stikine Gold), banded massive sulphides at Sullivan horizon, at depth and north of Sullivan mine

Two or more styles of mineralization under exploration:

- Iron oxide-Cu-Au (IOCG?)
- Ag-Pb-Zn (SEDEX)

Ongoing drilling, inc. Talon zone, where gold is associated with base metals
Harper Creek
Yellowhead Mining Inc

- Proposed copper-gold-silver mine
  - 70,000 t/d
- Stratiform deposit within metamorphosed volcanic/sedimentary rocks
- Feasibility study completed
- 11,000 m drill program underway

704.4 Mt at 0.26% Cu, 0.029 g/t Au and 1.14 g/t Ag (P+P)

Image courtesy of Yellowhead Mining
Ruddock Creek
Imperial Metals

- Underground zinc-lead project
- Drilled V and Creek zones
- U/g drill and bulk sample at E zone
- Updated PEA expected in 2013

4.65 Mt of 6.77% Zn, 1.38% Pb (Ind.)
**Akie**
Canada Zinc Metals Corp

- Sedex lead-zinc project
- New res. est. for Cardiac Creek deposit
- Kechika regional program (Pie, Mt Alcock)
- Underground exploration anticipated

12.7 Mt at 8.4% Zn, 1.7% Pb, 13.7 g/t Ag (Ind)

**J&L**
Huakan Int’l Mining Inc

- Gold-silver-zinc-lead project
- Large u/g drill program
- New resource estimates

**Main**
3.9 Mt at 5.7 g/t Au, 56.5 g/t Ag, 1.9 % Pb, 3.6% Zn (M+I)

**Yellow-jacket**
1 Mt at 64.1 g/t Ag, 2.8% Pb, 9.1% Zn and 0.2 g/t Au (Ind)

*Image courtesy of Canada Zinc Metals*
*Image courtesy of Huakan Int’l Mining Inc*
Yellow Giant
Banks Island Gold Ltd

- Proposed 200 t/d gold mine
- Procuring equip. and camp to begin test mining in 2013

115,000 Tonnes @ 23 g/t gold (Inf)

Red Mtn.

- PEA updated resource estimate
- Discovery of “Lost Valley” occurrence

1.6 Mt of 8.4 g/t Au, 38 g/t Ag (M+I)

Very active on site in 2012

Image courtesy of Banks Island Gold
Comparing Ordovician VMS deposits of southern Alexander terrane to the great camps of the Appalachians and Norway

Compilation of map data 2009-2011

JoAnne Nelson presentation
Tuesday Public Geoscience Session

GSC (GEMs) – BCGS Partnership (Nelson and Diakow)
Granduc
Castle Resources Inc

- Past producing copper mine
- 17 km tunnel provides access to the underground deposit
- 24 000 m drilled
- U/g development
- New resource est.
- PEA and EA submission expected in 2013

11.32 Mt of 1.5% Cu, 0.17 g/t Au, 12.4 g/t Ag (M+I)
Kutcho Creek Copper Corp

Copper-zinc project
- $213.5 million cap. ex.
- 12 year mine life,
- 2500 t/d; 3 lenses
- LNG power plant

- Baseline data work and eng. in 2012
- Updated mine design
  - Main zone open pit
  - Esso zone u/g

10.4 Mt of 2% Cu, 3.2% Zn, 34.6 g/t Ag, 0.37 g/t Au (Prob)

Image courtesy of Kutcho Creek Copper Corp
Kutcho-Farwell Canyon Correlative Study

- Study of Kutcho equivalent rocks in the Farwell Canyon
- Open File 2012-8 (P. Schiarizza)
Tulsequah Chief
Chieftain Metals Inc

- Proposed Cu-Zn-Pb-Ag-Au mine
  - in final permitting stages
- Feasibility study completed
  - 2000 t/d, 9 year life
  - anticipated construction in 2013
- New corporate MOU sets path ahead

6.45 Mt of 2.3 g/t Au, 81 g/t Ag, 6% Zn, 1.1% Cu, 1% Pb (Prov.)
Nickel
(Ultramafic associated)

Giant Mascot
BC’s only historical nickel mine
Operated between 1958 and 1974
Mined 4.2 Mt of ore averaging
0.77% Ni and 0.34% Cu.
Nickel in ultramafic rocks

Awaruite yielding nickel-iron alloy

Original thinking
- Gravity / Magnetic separation
- No flotation, smelting, ARD

Large drill campaign, res estimate for Baptiste zone

PEA underway

12BAP-41 from 10m to 296.7m grading 0.136% DTR Ni

Serpentinite speckled with awaruite

1197 Mt of 0.113% Ni (M+I)
Turnagain
Hard Creek Nickel

- Sulfide hosted Ni
- Expected conc. grade 18% Ni
- ~ 750 Mt @ 0.215% Ni & 0.135% Co (M+I)

Image courtesy Hard Creek Nickel
BC Component: “Orogenic” Ni-Cu-PGE systems

• Mafic-ultramafic intrusions in orogenic belts

Develop mineral deposit and exploration models for:

• Giant Mascot (1958-74) – BC’s only Ni mine
• Turnagain Alaskan-type intrusion

Geology of the Turnagain ultramafic intrusion, northern

• BC Open File 2012-05 (G. Nixon et al.)

J. Scoates (UBC), G. Nixon (BCGS) & Doreen Ames (GSC)

GSC (TGI4) – BCGS – UBC Partnership
Specialty Metals Project

More than 20 documents published or submitted for publication

• Ore deposits and mineral economics
• Vectoring towards ore deposits
  • Open File 2012-7 just released

George Simandl presentation
Tuesday Public Geoscience Session
Aley
Taseko Mines

Niobium in carbonatite

“World’s largest” undeveloped niobium deposit

Bulk sample taken

Feas. study in 2013

Blue River
Commerce Resources Inc

Tantalum and niobium in carbonatite

7500 t/d u/ground mine considered

Ongoing metall. studies, structural reviews, core re-logging

Albitite-syenite fenite breccia

(Geologist Mercedes Rich)

286 Mt of 0.37% Nb₂O₅ (M+I)

51.8 Mt of 192 ppm Ta₂O₅ and 1490 ppm Nb₂O₅ (Ind.)
Updated Cordilleran Tectonics and Metallogeny (Nelson and Colpron)

Field Trip
- Highland Valley
- Copper Mountain
- Mt Polley
- New Afton
- Endako
- Gibraltar
International Exposure

• British Columbia government profiles opportunities in the province and the global reach of the industry

• Cooperate in trade missions and meet with inbound investors

• We may be able to help you profile your project or company

• Contact the MDO or JTST
Thank You

Come visit us at the BC booth

Ice road developed to mobilize equipment at Brucejack