

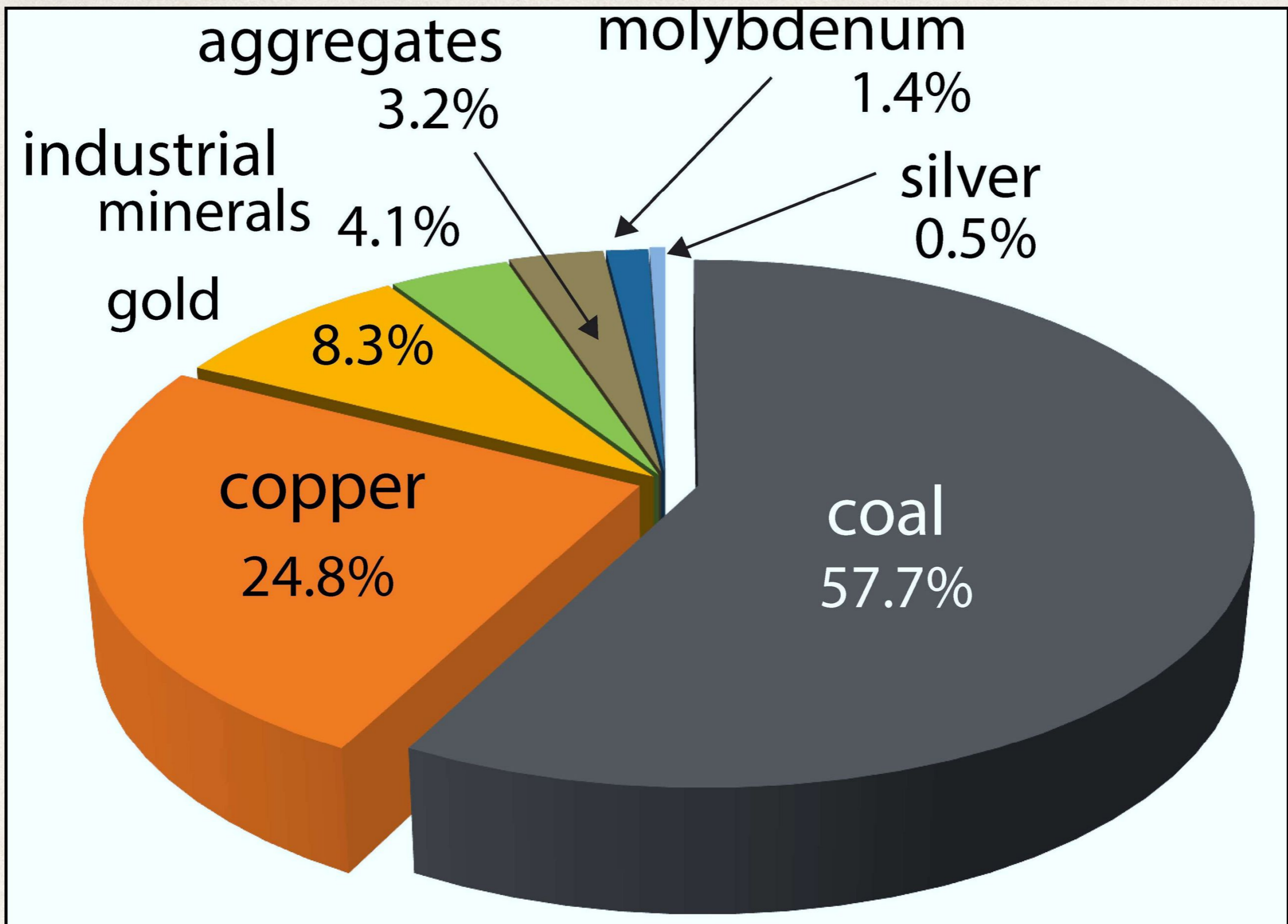


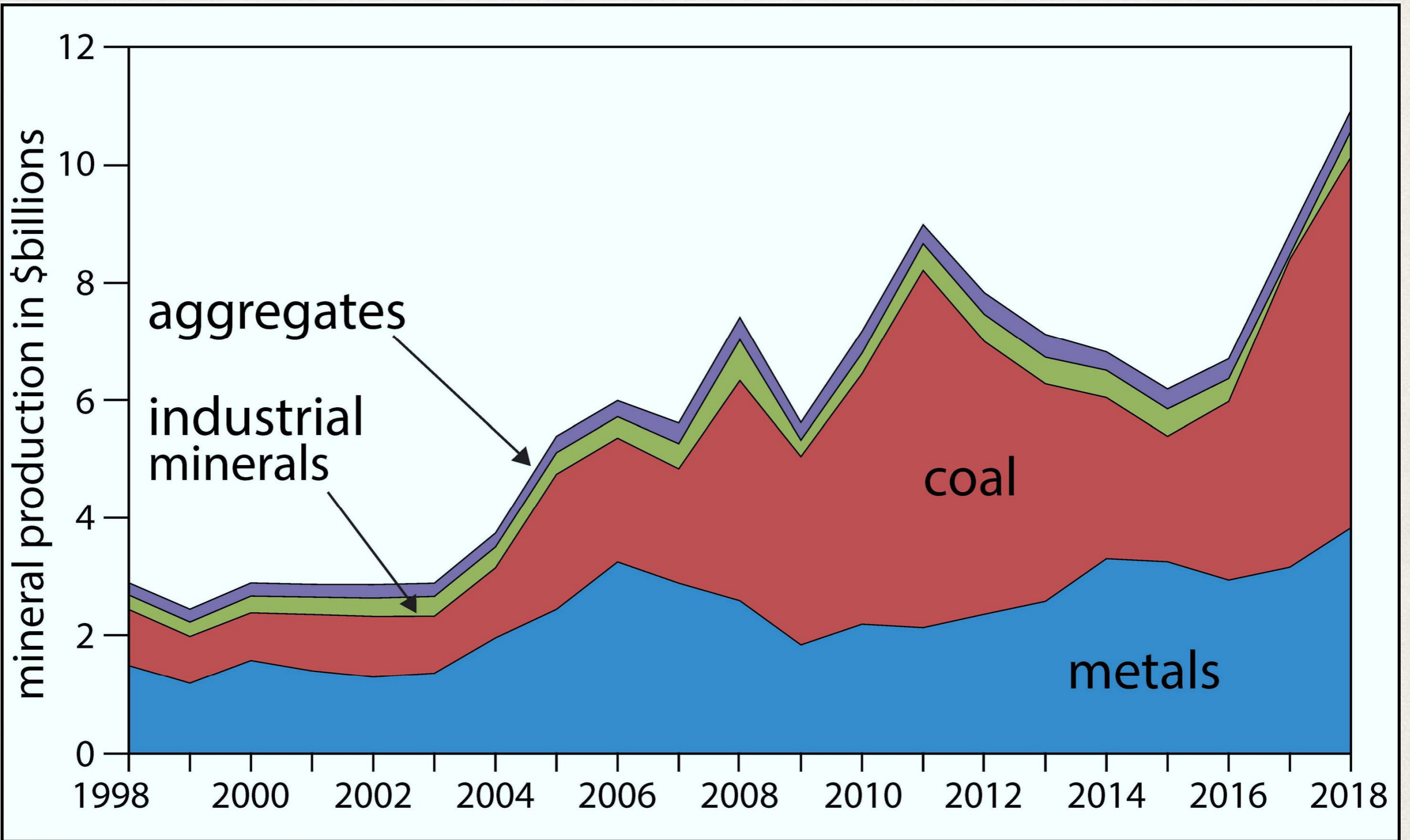
Ministry of  
Energy, Mines and  
Petroleum Resources

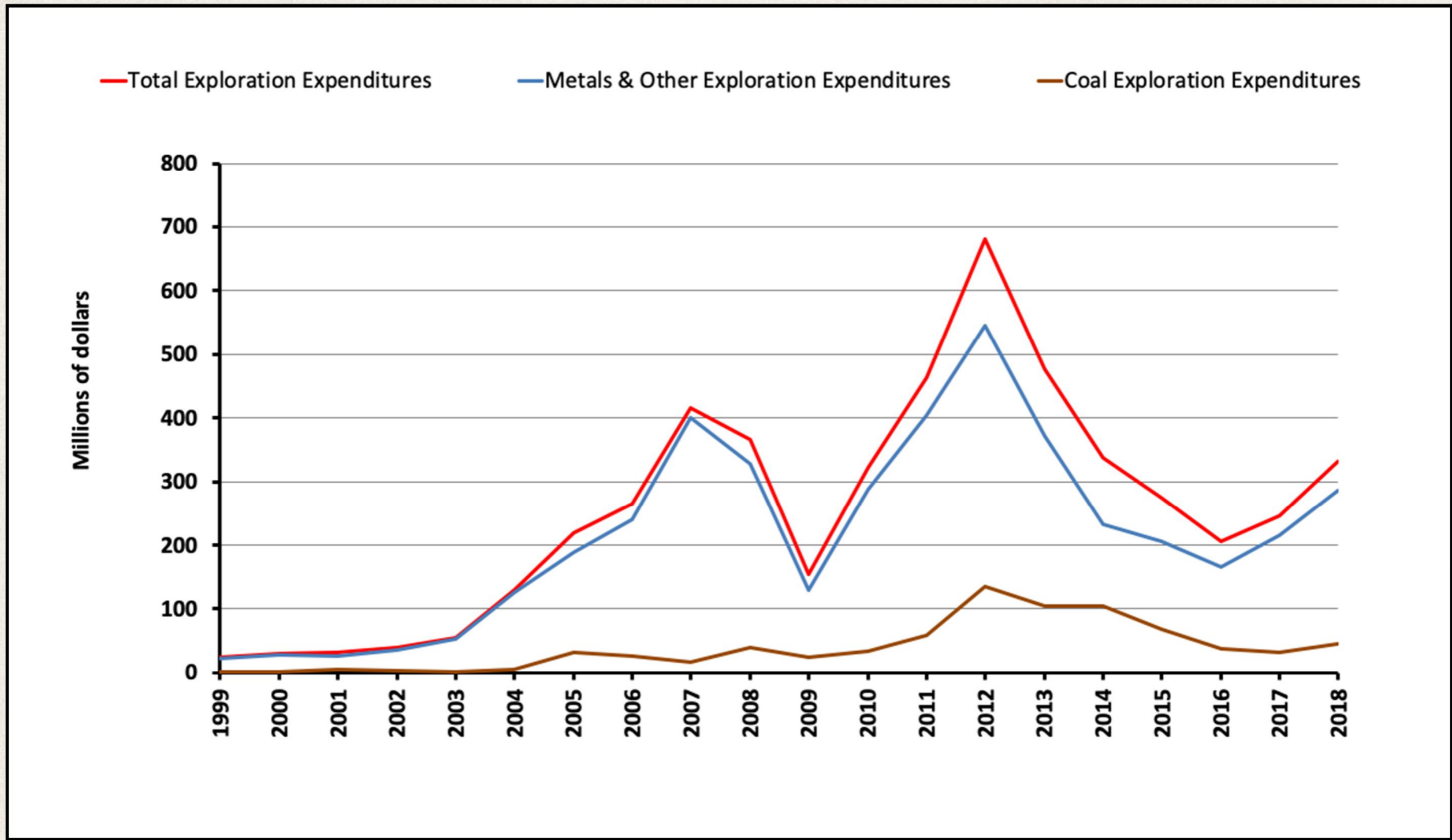
# Exploration and Mining in 2018 North Central and Northeast Regions British Columbia

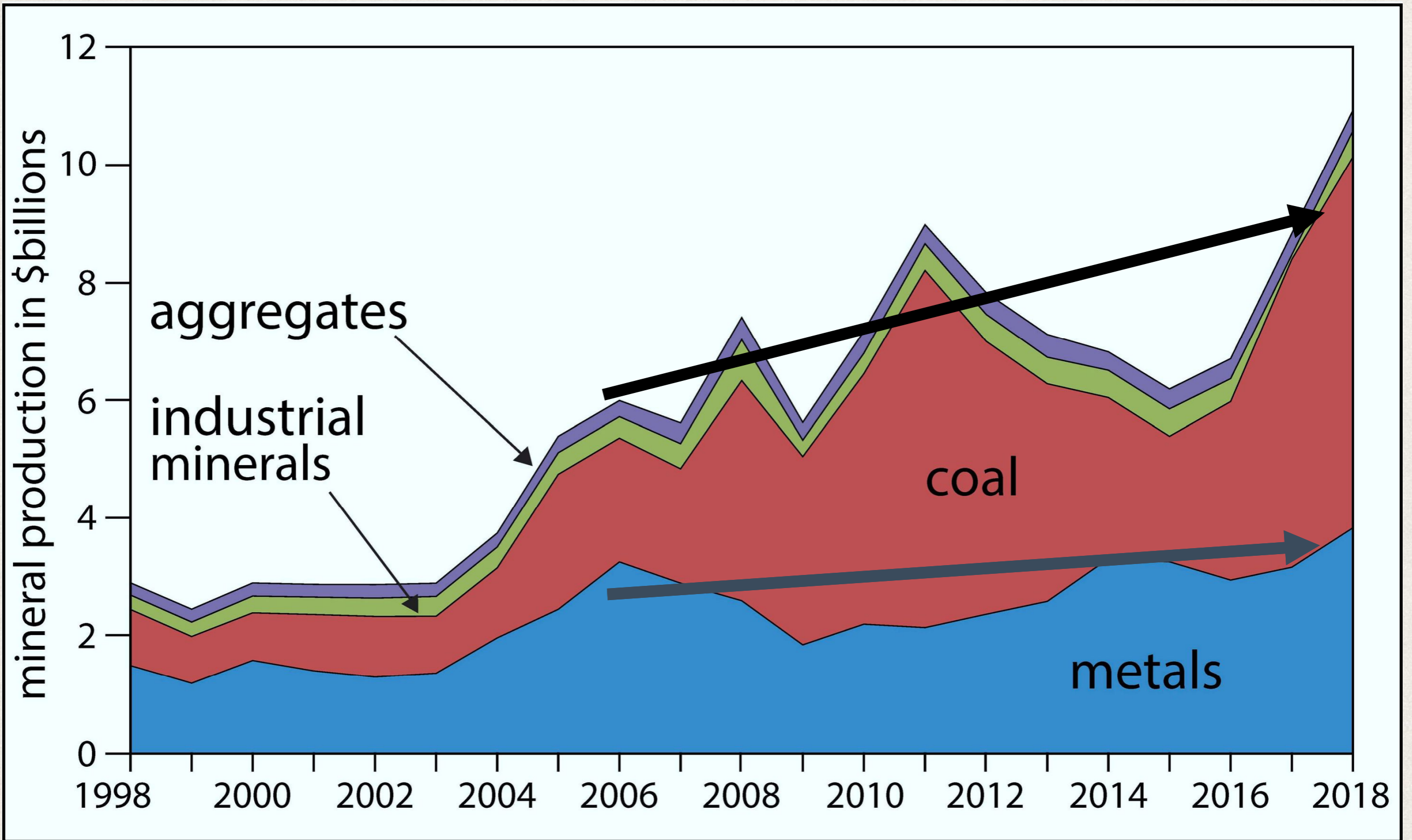
**John DeGrace, M.Sc., P.Eng./P.Geo.  
Regional Geologist, North Central and Northeast  
Ministry of Energy, Mines and Petroleum Resources**

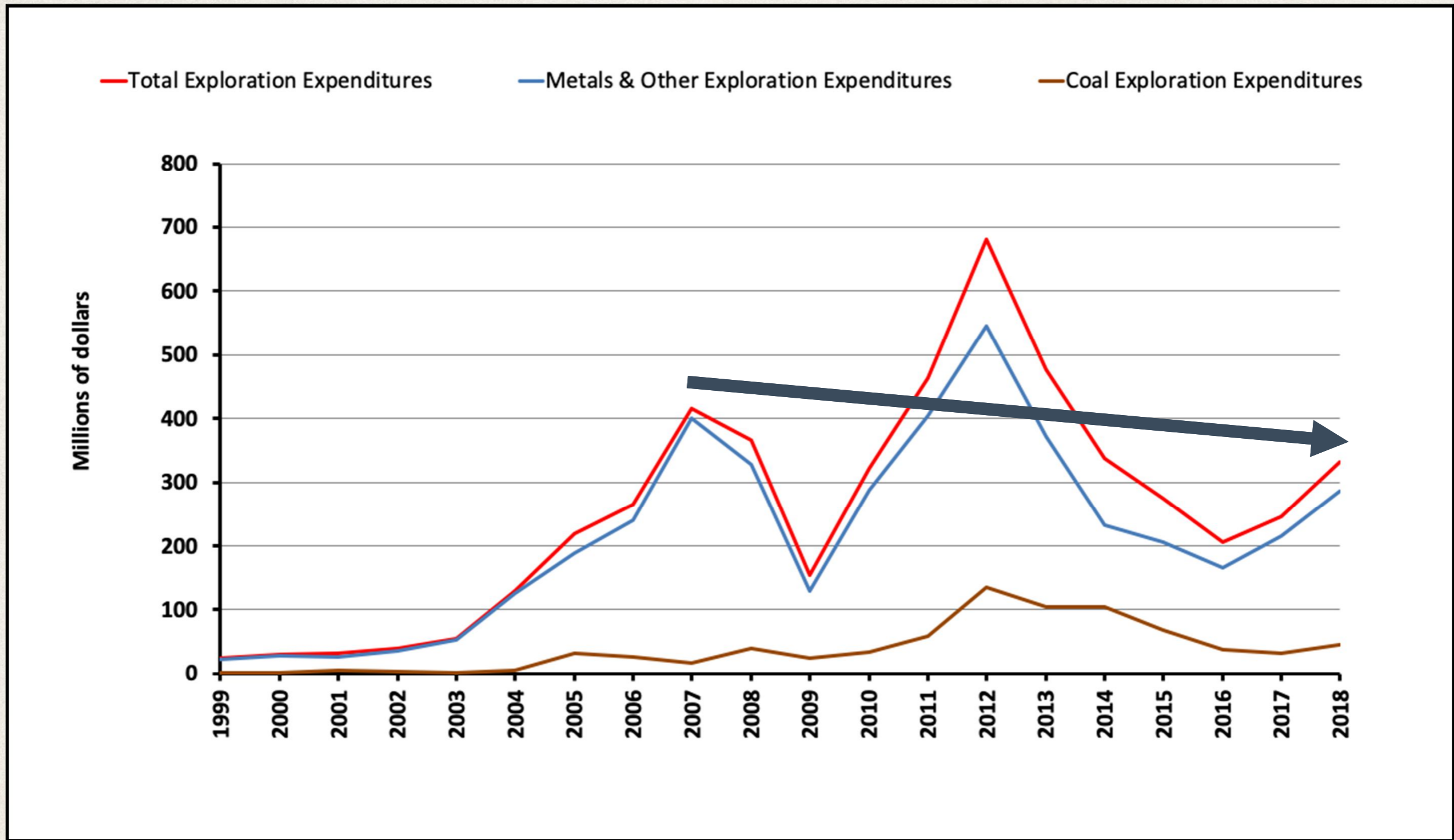


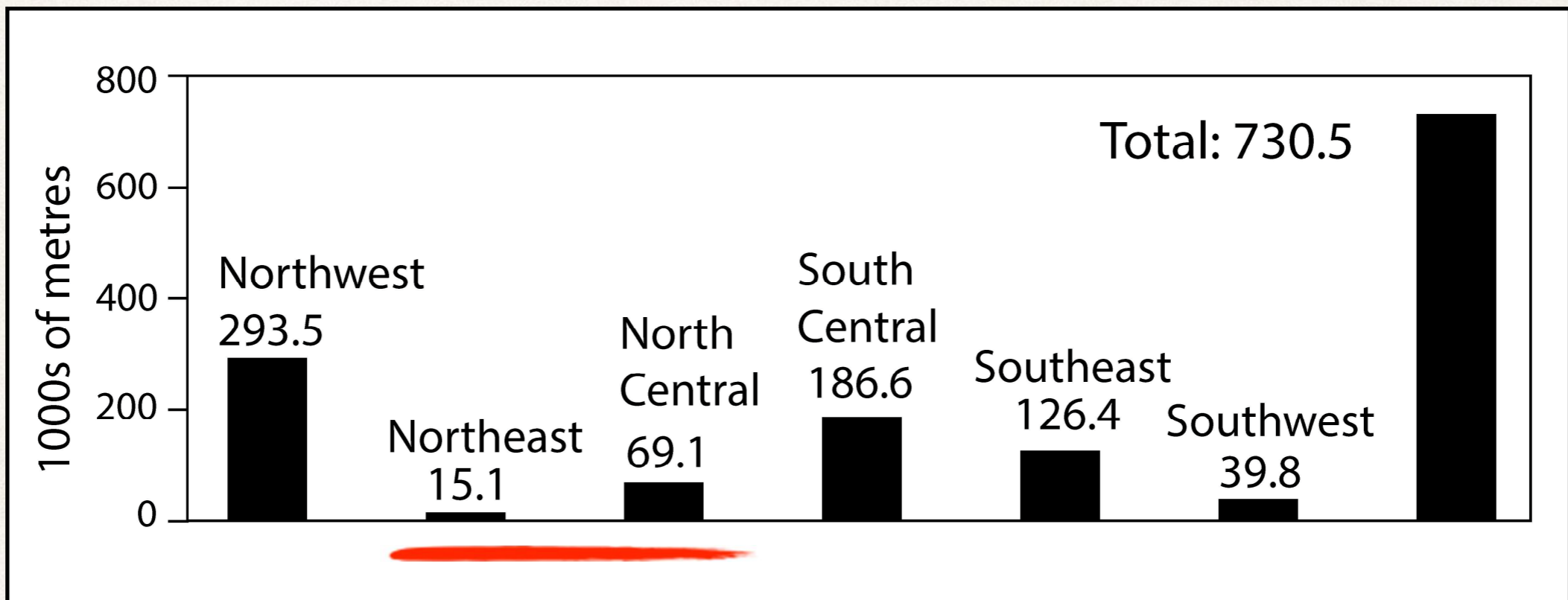
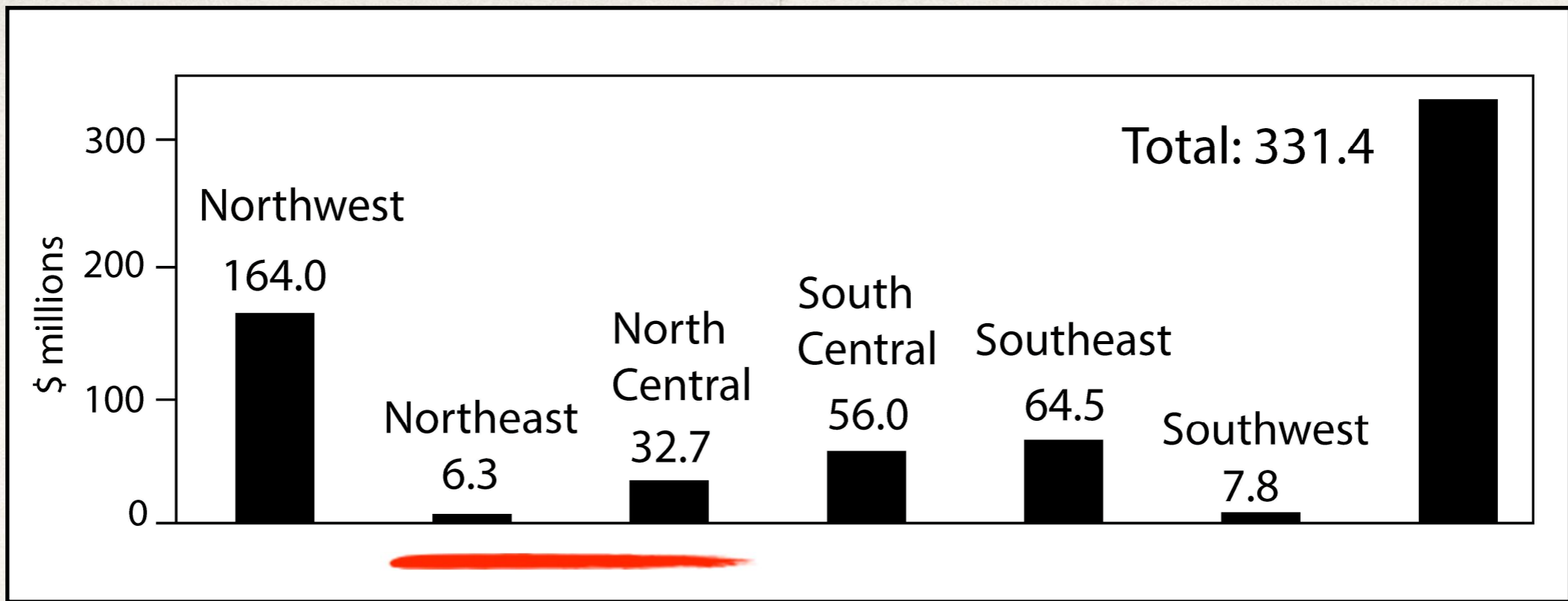




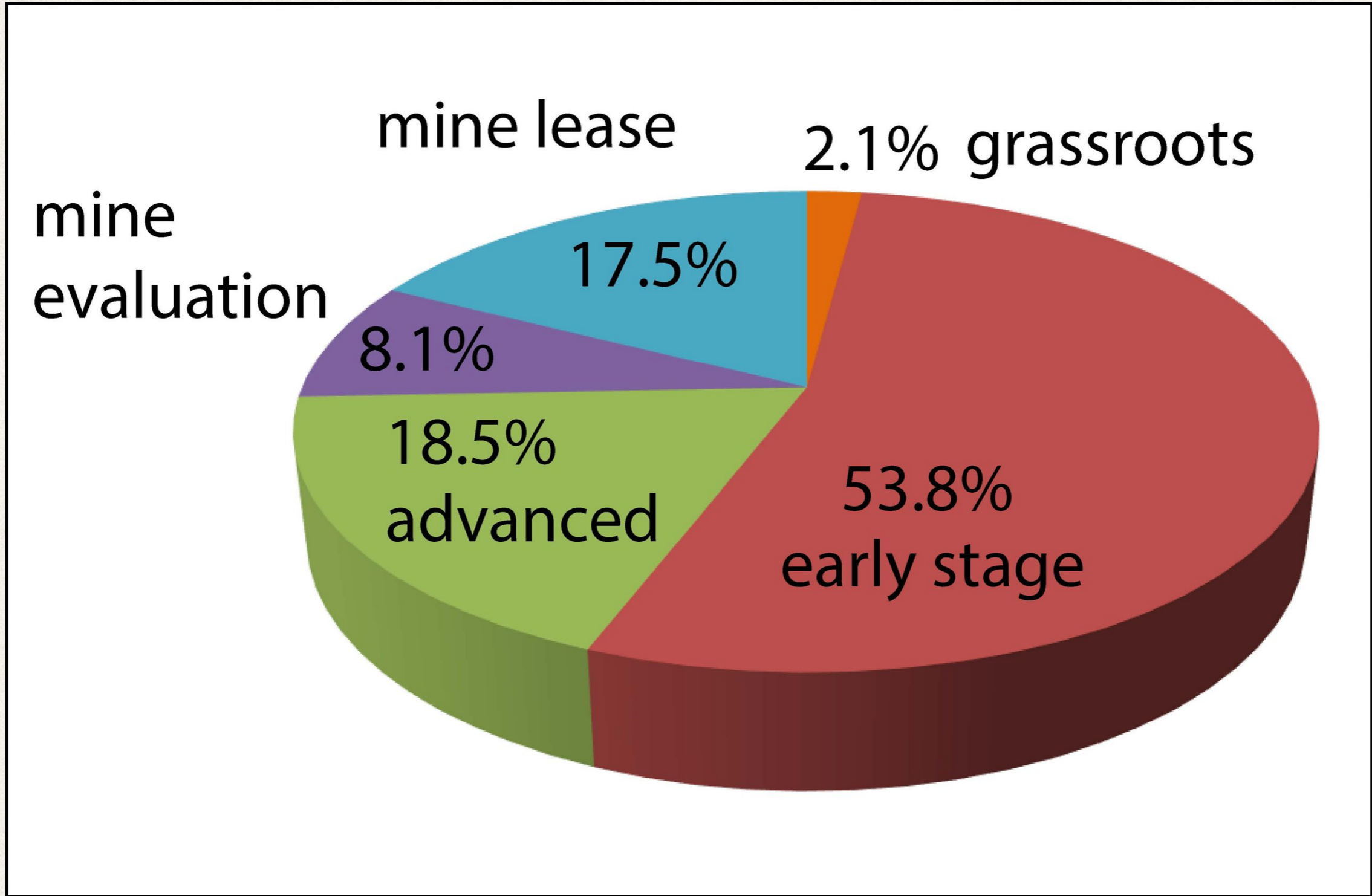


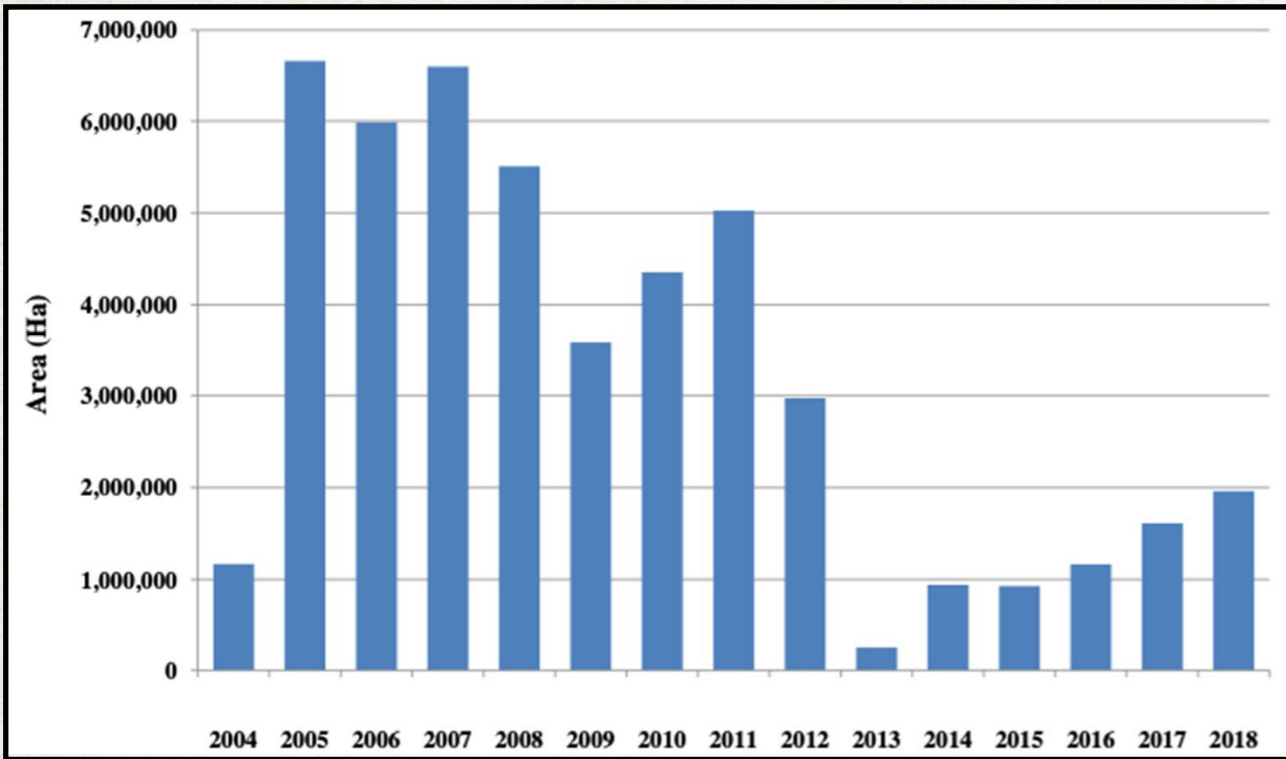






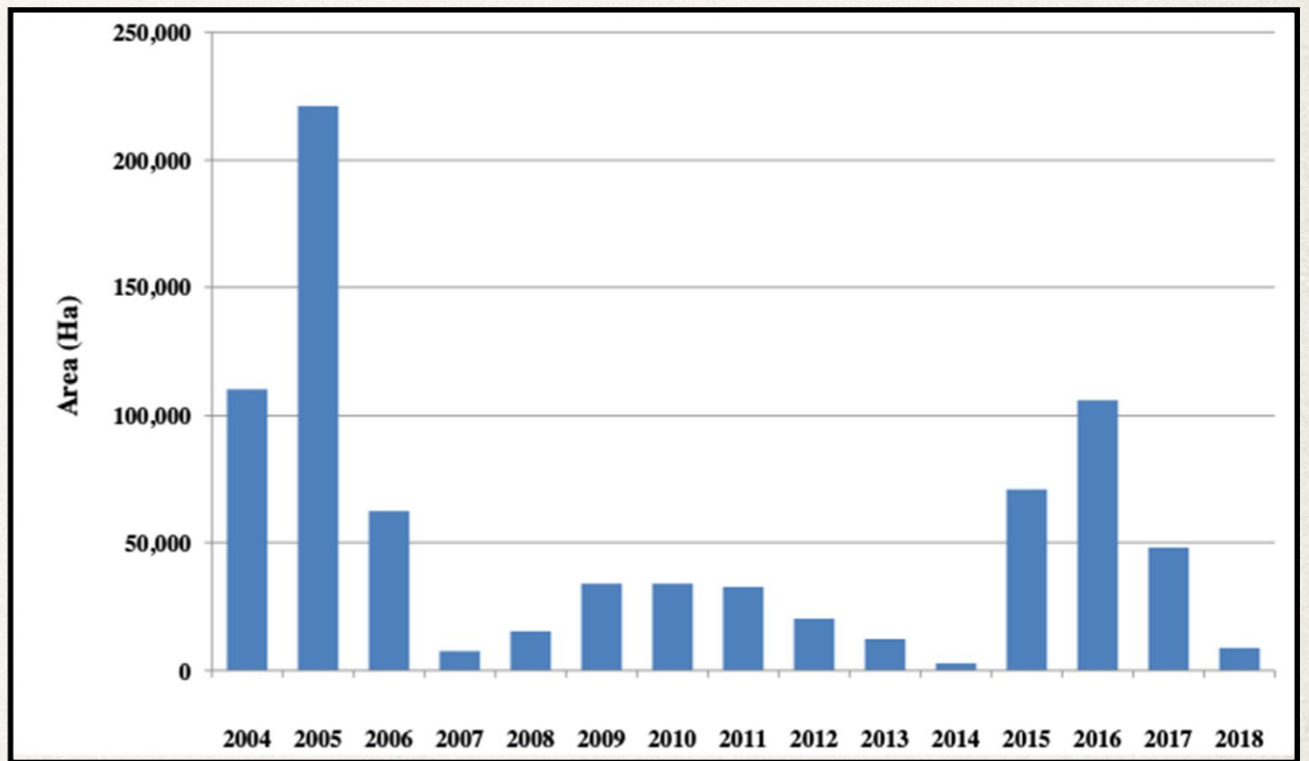




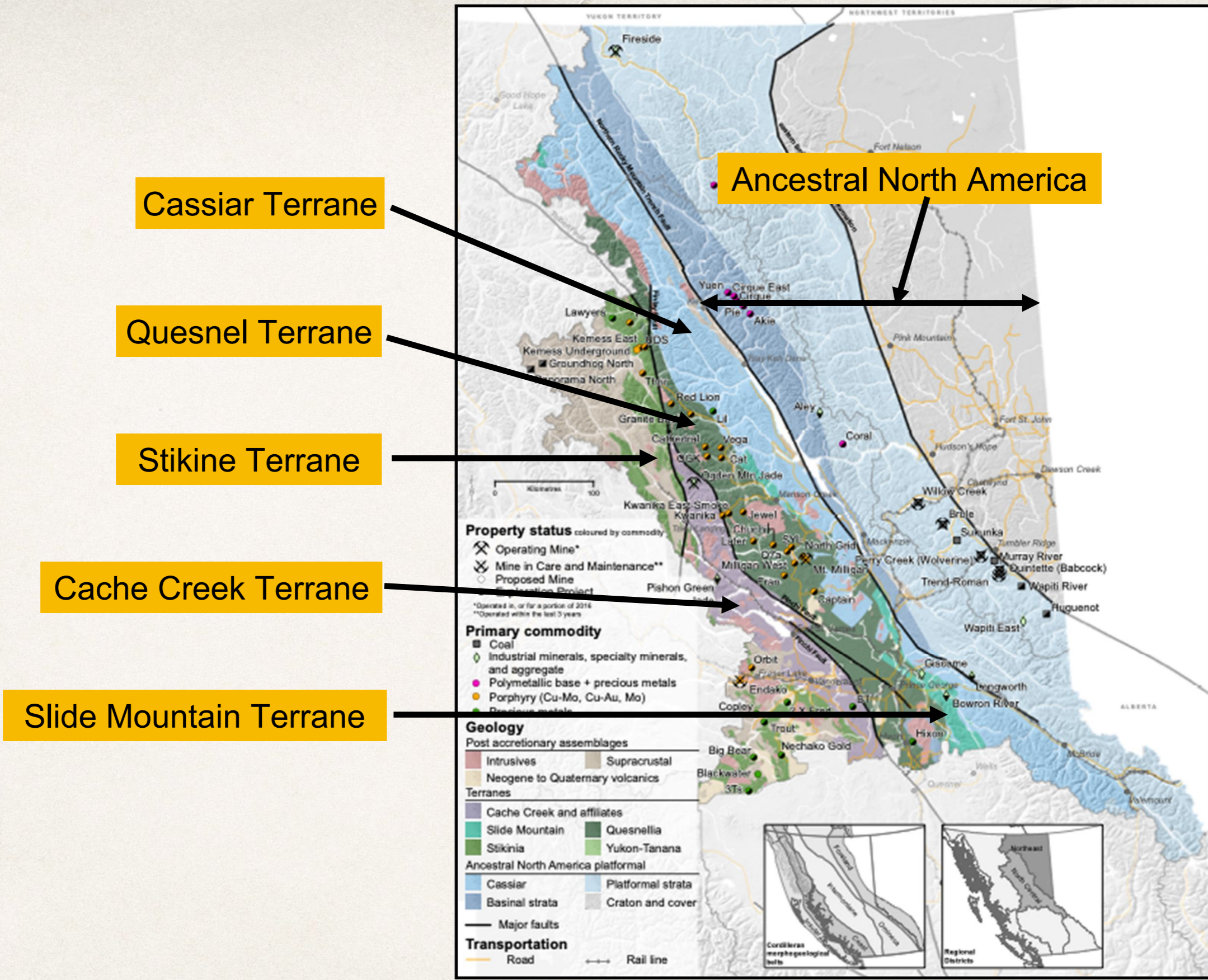


Minerals

Coal



# New Mineral Tenures and Coal Licences

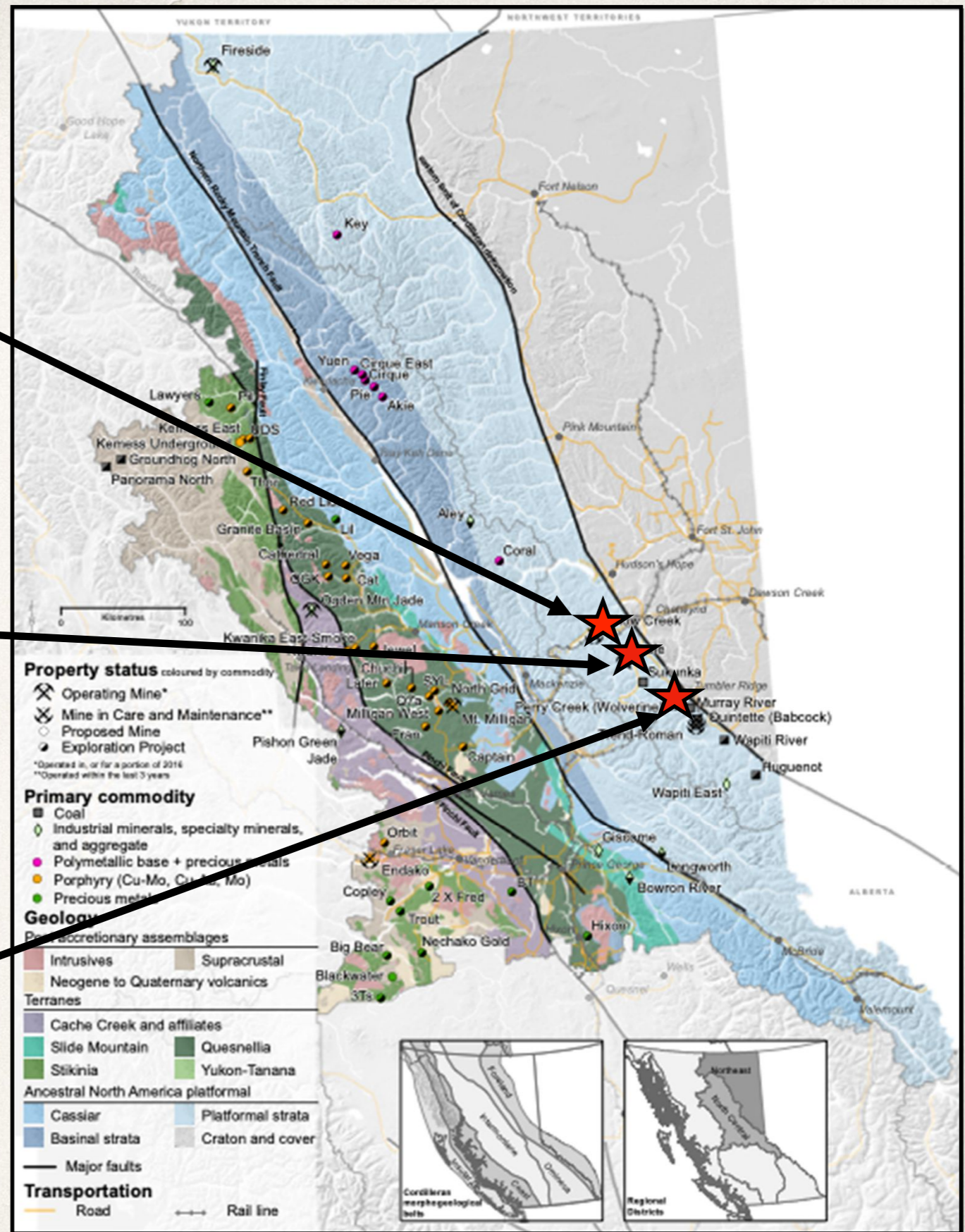


# North Central and Northeast BC Terrane Map

Willow Creek Mine

Brule Mine

Wolverine Mine



# Willow Creek Mine

(Conuma Coal Resources Limited)



Wash plant

- Re-opened in July 2018
- Expected production in 2018: 482,000 tonnes (1.5 Mt/year when at full production)
- 2018: major mine-site drilling program to extend the coal resource: 37 drill holes (rotary and diamond), total 4703 m



Mining activities



Loading waste rock



Stripping coal; folded beds in background

# Brule Mine

(Conuma Coal Resources Limited)

- Reopened September 2016
- In 2018, 2,476,000 tonnes production
- Coal transported to to Willow Creek wash plant
- Major on lease drill program started November 2018: about 40 rotary boreholes total 8,000 m, 8 diamond boreholes total 1,200 m

# Wolverine mine

(Conuma Coal Resources Limited)



Dumping waste in mined-out area, “J” seam in background

- Reopened January 2017
- In 2018, 1,892,000 tonnes production
- In-pit drill program planned: initially about 4 diamond boreholes to prepare for underground mining



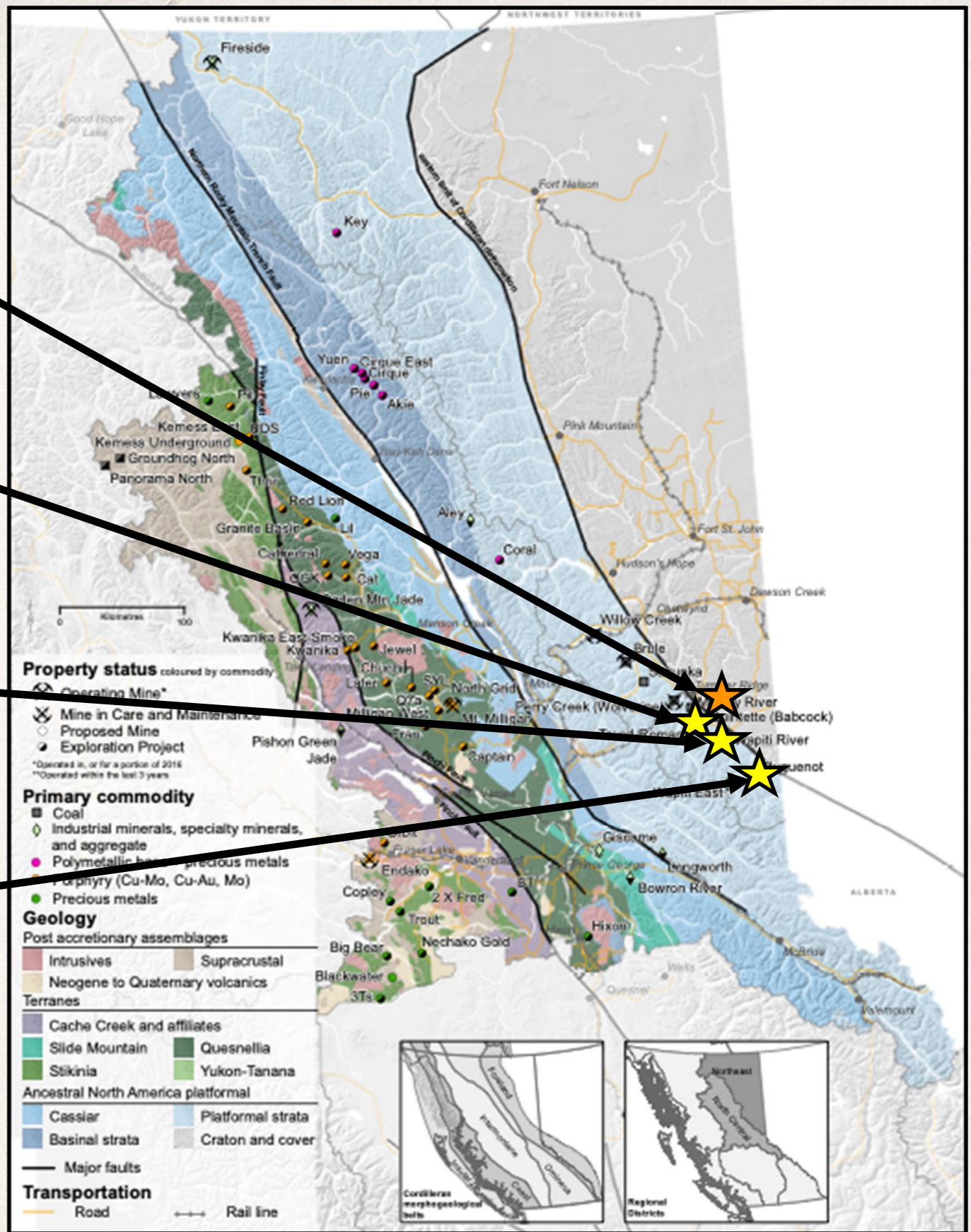
Examining the “J” seam

Murray River

Hermann

Flatbed (Gordon Creek)

Huguenot

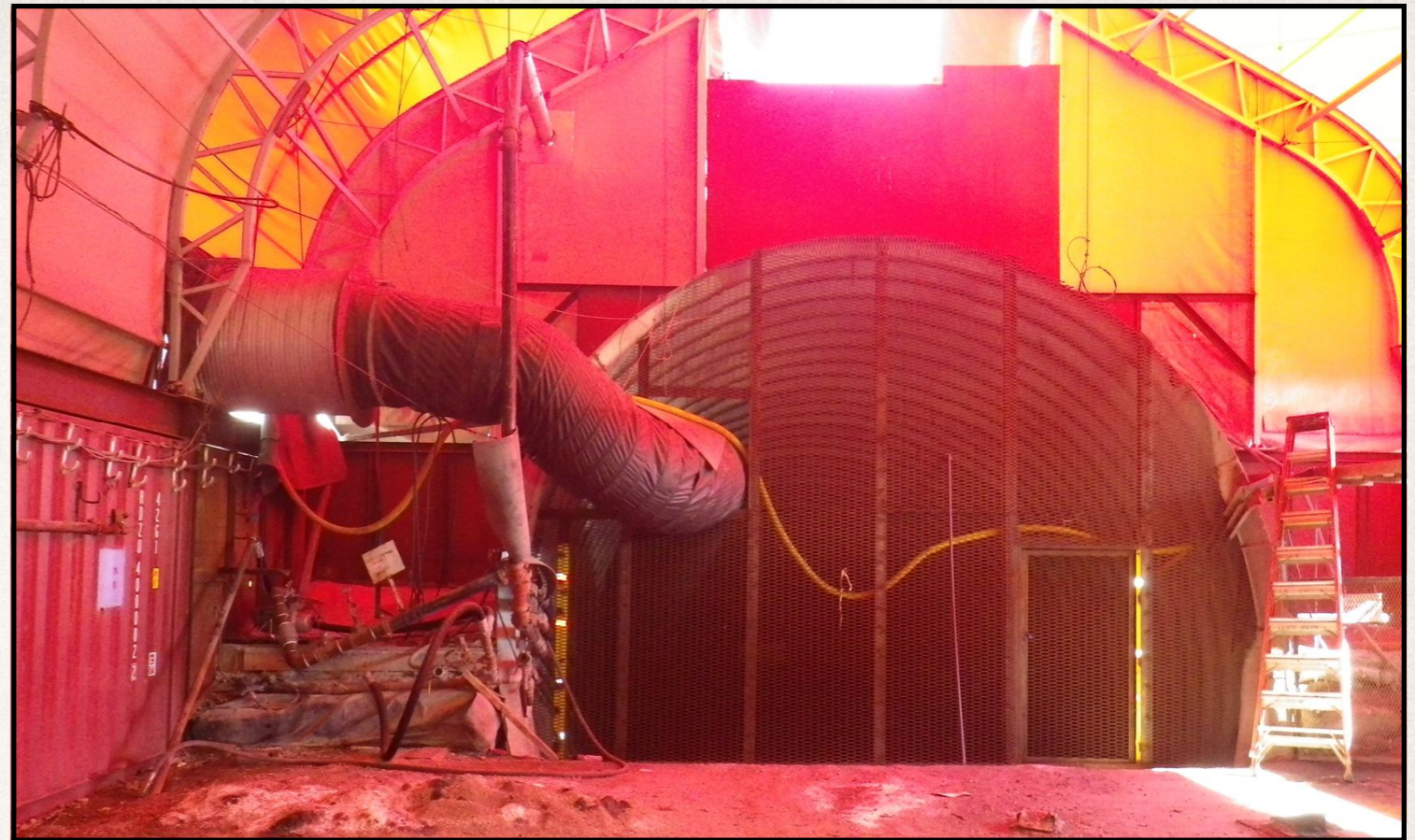




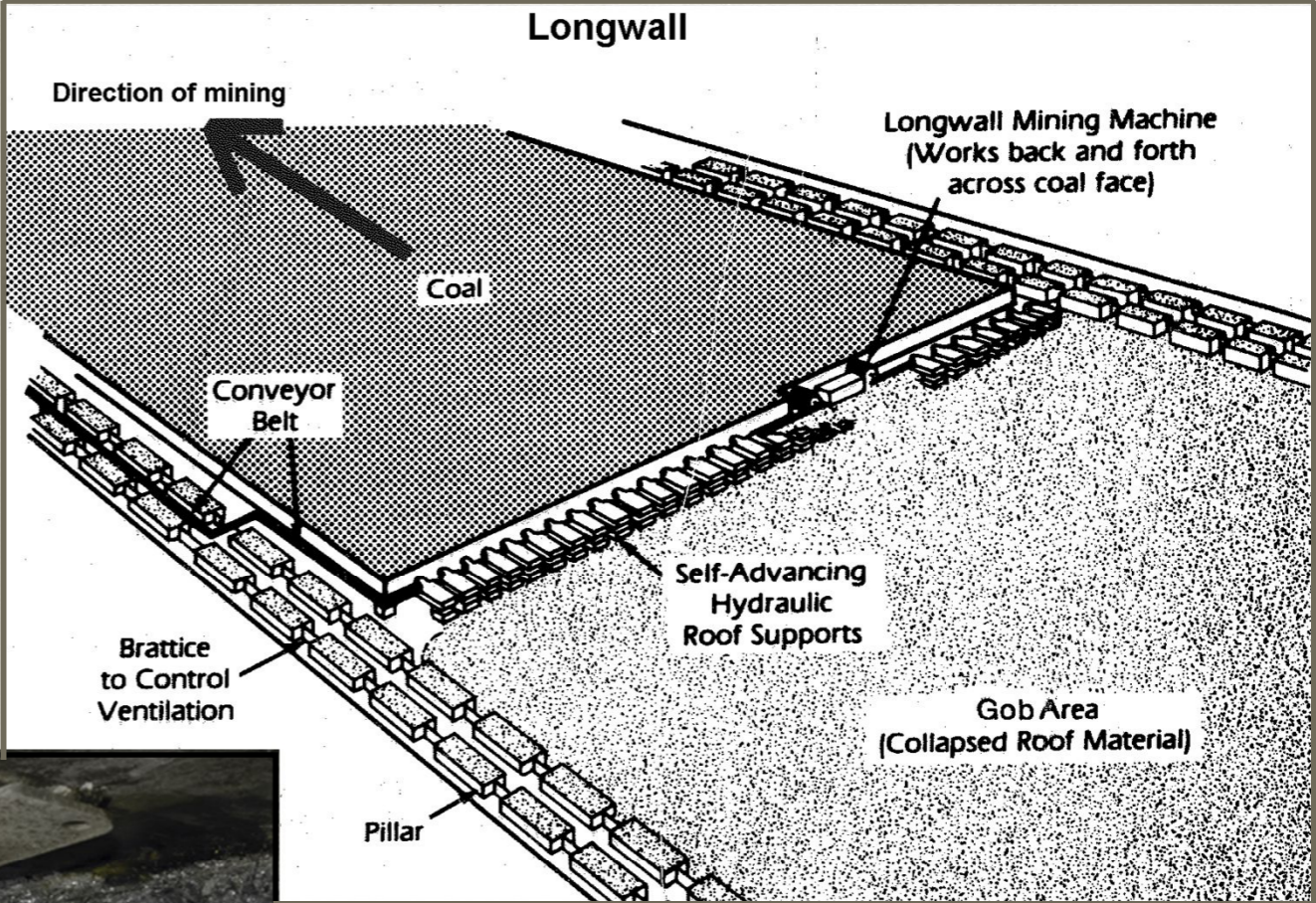
# Murray River

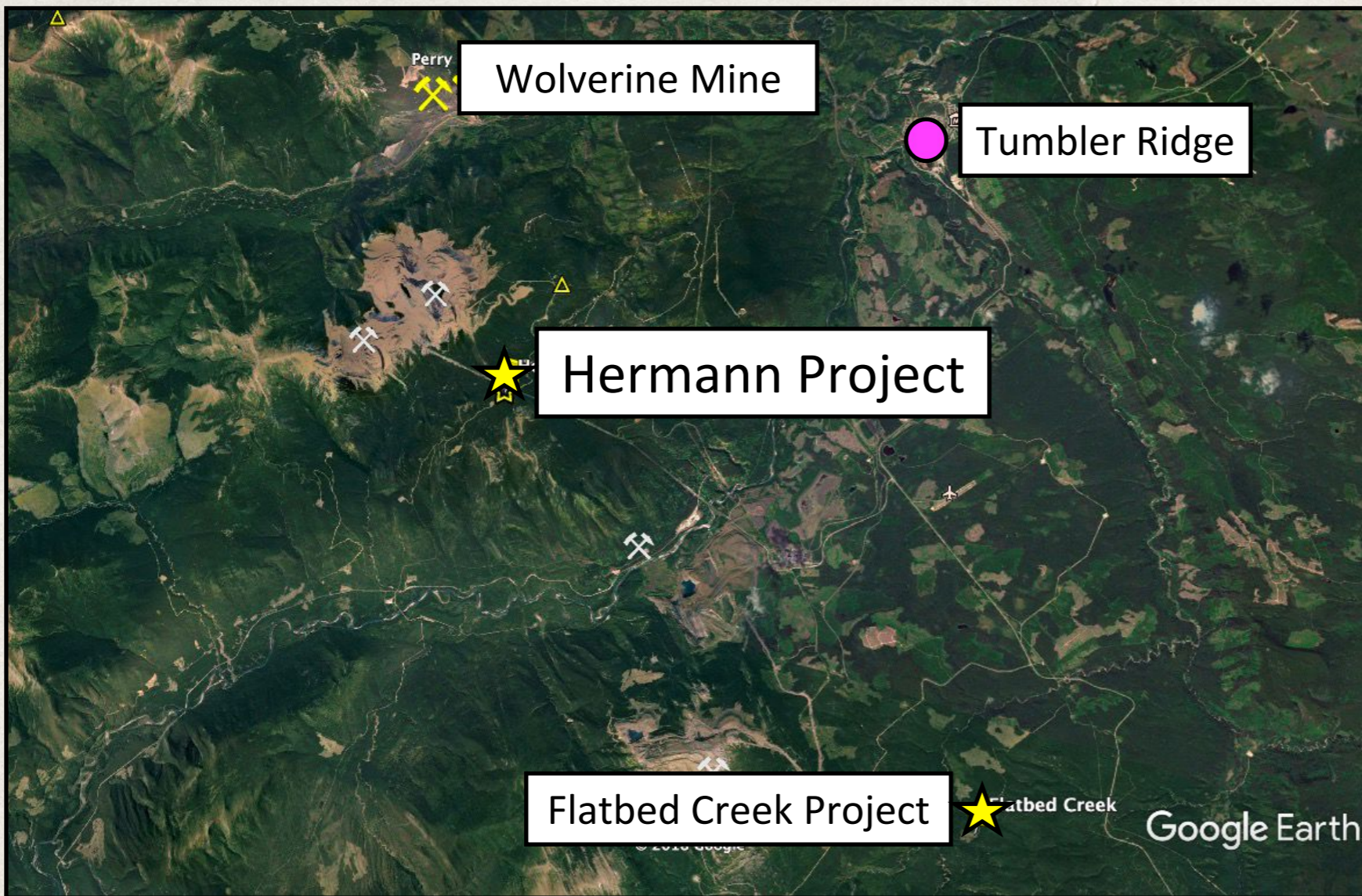
(HD Mining International Ltd.)

- Mine Permit April, 2018
- Will construct own wash plant, use existing rail lines
- Projected to produce 6 Mt/yr, 25 year mine life
- 756 direct jobs, initially all Chinese with longwall experience, transitioning to Canadian over 10 years
- Methane production an issue



# Longwall Mining

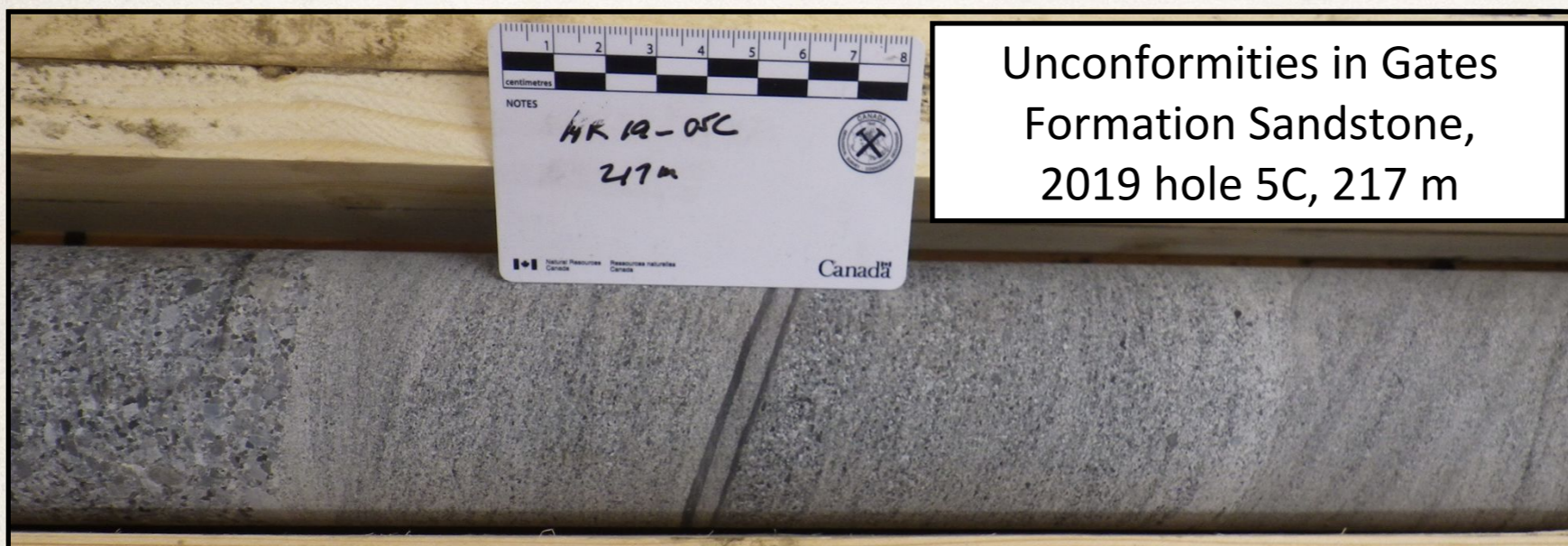




# Hermann

(Conuma Coal Resources Limited)

- Proposed open pit mine, 08. -1.1 Mt/yr over 10 year mine life.
- In Gates Fm basinal structure
- EA Certificate granted 2008, later extended to 2018
- March to May 2019: 22 drill hole program
- Ideally, would begin mine development by end 2019

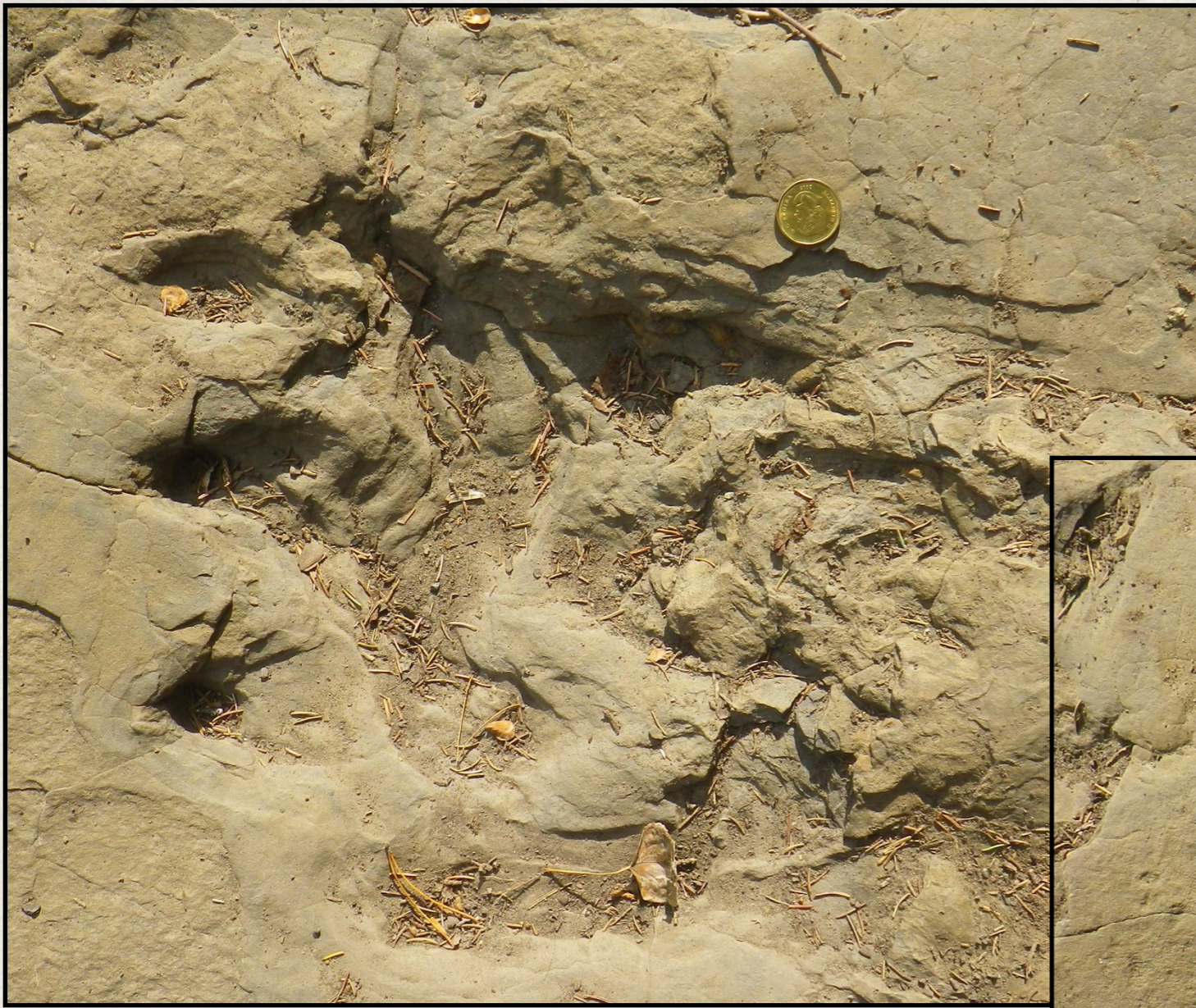


Unconformities in Gates Formation Sandstone, 2019 hole 5C, 217 m

# Flatbed (Gordon Creek) and Huguenot (Colonial Coal International Corp.)

- Preliminary economic assessments issued for both in 2019:
- Gordon Creek - underground mine, 57.4 Mt clean coal over 30 year mine life
- Huguenot - combined open pit and underground, total 266 Mt over 31 year mine life





← him standing...

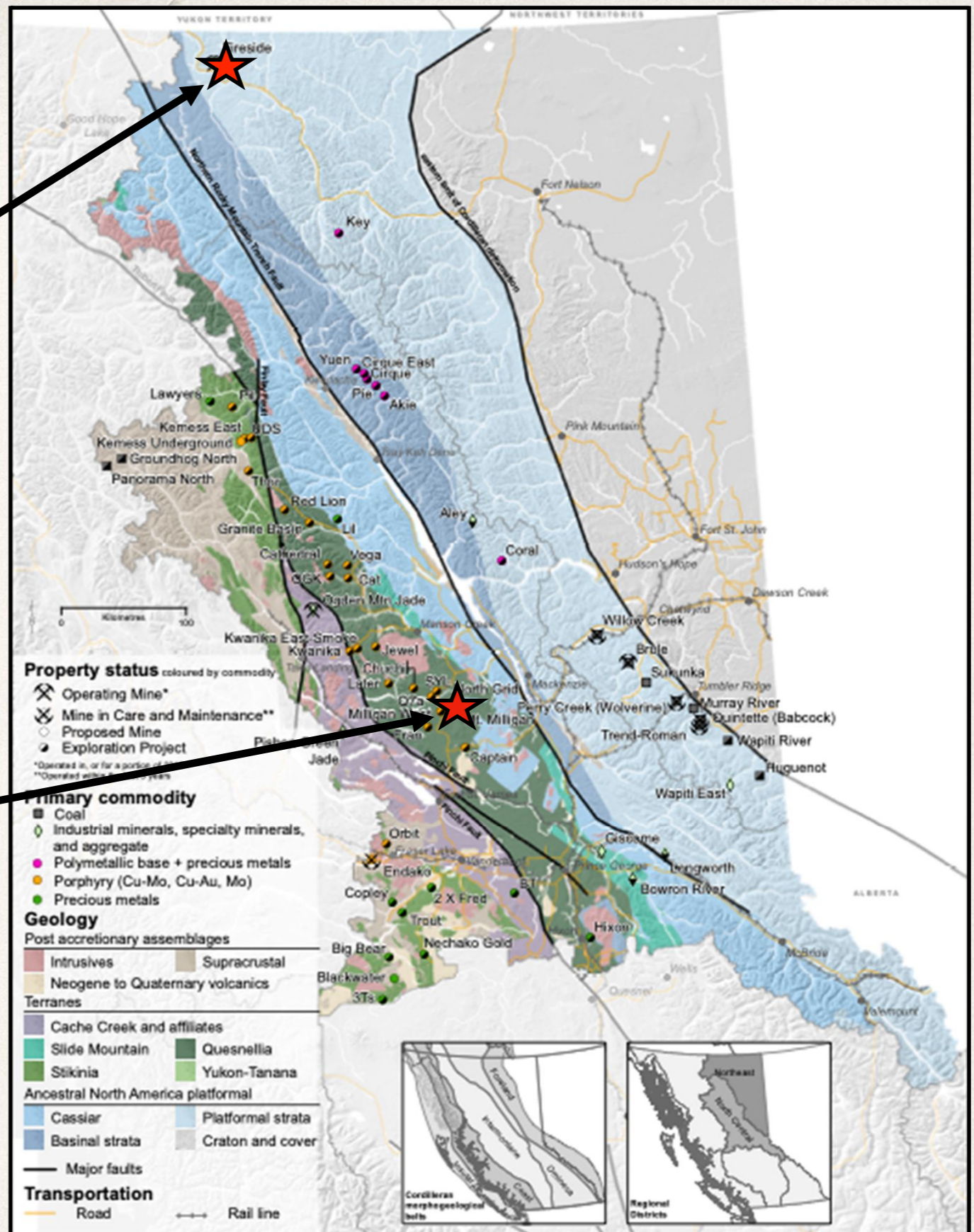


...and him running →

A brief aside on life in the Cretaceous:  
a Tyrannosaurid...

Fireside Barite

Mt. Milligan





## Producing mine (small): Fireside Barite (Fireside Minerals Ltd.)

- Produces barite (barium sulphate,  $\text{BaSO}_4$ ) to make drilling mud
- Used in the petroleum industry because it is denser than the enclosing rock and prevents “blowouts”
- Producing since 2000, and 30,000 tonnes in 2018

# Producing mine (large): Mt. Milligan

(Centerra Gold Inc.)

- Began operation in 2013
- Acquired by Centerra Gold in 2016
- Measured + indicated resource 243.9 Mt at 0.134% Cu and 0.226 g/t Au
- In 2018: near-pit infill and expansion drill program - 52 holes and 19,250 m to add to resource, 22,500 m planned for 2019
- Water supply problems (since mitigated) led to reduced 2018 production
- In 2018 produced 729,556 ounces Au and 47.1 million lbs Cu



Moving ore from “Phase 3” mining area



Mt. Milligan concentrator, tailings ponds in background

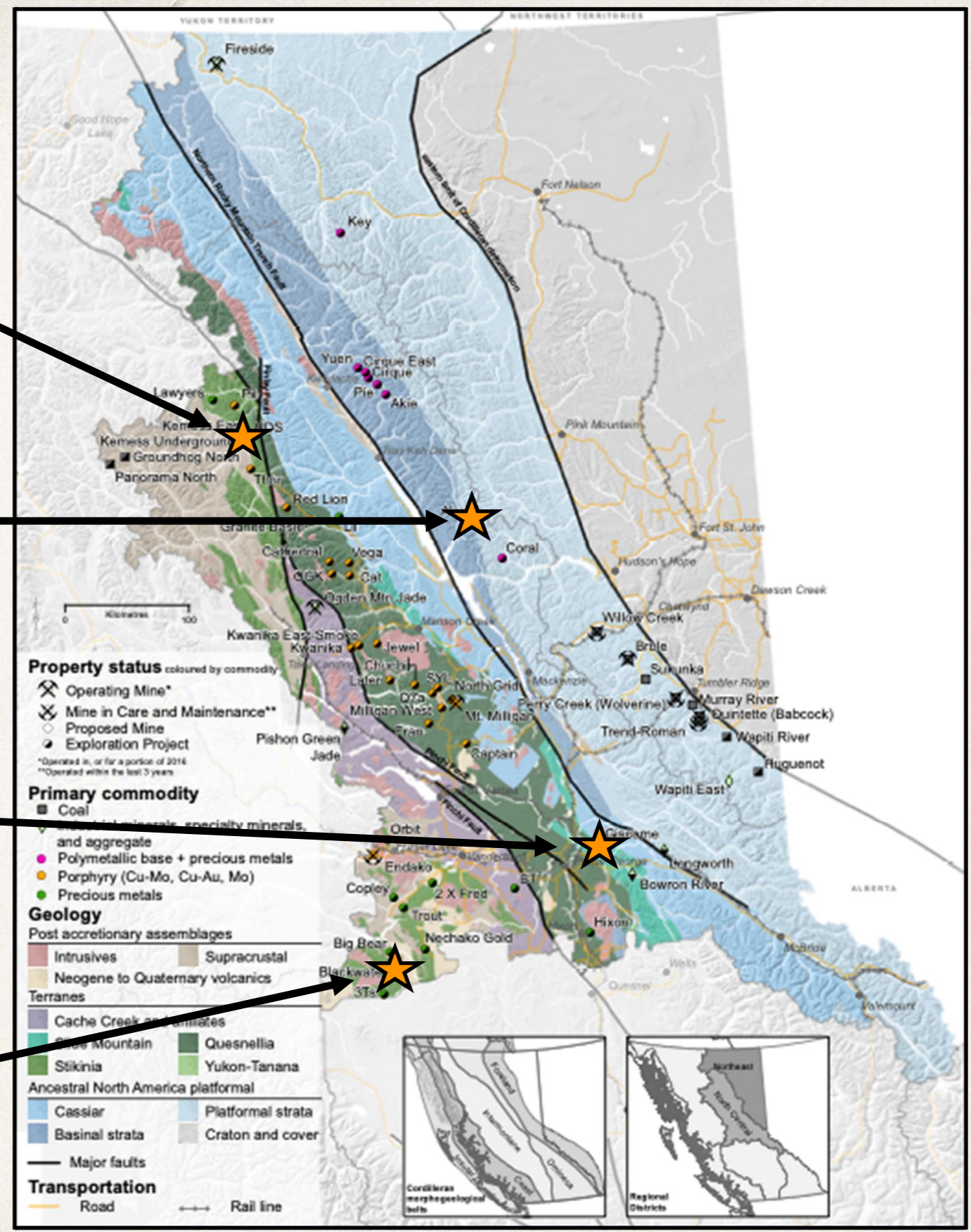


Kemess Underground

Aley

Giscome

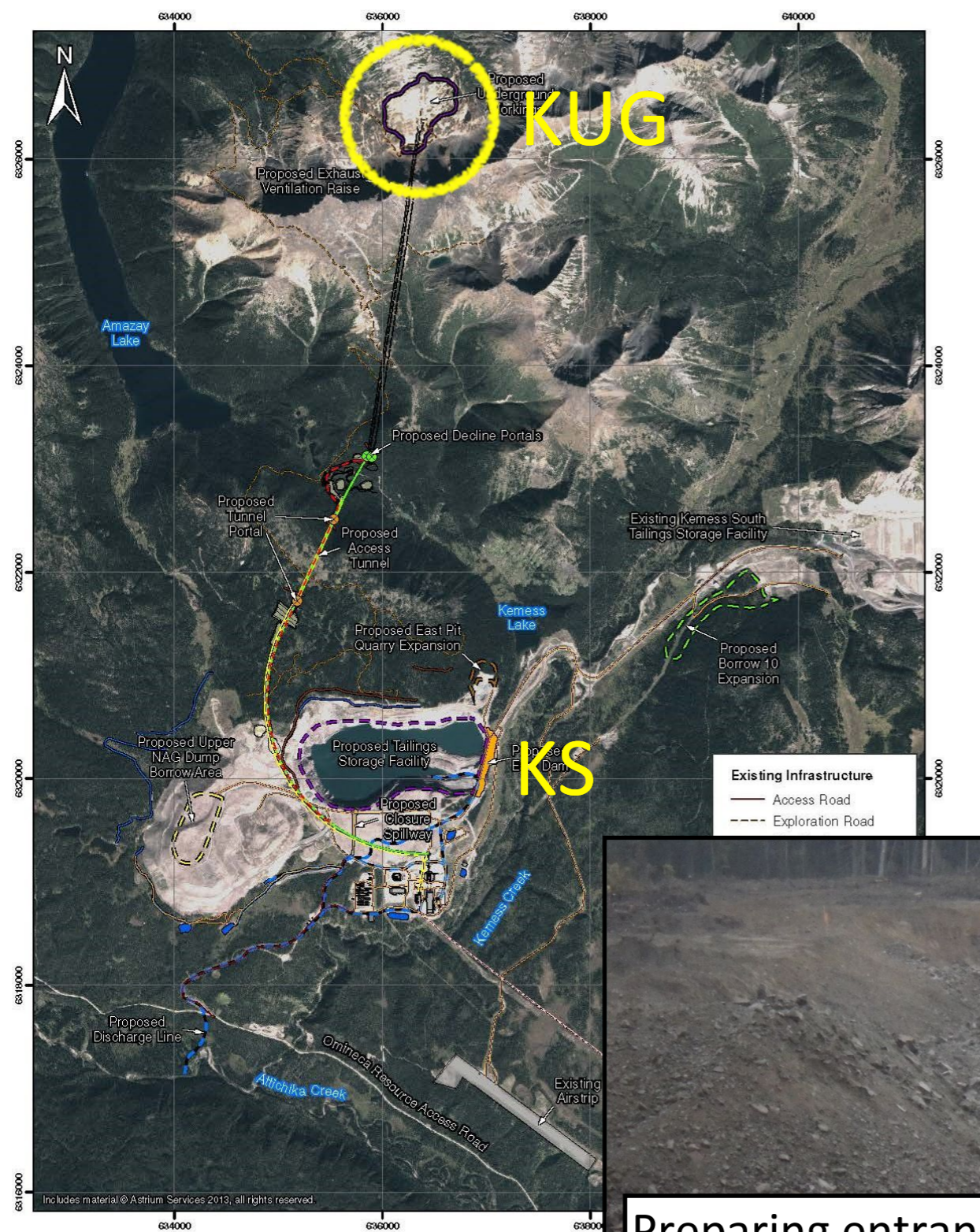
Blackwater



# Mine Development

# Kemess Underground (KUG) (Centerra Gold Inc.)

- Mines Act approval received July 2018
- Will access KUG from Kemess South, and use KS facilities
- Probable reserves of 107.4 Mt containing 629.6 Mlbs Cu, 1.9 Moz Au
- 475 jobs when up-and-running
- But: corporate decision in late 2018 to suspend development in favour of mine in Kyrgyz Republic and solution to water supply issue at Mt. Milligan



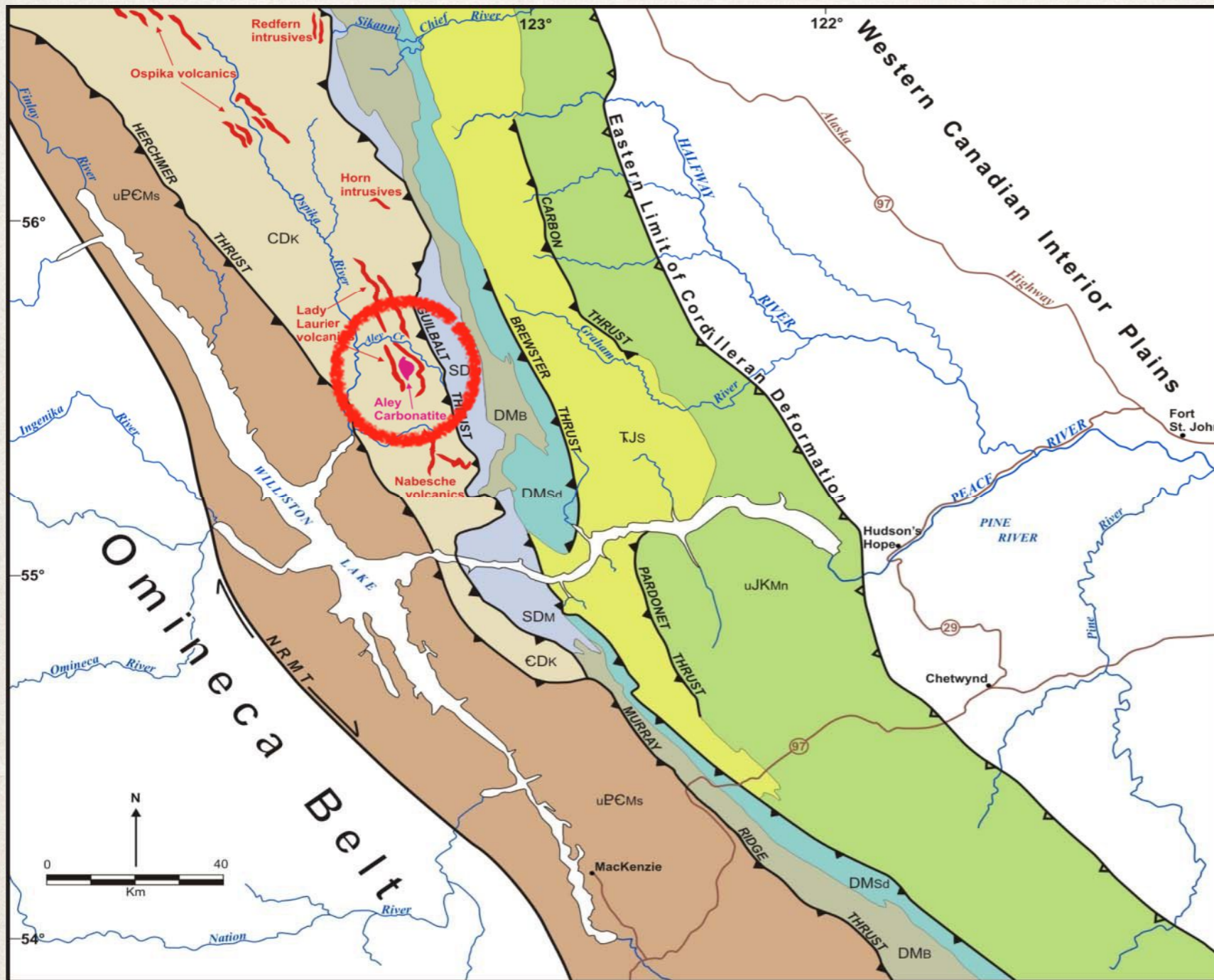
Preparing entrance to south mine portal

Built in the 1980s, 60 tonne limit → 30 tonne in 2017 → 5 tonne in 2018 → possible closure in 2019. But, since 2018, Centerra will look after Attycelly, others active to the north will share the

cost with Sable Resources.



# Aley (Taseko Mines Limited)



- Among the world's largest niobium deposits, 84 Mt proven + probable reserve @ 0.50% Nb<sub>2</sub>O<sub>5</sub>
- Used mostly and an alloy to harden steel
- 2018: 24 drill holes, total 2,700 m - inside previously-previously-drilled perimeter, for metallurgical testing
- Updated technical report in progress

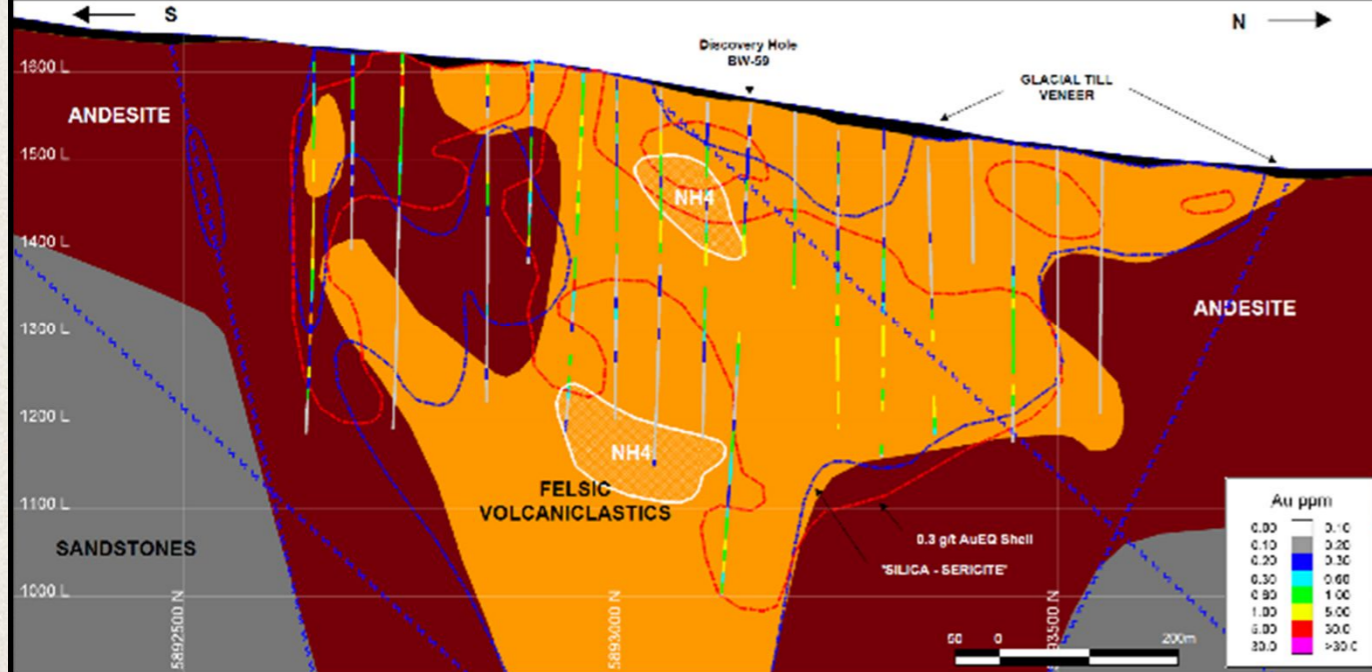
# Giscome Quarry and Lime Plant (Graymont Western Canada Inc.)

- High-purity limestone deposit southeast of Giscome
- Over 100 Mt deposit, producing 600,000 t/y
- Vertical lime kilns to be constructed at Giscome CN Rail load out, shipping 198,000 t/y of lime
- 50+ year project life, startup in 2020(?)



# Blackwater (New Gold Inc.)

## North-south cross-section



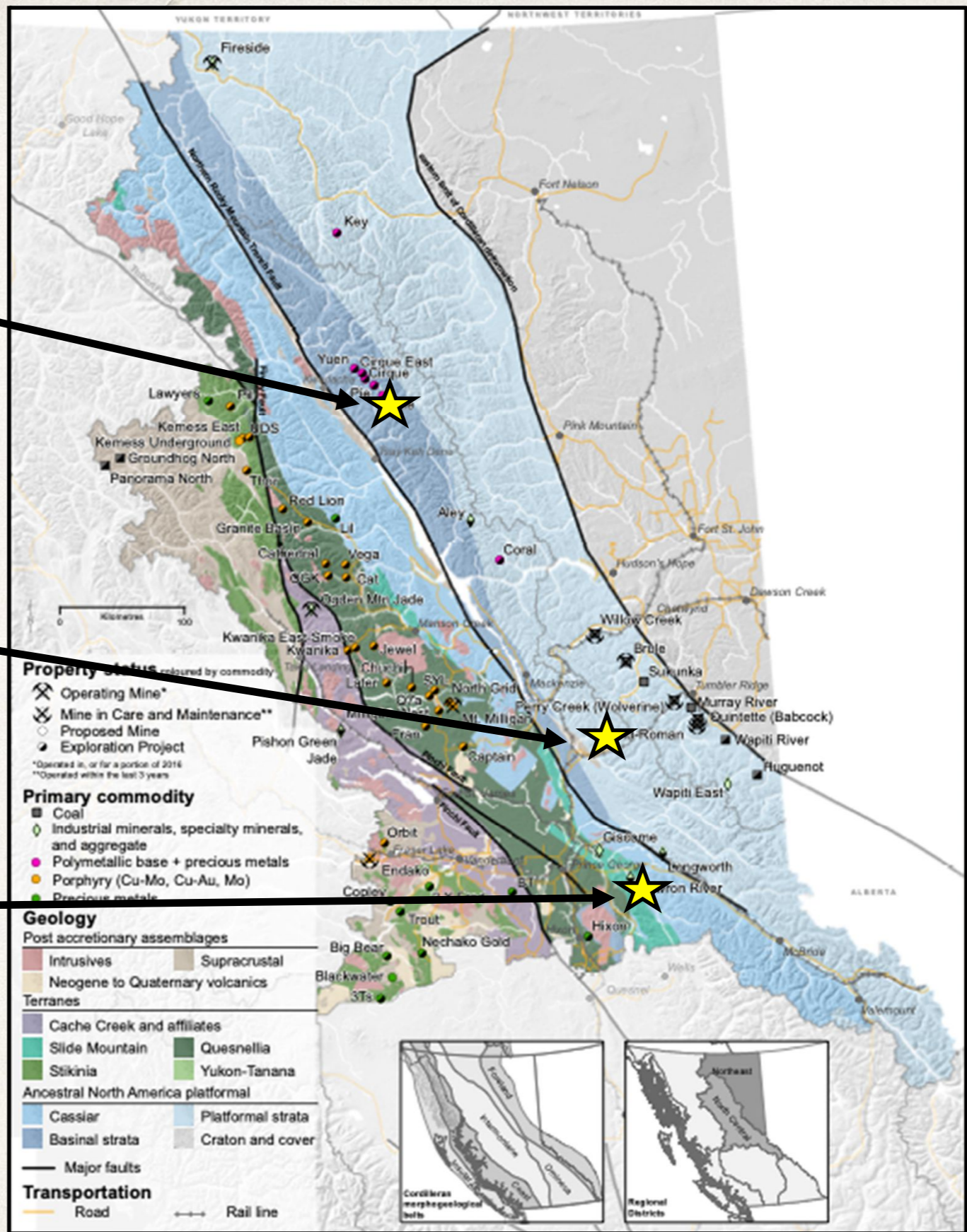
Area over ore body, cleared for drilling

- Gold deposit, hosted by volcaniclastic rocks
- Proven reserves 124.5 Mt @ 0.95 g/t Au and 5.5 g/t Ag
- Planned as a 60,000 t/d operation, 17-year mine life
- 30-day public and indigenous comment period on draft Environmental assessment report began November 2018
- Major in-pit drilling project planned, but not for 2019

Akie

Wicheeda

Indy



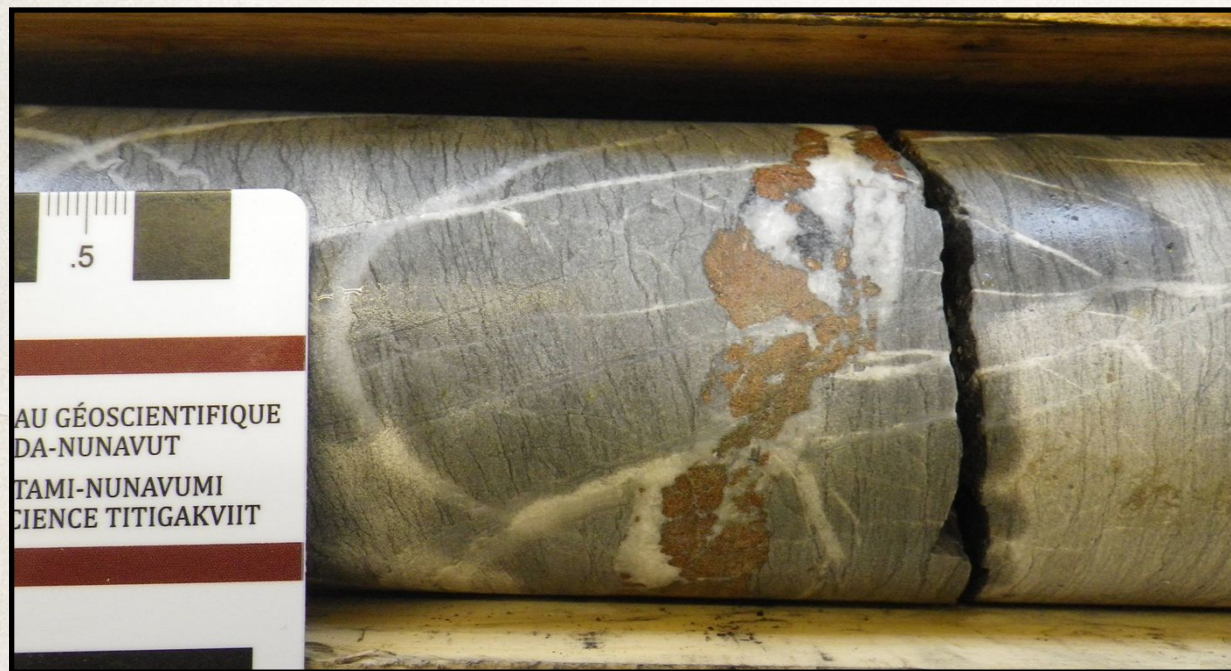
Selected exploration projects, sedimentary host rocks

# Akie

(ZincX Resources Corp.)



Long-term drill core storage



Hole A-18-145, 175.3 m: sphalerite in quartz vein, Sitka zone

- A SEDEX (Sedimentary Exhalative) Zn-Pb deposit
- In 2018, 5 drill holes totalling 2,013 m on the Southeast, North Lead & Sitka, and Sitka Extension zones
- 2018 Preliminary Economic assessment suggested a 4,000 t/d underground mine feeding a 3,000 t/d concentrator over a mine life of 18 years
- Mobilization for current drill program expected June 2019

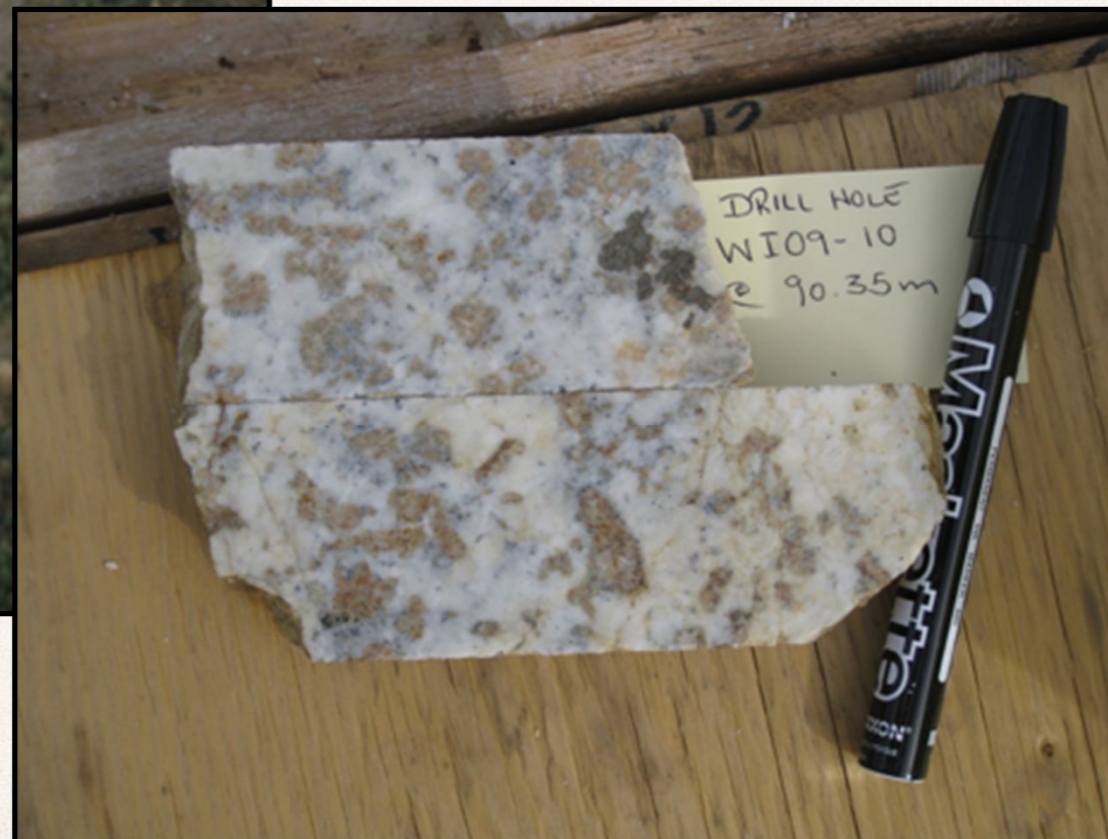




Project location

## Wicheeda (Defense Metals Corporation)

- Set of intrusive bodies, including mineralized carbonatites, in Kechika Group sedimentary rocks
- “Main Zone” carbonatite syenite intrusion enriched in REE
- Non NI 43-101 compliant estimate reported indicated resource: 11.26 Mt @ 1.95% LREE



Dolomite carbonatite

(1.16% Ce, 0.54% La, 0.24% Nd, 0.03% Nb, and 0.01% Sm)

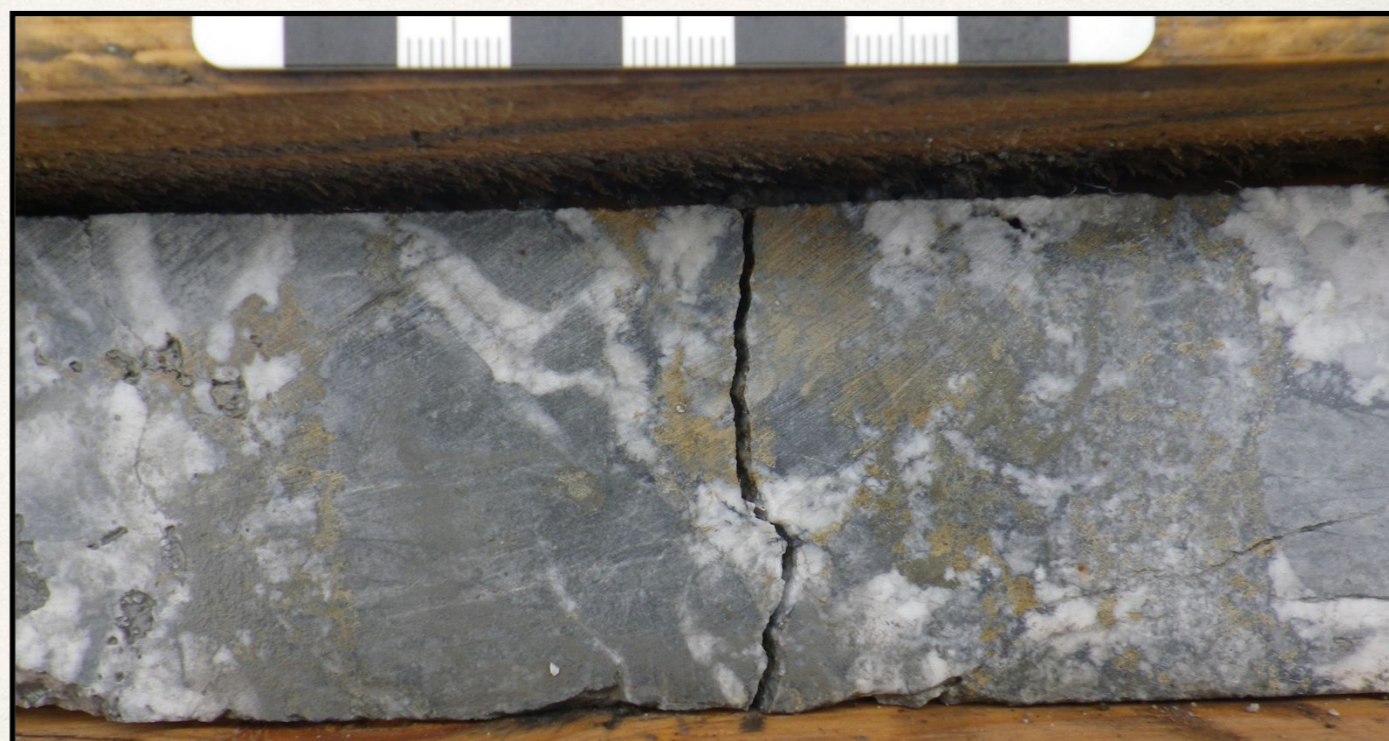
- Late in 2018, completed 30 tonne bulk sample for bench-scale testing. Drill program from up to 51 sites planned for 2019

# Indy (InZinc Mining Ltd.)

- ...of exploration interest since the early 1980s
- 4 known soil anomalies A, B, C, D
- In 2018: 11 holes totalling 1,271 m
- eg. Hole IB18-009: 12.33 % Zn, 2.98% Pb, 24.6 g/t Ag over 6.29 m at 60 m depth
- Long thought to be a Mississippi Valley-type deposit, now considered a vent-proximal SEDEX deposit
- 2019: extensive soil sampling program planned, to define drill targets.

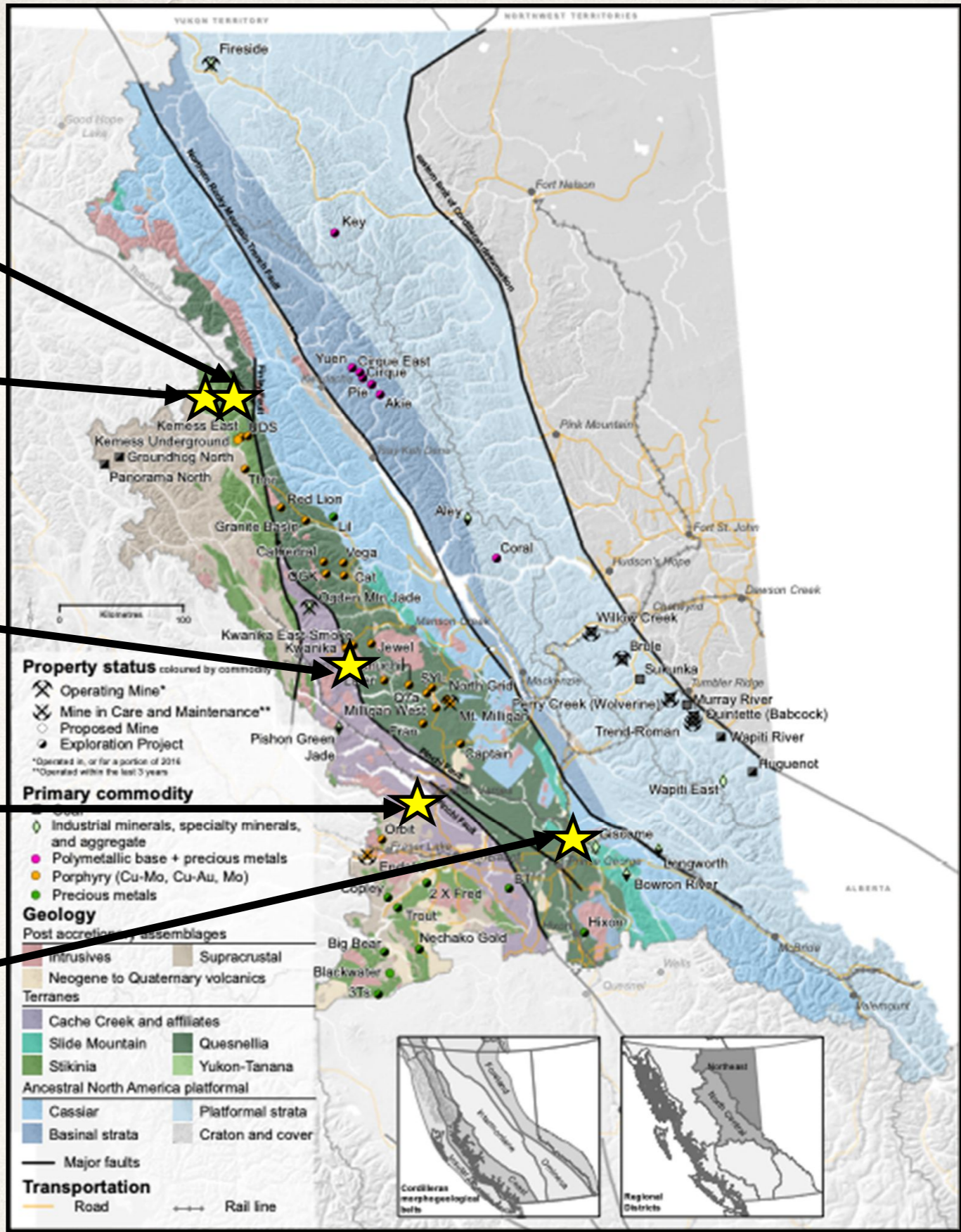


IB18-009 79m: galena in quartz



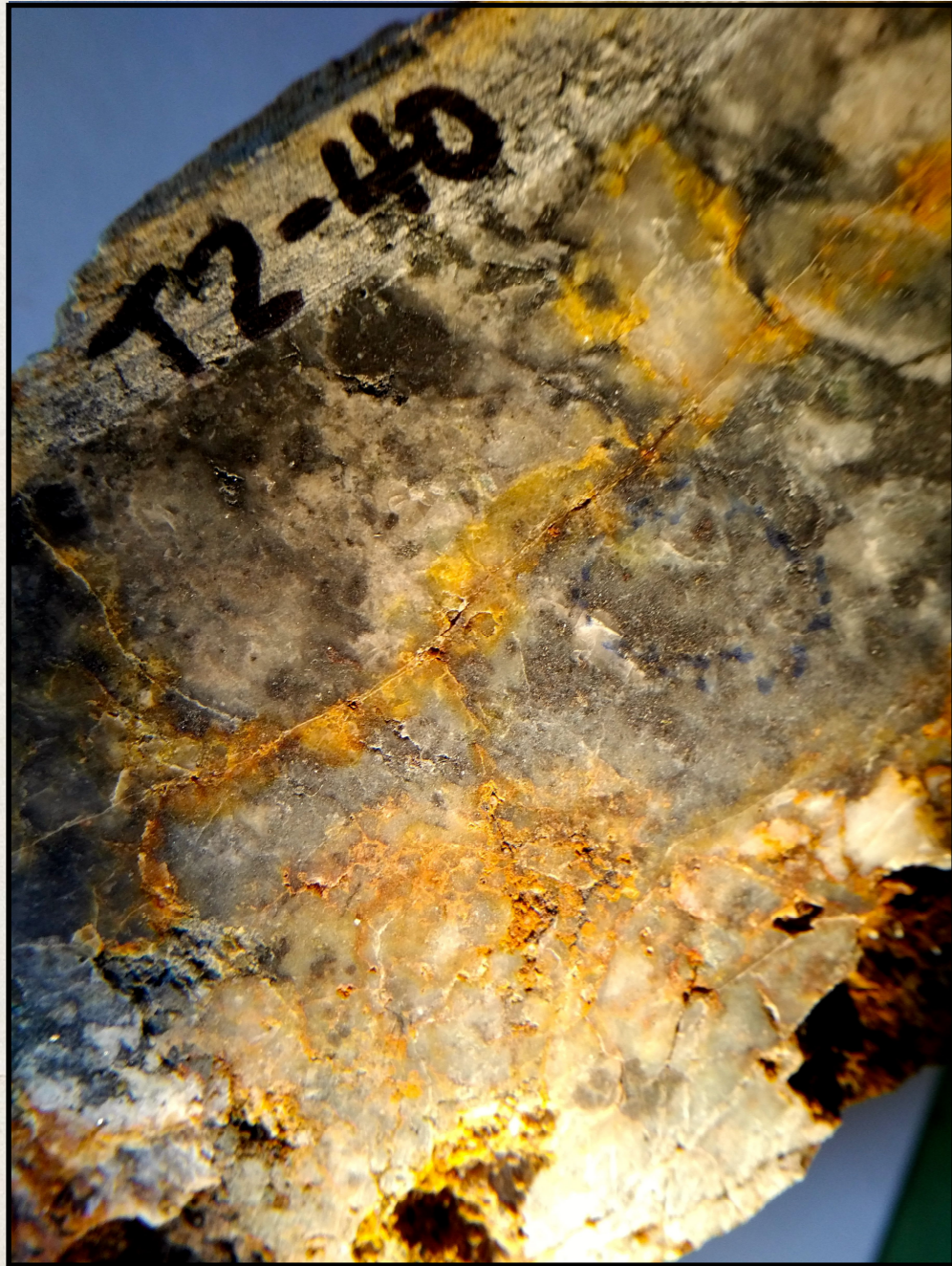
IB18-006 104m: dolomite breccia with sphalerite

Pil  
 Lawyers  
 Gibson  
 Snowbird  
 AK

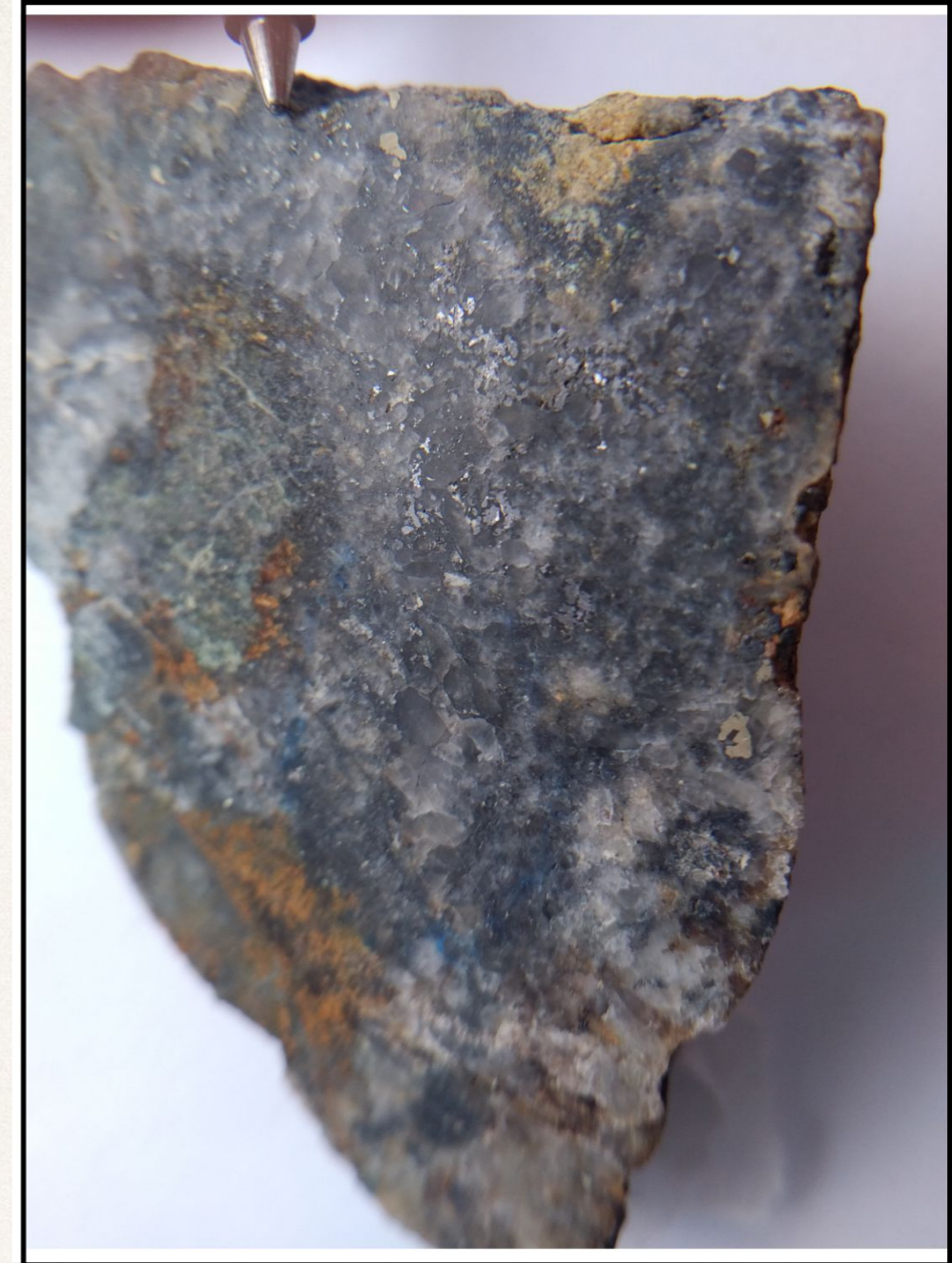


# Selected exploration projects, precious metals

# PIL (Finlay Minerals Ltd.)



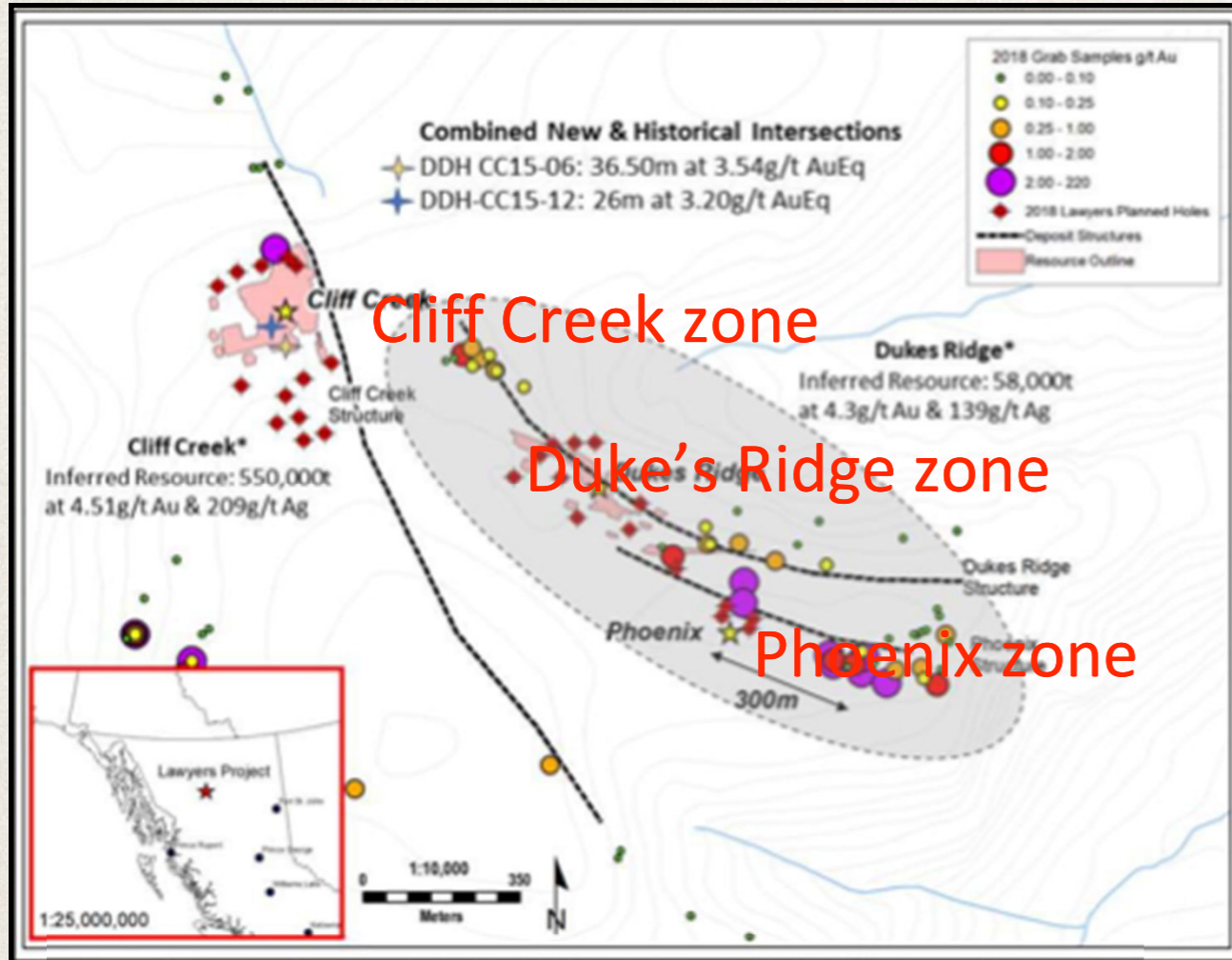
- 2018: trenching exposed 9 new mineralized zones - 23 samples over 1 g/t Au, 15 over 50mg/t Au.
- 3 major mineralized zones thought to relate to a large, deep-seated porphyry system
- 2019: detailed mapping, further trenching, 5.4 km deep-penetrating IP prior to drilling



2018 Sample T2-40: 14.22 g/t Au, 113 g/t Ag, 441 ppm Cu, 3,705 ppm Pb, 525 ppm Zn

2018 Sample T2-13: 121.22 g/t Au., 567 g/t Ag, 265 ppm Cu, 446 ppm Pb, 982 ppm Zn

# Lawyers (Benchmark Metals Inc.)



- Close by the former Cheni Au-Ag mine
- Three principal Mineralized zones: Cliff Creek, Duke's Ridge and Phoenix, which may be continuous
- In 2018, completed 30 holes, 4,116 m
- Relogged and assayed 1,041 m of historic core from Duke's and Cliff Creek and took extensive soil and rock samples
- NI 43-101 report 2016: 550 Kt @ 4.41 g/t Au and 209.15 g/t Ag on Cliff Creek, 58 Kt @ 4.30 g/t Au and 139.13 g/t Ag
- Major drill program planned for 2019

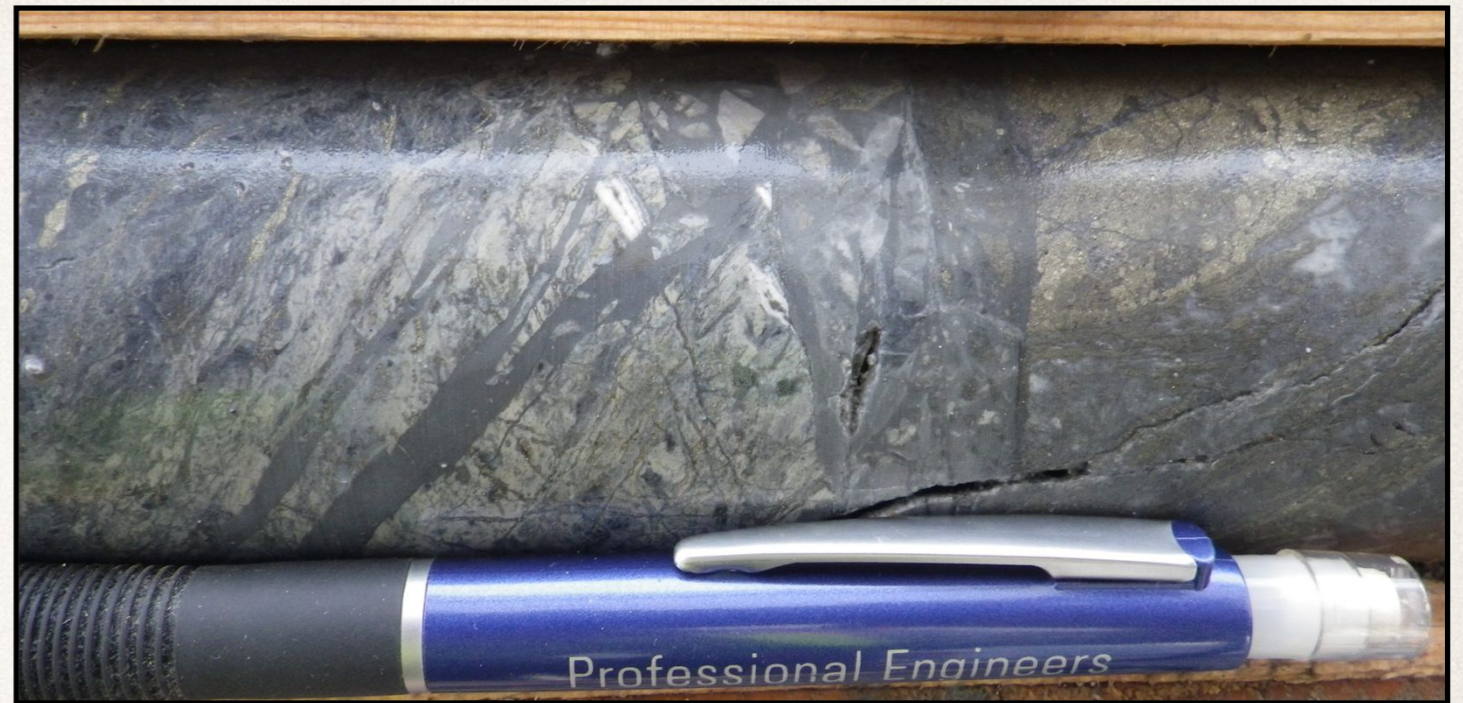
Lawyers portal entrance



# Gibson

(CANEX Metals Inc.)

- Precious metal-bearing vein deposit within 1 km of Hogem Batholith
- 10 holes totalling 1,001 m
- New zone of quartz-sulphide veining with sphalerite and galena; silver in galena of major interest.
- 31.5 m @ 1.63 g/t Au and 198 g/t Ag
- Continuity established 200 m along strike, open in all directions
- Bulk tonnage potential seen
- More trenching, drilling planned for 2019



G 18-10: 62.8 m, quartz-sulphide veinlet



G 18-10: 63.2 m, sulphides in siltstone

# Snowbird

(Gitennes Exploration Inc.)



Drill rig at Snowbird



SB-18-03: 45m, quartz vein and stockwork

- Orogenic gold in quartz deposit, within Sowchea fault zone
- Au in both veins and shear zone
- In 2018, drilled 10 holes, total 1,612 m; more planned
- Drilling connected North and Main zones; deposit open at depth and along strike
- Au values up to 81 g/t over short intervals

# AK (Exodus Mineral Exploration Ltd.)

- Discovered in 2018 by prospectors Andreas Angele and Max Keogh
- Samples returned 2.0 to 8.0 g/t Au from veins and associated shear zones
- Tentatively an orogenic gold deposit
- 2019 plans: further trenching for systematic exploration



“Discovery” quartz vein and associated shear zone



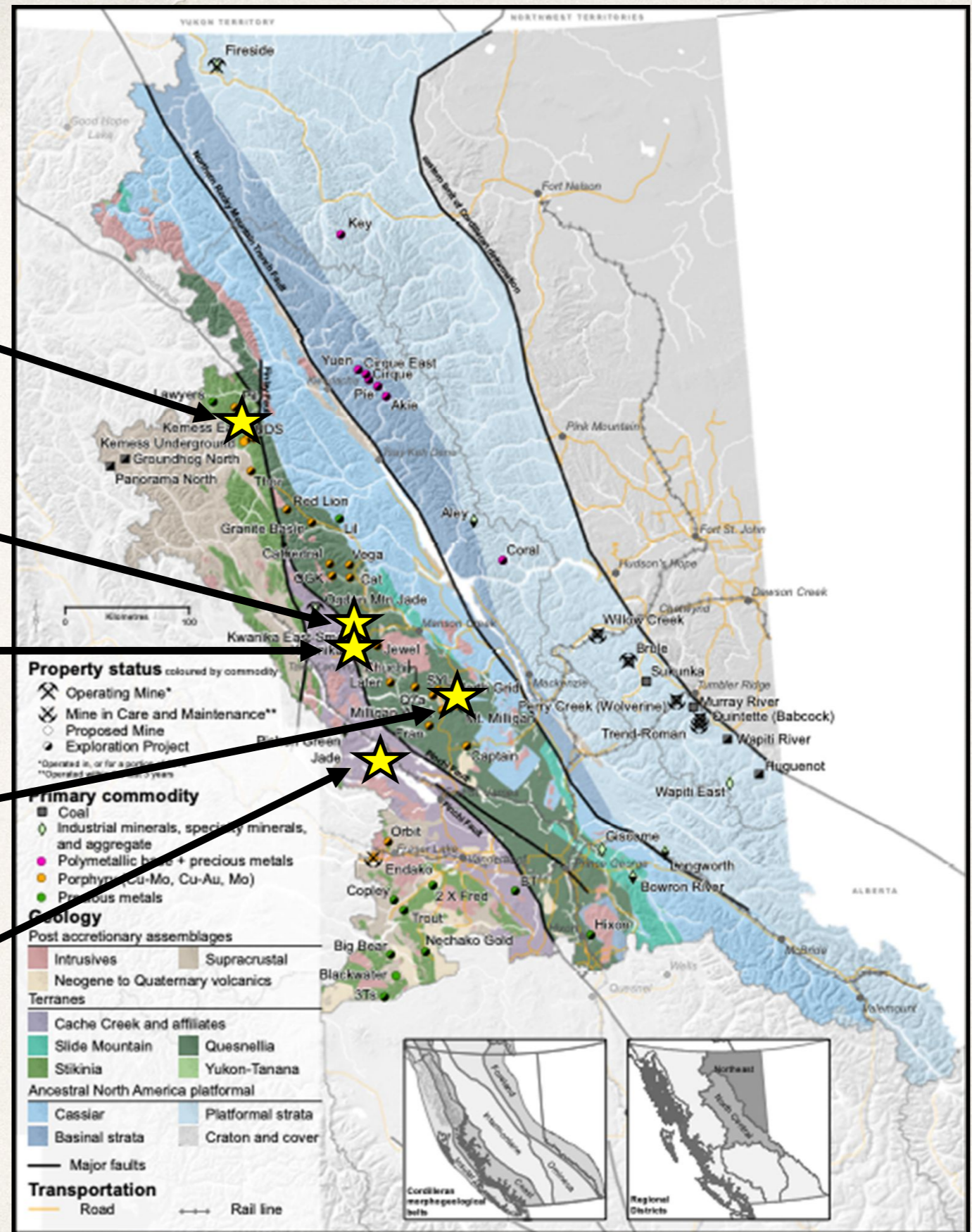
Joy

Stardust

Kwanika

Mt. Milligan area

Fran

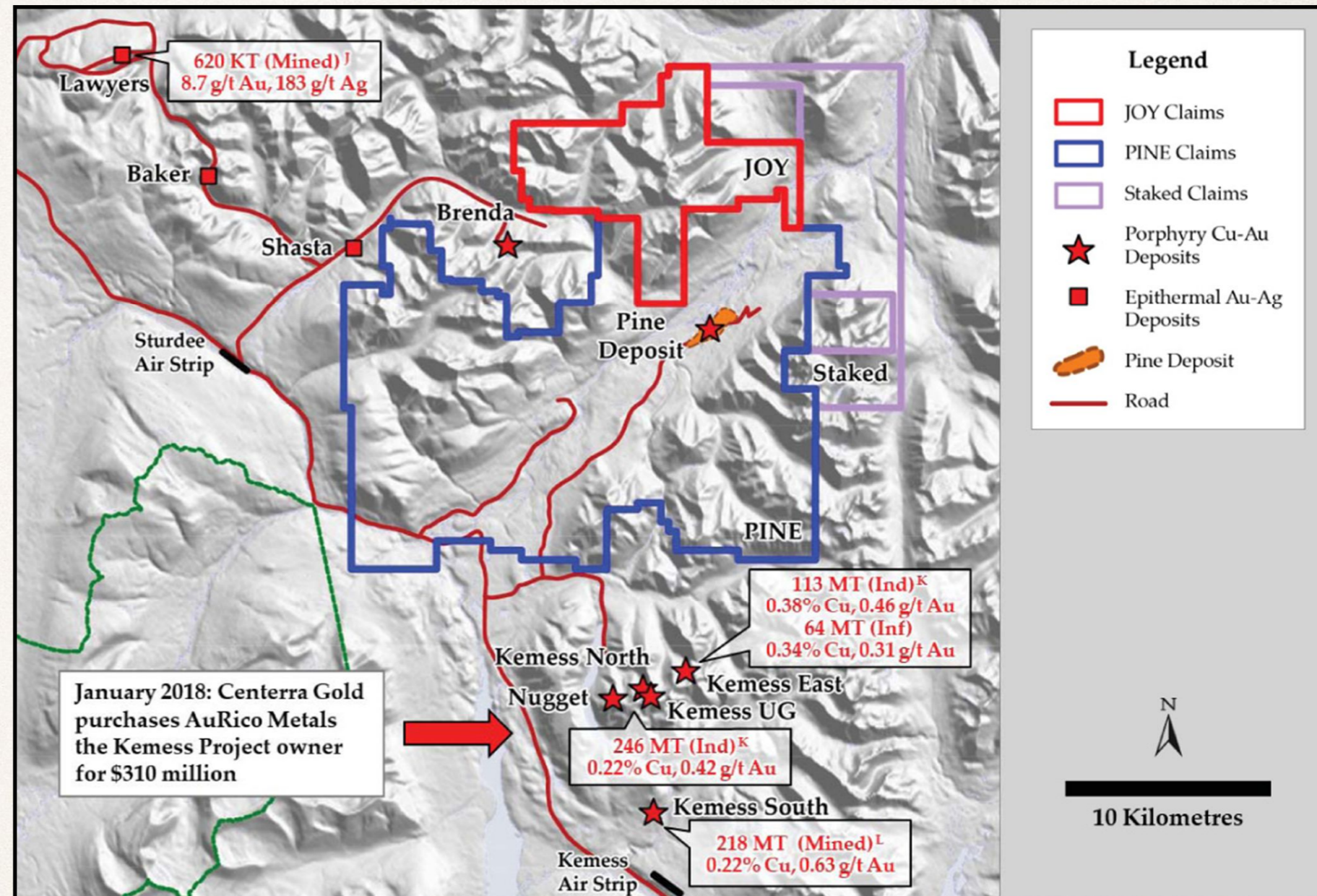


# Selected exploration projects, porphyry settings

# JOY

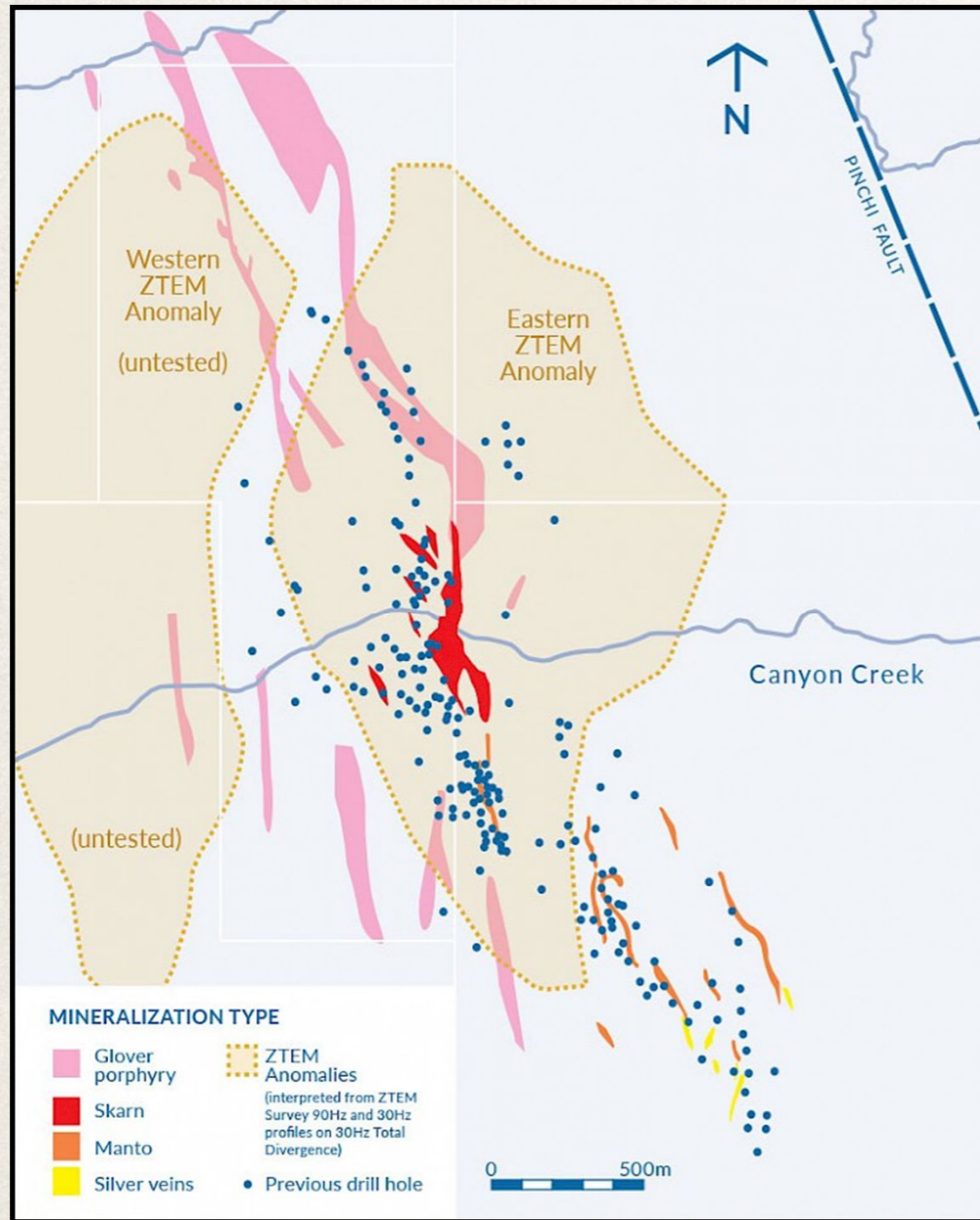
(Amarc Resources Ltd.)

- 2018: first year of a multi-year program
- 2 drill holes, total 946 m
- 1,356 km airborne magnetic survey
- 63 line km IP
- 2,676 soil samples
- In 2019, looking for new funding partners



# Stardust (Sun Metals Corp.)

Sun Metals formed in 2017 by Oxygen Capital specifically to explore and develop Stardust



Previous drill holes, and scarn (red), manto (orange), and silver vein (yellow) mineralization

- A carbonate replacement deposit, Glover Porphyry at depth
- About 80,000 m previous drilling, 390 holes
- In 2018: 22 holes total 6,838 m, 15,000 m planned for 2019
- Inferred 1.895 Mt @1.24% Cu, 0.14% Zn, 1,72 g/t Au, 30.50 g/t Ag



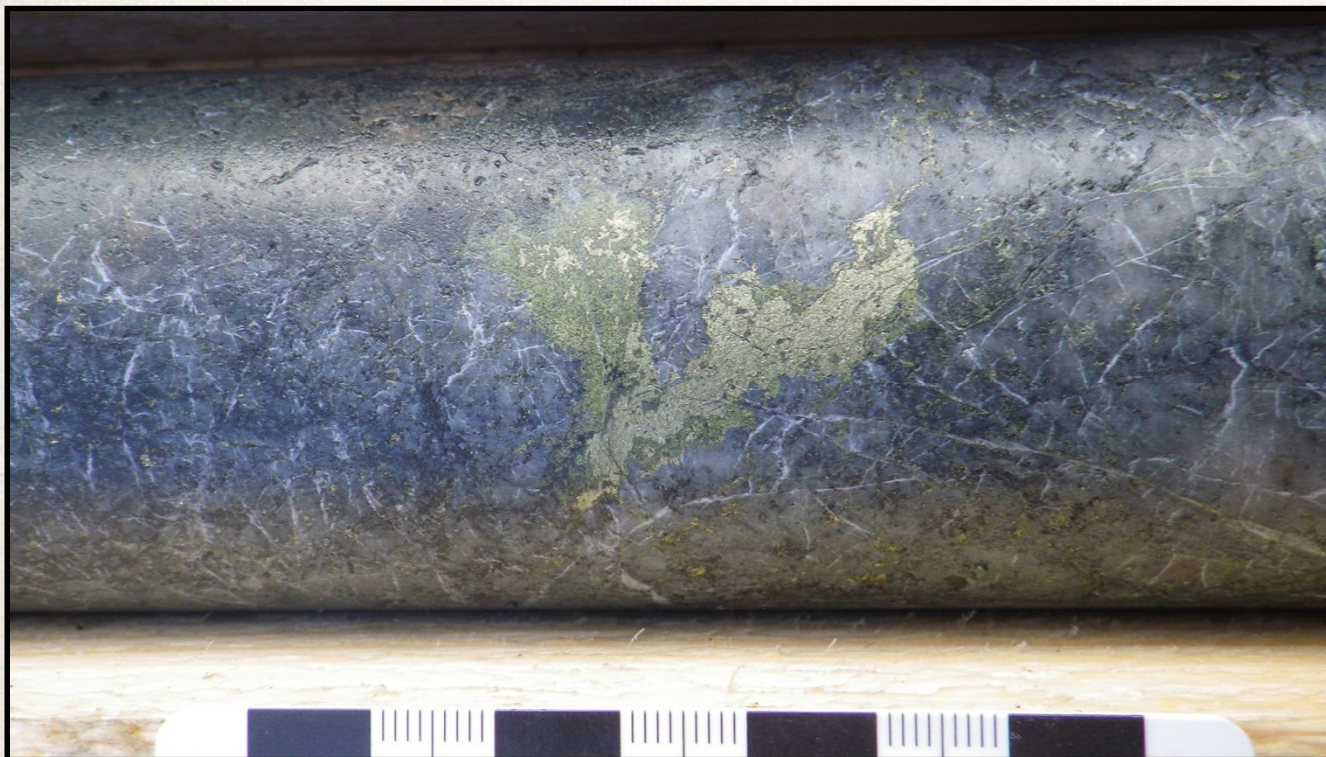
Historic core storage

# Kwanika

# (Kwanika Copper Corporation)



Core shack and core storage



K-18-184: 369m, pyrite haloed by chalcopyrite, quartz crackles

- KCC formed in 2017 by Serengeti Resources Inc. (65%) and Daewoo Minerals Canada (35%) explicitly to develop Kemess deposit
- Kemess (Central and South zones) explored extensively since 2006; current focus is on Central Zone
- In 2018, 21 hole, 7,411 m drill program on Central zone, 3 to test potential tailings storage foundation
- Central zone proposed as combined open pit and underground mine; in 2019 environmental studies, development of mine plan
- 2017 NI 43-101: o/pit 11.8 Mt @ 0.37% Cu, 0.39 g/t Au, 1.07 g/t Ag; u/g 41.4 Mt @ 0.46% Cu, 0.52 g/t Au, 1.36 g/t Ag

# Mt. Milligan area

(Centerra Gold Inc.)



Drilling at Goldmark prospect



18-1096: complex quartz-magnetite vein in sericite schist, Mitzi prospect

- In addition to near-pit and infill drilling, brownfield projects (on lease) Goldmark, North Slope, Saddle West zones - 12 holes, 6,669 m; and completed an IP program begun in 2017
- ...and greenfield projects (off lease), Mitzi East, D2 and Heidi Stock, Fugro 1 zones - 13 holes, 5,616 m
- Brownfield and greenfield projects were previously untested
- 8,500 m program planned for 2019

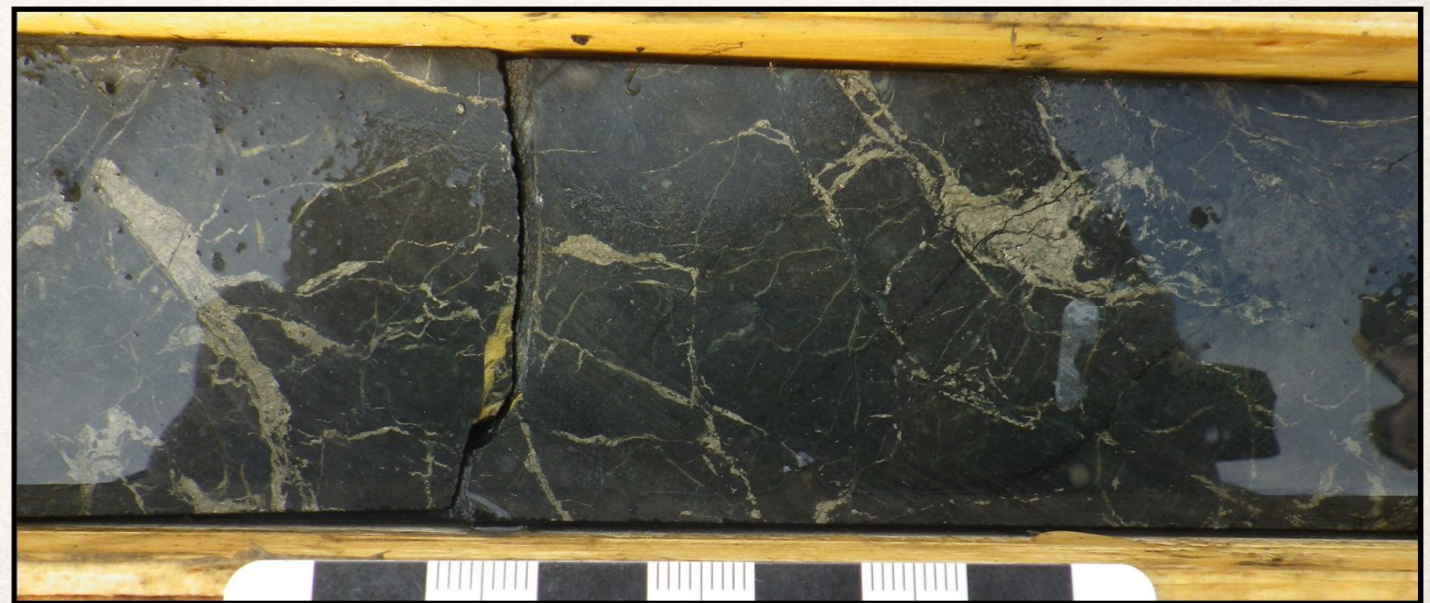
# FRAN

(MGX Minerals Inc.)

- In 2018, 112 line-km IP, and 10 holes, 3,000 m, alkalic porphyry target.
- More holes completed in December 2018, and January-March 2019
- Takla Group sedimentary, volcanic and volcanoclastic rocks hosting quartz-quartz-sulphide veins and stockworks



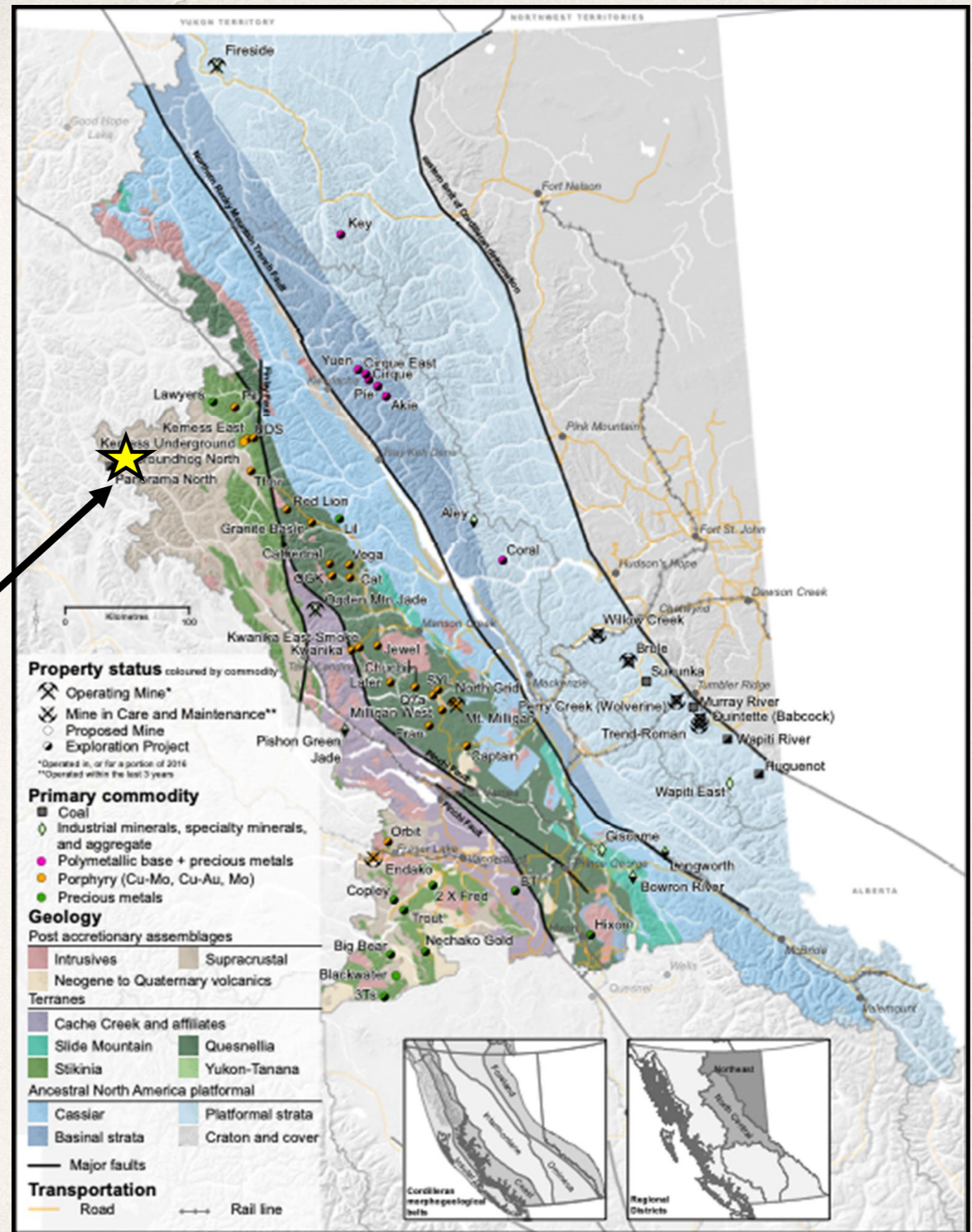
Sawing core, Fran project



FR 18-90: 337 m, pyrite in hornfelsed siltstone

# Bowser Basin Coal

Panorama



# Panorama North

(Atrium Coal Limited)

Receiving core

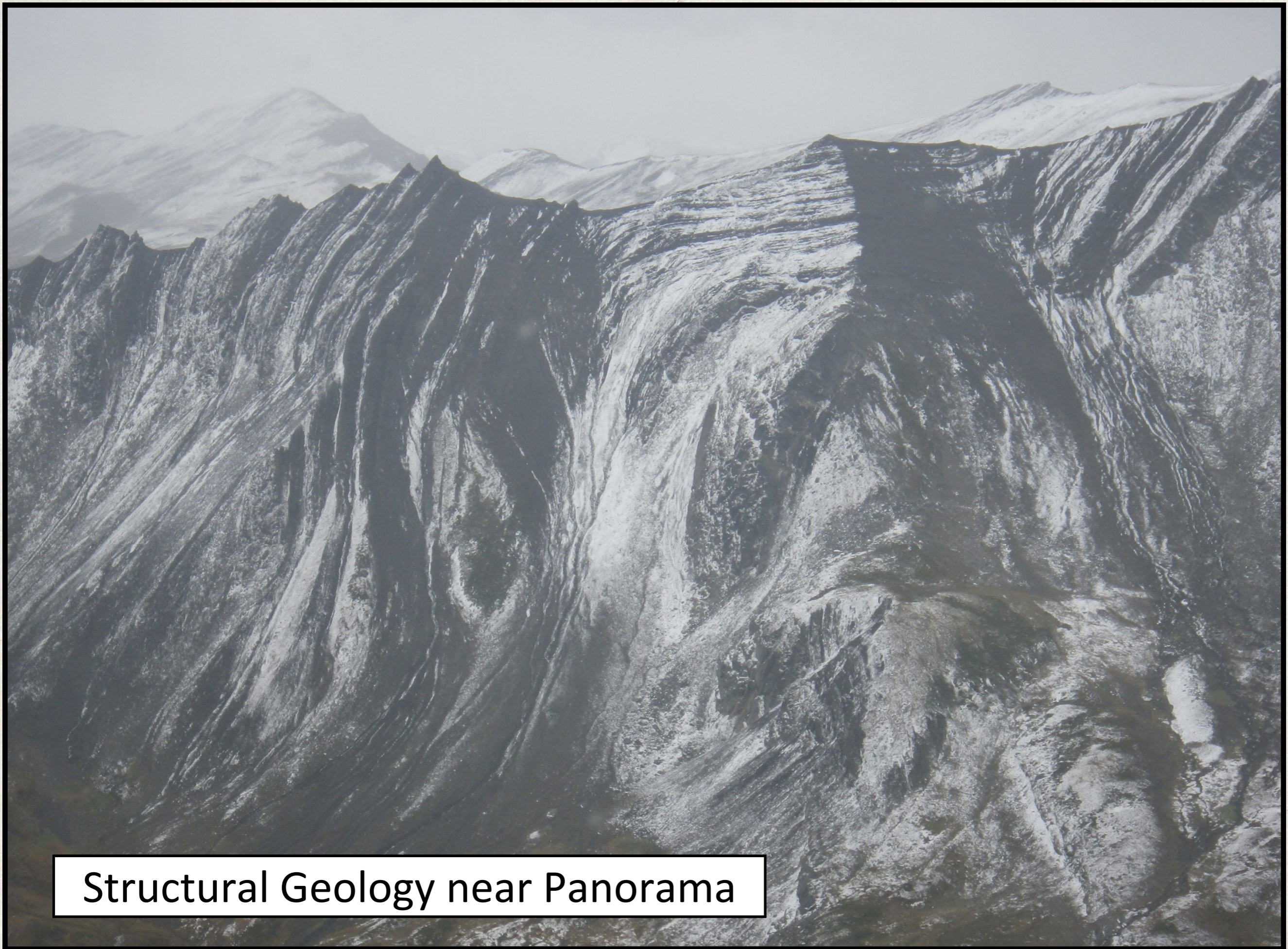


- With partner JOGMEC (Japan Oil, Gas and Metals National Corporation)
- Target low-sulphur anthracite (metallurgical) coal to blend with bituminous coal for PCI product
- In 2018, 8 drill holes, total 1,979 m



PNDH-18-04 63m: fractured anthracite coal

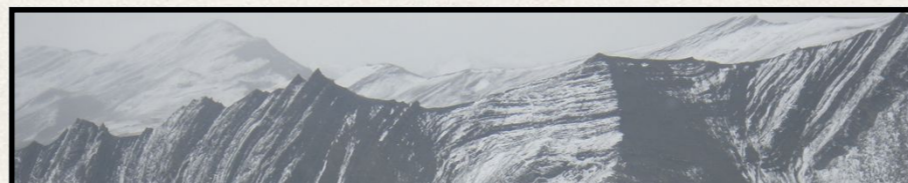




Structural Geology near Panorama



Any questions? “ooh! ooh!”





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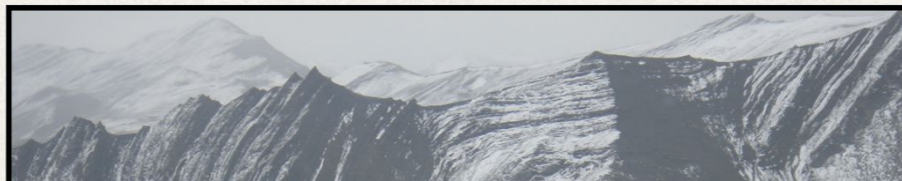
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**Exploration and Mining 2018  
North Central and Northeast**



**John DeGrace  
Regional Geologist**