Idaho Mining and Exploration, 2020-2021

Virginia S. Gillerman
Earl H. Bennett
Alexis Clark
Mark Barton

Staff Reports present timely information for public distribution. This report may not conform to the agency’s publication standards.

Idaho Geological Survey
Morrill Hall, Third Floor
University of Idaho
Moscow, Idaho 83844-3014
Contents

Table of contents .........................................................................................................................................i
Regional Development 2020 presentation slides .................................................................2020-001
Regional Development 2020 speaker notes...............................................................2020-051
Regional Development 2021 presentation slides .........................................................2021-001
Regional Development 2021 speaker notes...............................................................2021-066
Annual Idaho Regional Development presentation to American Exploration and Mining Association, 2020

Virginia S. Gillerman
Earl H. Bennett
Alexis Clark
Mark Barton
Idaho Mining and Exploration, 2020

Virginia S. Gillerman
Idaho Geological Survey
www.idahogeology.org

American Exploration and Mining Association
Virtual Conference
December 2, 2020
Acknowledgements

- AEMA
- Idaho Dept. of Lands staff
- BLM and USFS minerals staff
- Industry geologists and companies
- IGS and Claudio Berti (IGS Director)
- Earl Bennett
- Fieldwork
2020 Highlights and Trends

- Mining: a critical industry
- Idaho ranked 8th by Fraser Inst.
- Phosphate is leader
- End to Lucky Friday strike!
- Gold and Silver Prices Up!
  - 11/17/2020 Spot Prices:
    - Au: $1882/tr. oz.
    - Ag: $24.48/tr. oz.
- Advanced Development Projects
- Return of Grass Roots Exploration
- Drills Turning

2020 – the Covid-19 pandemic year

Covid-19 Virus: Image from CDC
Idaho Non-fuel Mineral Production

Leading Commodities: Phosphate rock, Sand and Gravel, Crushed Stone, Ag and Pb

Dec. 2014: Thompson Creek Mo on care and maintenance; large resource remains.


2019 data is preliminary.
Idaho Mining

- **Coeur d’Alene District:**
  - Over 1.24 billion troy ounces Ag (38,568 metric tons)
  - Pb, Zn, Cu, Sb
  - Quartz-Siderite-Sulfide veins in PC Belt metasedimentary rocks
  - Very deep mines, ore extends vertically

- **SE Phosphate District:**
  - Also over 100 years production
  - Permian Phosphoria Formation
  - Sedimentary apatite-rich black shale of regional extent

- **Gold Mines, Industrial Minerals, Energy**
Coeur d’Alene district (Silver Valley)

**Operating in 2020:**
- Lucky Friday mine
- Galena Complex
- Golden Chest (at Murray)

**Exploration in 2020:**
- Bunker Hill mine
Hecla Mining Company: Lucky Friday mine

2019 (strike): 633,000 ounces Ag by salaried employees
Q2 2020: 470,000 ounces Ag; Full 2020 projection: 1.6M oz. Ag

**Mining:** 30 vein, Gold Hunter, 6400 level and below.

**Jan. 2020:**
Striking United Steelworkers Local 5114 narrowly approved a settlement between Hecla and union, allowing their 164 miners to return. Strike started March 14, 2017.
Hecla announced immediate ramp-up and return to full production by end of 2020.
On target to do so.

**Deep Gold Hunter veins drilled to below 8300 level, accessed from new #4 shaft. Reserve 80 M oz. Ag, with similar M+I.**

**RVM (Remote Vein Miner):** Testing in Sweden; Idaho in 2021
Closely spaced holes allowed recognition and correlation of bedding that will help in understanding the geometry of the rock units in the mine.

**Geologists working on increasing confidence in vein locations in real-time, based on drilling and 3D modeling.**

Lucky Friday

Our staff geologists are updating our 3-D modeling by digitizing previously hand drawn geologic maps and updating our structural model with more data.

These maps provide data from which to begin modeling mine scale faults and other geologic features.

The fault modeling continues help with understanding seismic risks associated with faults.
Americas Gold and Silver Corporation

• Galena Mine Complex
  • Galena – operating
  • Coeur mine – adjacent
  • Ag-Pb veins and Ag-Cu veins
• 2019 – JV with Eric Sprott
  • $20 million invested for 40% stake
• 2020
  • Needed shaft and drift repair on 4300 and 5500 levels (5,300 ft. of drift, + rail)
  • Massive exploration and development drilling program
  • Over 48,000 feet by Nov. 1, 2020
  • Covid protocols for underground – checking temps and only 4 miners per hoist run
Galena mine – 2020 Exploration

• **Multiple Drill Targets**
  • 72 vein
  • 360 Complex
  • Triple Point
  • Over 9,600 feet of drilling from 5500 level, targeting deep extensions (DH 55-124: 1,046 g/t Ag and 2.3% Cu over 2.4m)
  • Drilling into 2021

• **2020 Resource Expanded**
  • Reserve to 37 million oz. Ag + Inferred Resource increased 100% to 78 million oz. Ag
Galena mine

Drilling continues, new development drift to access more veins and drill stations on 5500 level. Five in-house drill crews and a contractor. Will mine newly drilled areas in 2021.

Geologist Morgan Vane, logging core at Galena mine

Ag-Pb vein intercept from 360 veins, 4300 level, Galena mine
New Jersey Mining: Golden Chest mine

2020: NJMC transitioning Idaho pit to new area; Raised $2.7 million for drilling down dip on Idaho vein. Added drill crew and equipment. Solidified land position in Murray District.

Goal: Double production in next year.

Au-quartz vein, Golden Chest mine, 2020

New Jersey mill at Kellogg, Idaho

Endomines:

Friday mine, Elk City

- Orogrande Shear
- Underground
- Shipped 1st Au Con, Q2, 2020
- Start-up issues at mill
- IGS mapping Elk City region
Thompson Creek Molybdenum mine - extended care and maintenance since December, 2014. Permitted resource in ground.

2016 – present: Use Mo concentrator at Thompson Creek for limited beneficiation of concentrates from 3rd party customers. Process 20-25 million lbs. through leaching plant. Bulk cons ship to roaster in Langley, PA, or bagged onsite for HPM (high purity molybdenite) shipped direct to buyer.
Phosphate Mining in Idaho: 2020

Permian Phosphoria Formation:
Meade Peak Member - phosphatic black shale

Apatite (P), + C, V, U, Mo, Se, REE

SE Idaho phosphate supplies 22% of nation’s phosphate and 4% of the global demand. (BLM, 2020)

3 newly approved mine plans will replace depleted reserves.

2020-015
Phosphate Processing Plants

- Itafos Conda Fertilizer Plant, 2019
- Simplot Don Fertilizer Plant, 2014
- Monsanto Elemental P Plant, 2014

3 Large Plants
Over 350 workers at each
Industry supports 4,500 jobs
Economic anchor to SE Idaho

Add $2 billion in value-added products to U.S. economy (BLM)
J.R. Simplot Co.: Smoky Canyon

Mining at Panel F
Also mining in Panel G, multiple pits.

87-mile long slurry pipeline takes ore to Pocatello plant.

Reclamation in Panel F (pit F1North)
Simplot segregates waste rock with leachable Se from more benign material. Places infiltration-limiting cover on seleniferous waste. Increases mining cost but decreases reclamation cost and reduces environmental impact.
J.R. Simplot: New mine plans


**Dairy Syncline:** ROD released April 7, 2020, to allow mining and development on 2,767 acres. 30-year mine life. Move and transition over next few years.
Bayer (P4): Blackfoot Bridge mine

Mining in Mid-pit. Maximizing ore recovery and keeping safe work environment.

View over Mid-pit to backfilled North-pit reclamation. Also using external overburden pile with cover lysimeters.
Bayer (P4): Development work

Caldwell Canyon ROD issued August, 2019. Initial haul road construction to staging at closed Dry Valley mine, topsoil stockpiles, water management plans, etc. Construction of buildings in 2021.

Development drilling at Caldwell Canyon South pit property, 2020
54 holes for over 10,000 feet.
Itafos purchased Agrium’s Conda Phosphate in 2018 just as Rasmussen Valley approved.

Rasmussen Valley mine, looking south. 2020 a challenging year. Overburden placed at nearby South Rasmussen and Lanes Creek.

Mined approximately 2 M tons. Finished mining at private Lanes Creek mine and constructed test plot for stockpile and cover design.
Itafos: Exploration and Permitting

- Husky 1/North Dry Ridge mine plan
  - Agrium discontinued permitting there in late 2014
  - Itafos requested BLM and Forest Service to restart permitting
  - May 2019 EIS process resumed
  - April 2020 Proposed Mine and Reclamation plan submitted
  - Dec. 2020 Public notice
  - 14 year mine-life, 1,145 acres

Husky lease area with exploration drill roads.

Paris Hills property: Received exploration permits but no activity.

2020-022
Other Industrial Mineral Operations

- Aggregate = $$
- Diverse commodities & uses
  - Industrial garnet and pumice
  - Dimension stone
  - Lime
  - Zeolites and Clays
  - Industrial sand
  - Landscaping rock
  - Gemstones
- Stable, rural, smaller
- More affected by Covid, local issues, and visa issues?
- Business slower but still strong in 2020

Treasure Canyon Calcium (May, 2020): Submitted Plan to BLM for expanding limestone quarry in Franklin County to public land. In review.

Steelhead – Zeolites, new owner PDZ.
Aggregate: Construction Sand & Gravel, Crushed Stone

Second most valuable commodity in Idaho

Cope Sand and Gravel, Canyon County, March 2020

- IDL Surface mine reclamation plans: 100 + gravel pits and quarries (FY19 state royalty $1.1 million)
- Construction and Road Projects

Emerald Creek Garnet:

- Benewah County since 1930.
- Opta Minerals Inc.
- Almandine garnet - alluvial
- Water filtration, abrasives
- Good year, slightly slower markets

i-minerals: Bovill Project

- Latah County
- Revised to smaller operation
- Process clay only
- Prefeasibility Study: $48 million Capex for 10,000 tons halloysite and 20,000 tons metakaolin/year. (Millcreek Engineering, Mar. 2020)
  - 337 core holes and pilot plant testing
- Sept. 2020: Amended Operations and Reclamation Plan submitted to IDL. In review.
Dimension Stone: Southern Idaho

- **Oakley Stone (Middle Mtn.)**
  - Northern Stone Supply
  - Sawtooth Stone
  - Scrivanich
  - Oakley Mtn. Corp.
  - American Stone

- **Table Rock Sandstone**

Idaho State Activities

**Idaho Dept. of Lands (IDL) – Regulatory Reform**

- 2019: Idaho Legislature passed HB-141 (IMA sponsor):
  - Surface impacts of underground mines
  - Actual cost estimation of reclamation
  - Update of financial assurance methods
  - Modest fees

- 2020: IDL Rulemaking

**IDAHO GEOLOGICAL SURVEY 2020:**

- **Geological Mapping and Research**
  - Statemap - IGS-USGS
  - IGS – Industry (Integra Resources, others)
  - Critical Minerals, Data Pres. – IGS-USGS-IDL

- **Earthquake Response**
  - Zach Lifton, Claudio Berti
  - USGS, BSU and Others
  - Aftershocks Continuing

- **Groundwater Projects: Raft River, Big Lost River basin**

- **Geologic Hazards, Oil & Gas**

- **Staying Safe**

- [www.idahogeology.org](http://www.idahogeology.org)

Idaho Champion Geologist Duncan McIntyre (left) explaining rocks to State Geologist Claudio Berti (center) and new IGS mapping geologist, Russ Di Fiori (right); Elk City area.
Earthquake (M6.5): March 31, 2020 (evening)

Main M6.5 Quake: Left-lateral strike-slip with some dip-slip on NNW fault.

USGS catalog: ~ 2280 aftershocks (11/12/20)

Still shaking. Toppled rock spire. Liquefaction at Stanley Lake beach.
Exploration 2020

- Advanced projects from 2019
- Covid-related slowdown in spring
  - Supplies, personnel delays
- Ramp-up in activity in late summer and 2nd half of year
- High Au, Ag prices
- Drilling with results
- Underground targets back
- Grass roots exploration
- Fraser Institute Ranking (8th in world)
Bunker Hill Mining Corporation - 2020

• Funding aggressive exploration. Ex-Barrick management. Option to acquire till 2022.

• 3D modelling of historic stopes, DH, mine workings: UTZ, Newgard, Quill ore zones.

• New focus on Ag at historic Pb-Zn mine (36mt of Pb-Zn-Ag ore). 43-101 done. Known 8 mt Zn ore.

• Drilling and sampling – UG and Surface. Deeper targets as well.

• Commitment to water management.

• PEA – early 2021.

Nov. 23: Reduced option price by 30% after negotiations with lessor, Placer Mining Corp. Expires Aug. 2022. More S into ground.

Check Bunker Hill website for more details
Bunker Hill - underground

95 years of mining; 3,500 historic drill-holes; multiple vein sets and types; closed in 1981. No serious exploration since. 2020 – 10 DDH to date.

DHH 7035A:
1.5 m at 648 g/t Ag and 8% Pb.
Elk City Region: Gold Mines, Mapping, Exploration

- Historic Au mines – large placers
- New IGS mapping in progress
- Orogrande Shear Zone (N-S faults)
  - 20 km by 1 km regional structure
- Endomines Friday mine
- Prior permits: Bema – Buffalo Gulch, Erikson Reef (1990s) – never mined
- 2020: Idaho Champion, Bond Resources, Gold Lion, Endomines, New Jersey, others?
- Poor Exposure, metamorphics, intrusive rocks – ID batholith, Tertiary plugs

IGS Statemap Geologic Mapping Projects and Au mines

2020-031
Idaho Champion: Baner Project

- 2018 Drilling – very good results; geophysics (IP) targeting tool
- 2020 – $ 8 million financing
- Historic Baner mine - subsidiary structure to Orogrande Shear
- Soil geochemistry, mapping, new claims
- Drilling: 2,200 meters; results pending

Gold-quartz-pyrite mineralization
Baner drillcore
Midas Gold Corp.: Stibnite Gold Project

- Historic brownfields Au-Sb-W district, Valley County
  - ~ 5 million troy oz. Au, significant Sb (critical mineral)
  - Produced tungsten, antimony critically needed in WWII
- DEIS released for public comment: 8/2020 (420 MB, 1000s pages)
- 75-day public comment period over; in review by Forest Service
- Final EIS/ROD: Q3 2021 expected
- Large Project: 3 pits
  - Extensive reclamation and fish passage restored
  - 1 billion $ capex
  - 500 jobs
  - 15+ years project
  - Sole US antimony producer
  - Numerous technical issues
  - Exploration potential
- Ownership investment
  - Paulsen and Co. has 44% of shares
  - $ 35 million (March 2020)
Salmon Region: Au, Co, REEs

• Idaho Cobalt Belt – only US Co reserve
  • Mesoproterozoic Banded Siltites – complex
  • Lower Co price – less activity; Covid issues
  • Jervois Mining: Idaho Cobalt Operation (ICO)
    • Adjacent to Blackbird mine; RAM discovery in 1997
    • 2019 drilling increased resource by 22%
    • Positive BFS, Financing
    • Covid-related delays; Maintaining infrastructure
    • Planning for 2021
  • First Cobalt
    • Iron Creek Project
    • SE end of belt
    • Refinery in Cobalt, Ontario

• Rare Earth Elements (REEs) – NW belt
  • New Jersey Mining – acquisitions, surface sampling
    • Diamond Creek claims
    • Roberts prospect

• Gold: multiple areas & companies
  • Revival – Beartrack mine/Arnett Creek
  • Freeman Gold, Gaia, Hawkstone, Ophir, etc.

IGS Statemap quads for FY20 with Co and REE prospects, Salmon region
Jervois: Idaho Cobalt Operation

- **Jervois**: ICO 100%-ownership, permitted, underground portal site
- **43-101**: 5.24 Mt M+I @ 0.44% Co, 0.69% Cu, 0.53 g/t Au; plus 1.5 Mt inferred; open along strike, at depth
- Sept. 2020: Bankable Feasibility Study
- Second Half 2020 and first half 2021: Mill design and Construction Prep
- Mid-2021: Restart construction with goal of production by mid-2022

October 2018: *eCobalt Solutions* infrastructure

*Cobaltite with secondary erythrite*
First Cobalt: Iron Creek

- **Induced Polarity-Resistivity survey** completed in Fall, 2020.
- Objective - trace mineralization in the western portion of the resource below the Challis Volcanics cover, as well as to detect mineralization in the footwall identified at surface, but currently undrilled.
- Results will influence planned 2021 drilling program, currently in permitting with Forest Service.
- Metallurgical studies with Colorado School of Mines to improve beneficiation.
- Updated NI43-101: Indicated+Inferred of ~ 4.8 Mt at 0.3 CoEq

**RUBY ZONE**

- Cobalt-copper mineralization well exposed for +300m strike length along timber road in southern portion of property
- Similar siltite host rock to Iron Creek
- Channel sampling across 152m (500ft) strike extension
- Individual samples 1.5m (5ft) up to 0.48% Co (230 to 235ft)
Revival Gold: Beartrack and Arnett Creek

• Two projects – few miles apart
• Updated Mineral Resource:
  • Indicated 36.4 Mt @ 1.16 g/t Au; 47 Mt inferred
  • 43-101 (Feb. 2020)
• 10,000 m core drilling program underway
• **Beartrack mine** -
  • 5.6 km strike
  • Infill between pits
  • IP-RES Joss and Rabbit
  • NS Coiner Fault
  • Historic: ~ 600K oz. Au,
    • + Leesburg Placers

Reclaimed North pit at Meridian Gold’s Beartrack mine

2020 drilling, Beartrack project, 3 rigs into fall

2020-037
Revival Gold: Arnett Creek

**Haidee Target:** surface leachable

**AC20-43D:** 0.63 g/t over 22.9 m

**2020:** 30 holes for 4,900 meters and 65 line-km of IP-RES. Expand and upgrade resource. PEA for Phase 1 leach operation (Nov.). Existing facilities, inc. ADR plant, at Beartrack.

*2020-038*
Freeman Gold: Lemhi Gold Project

Ditch Creek/Humbug Property:
N of Salmon/North Fork, old placers, AGR and others 1984-2013; 355 historic holes. New claims for 7,515 acre land position. Oxide gold.

Visible gold, Lemhi Gold project, Freeman Gold website

End October: 16 core holes, totaling 3,328 m completed.
Visible Au in 6 holes logged.
Salmon Area – More Au in 2020

- Gaia Metals – NE of Salmon
  - Gold Dyke – 4 DDH, 457 m, twinned historic hole of 1.5 g/t Au, hit quartz veins, breccia
  - Carmen Creek/Freeman Creek
  - Surface mapping/sampling
- Hawkstone Mining -
  - Lone Pine Project – historic resource, near King Solomon mine, on Trans-Challis east of Beartrack
  - Sampling, Drilling, Land acquisition
  - High grade (+ 10 g/t Au) intercepts/samples
- Ophir /Minkap Res. - Breccia Project
  - Gahsmith mine 1930s (South Musgrove)
  - Epithermal; 2019 samples,
- US Gold – Challis Project
  (Musgrove Creek/Johnny’s Point resource)
- Utah Mineral Res. – Kenney Creek
- Others?

Gaia drill rig at Gold Dyke property

Hawkstone’s Adit 5 Lone Pine project: 14 g/t over 2.6 m.
**Excellon Resources:** Kilgore Au-Ag Project

**Centerra/Excellon:** Oakley Project

- Otis Gold – Federal Court confirms 5-year exploration permit from Forest Service for Kilgore (large 2019 drill program and PEA, Clark County).
- Feb. 2020 – Otis acquired by Excellon Resources.
  - Kilgore Resource ~ 1 million oz. Au
  - Drill in 2021
  - Oakley project, Cassia County (optioned to Centerra for 70% earn-in). Cold Creek/Blue Hill Creek. Miocene epithermal targets. Large claim block.
  - Centerra drill plans
- **Gold Lion Resources** – Robbers Gulch Project near Burley. Trenching, Permitted to drill.

*Oakley Project IP line with untested drill targets*
Idaho Champion: Champagne mine, Butte Co.

South pit, Champagne mine, Lava Creek District, west of Arco.

2020 Drilling, Champagne mine
5,000 m program started in August, 2nd core rig added in late October.
October – Ground IP-Resistivity Survey and Soil Sampling
Phoenix Copper Ltd.: Empire mine, Mackay 2020

(ExGen Resources, Konnex Resources)

Cu + Au and Ag, Zn

- 23 sq. km. claim area – historic Empire mine – polymetallic skarn, open pit geometry
- 32-hole Drill Program – RC and some core
- Hole KX20-26: 7.6 m of 4.38 g/t gold from 21.3 m depth
- Empire mine and Red Star prospect (Ag-Pb vein)
- Nov.: Updated 43-101 resource with 19% increase
  - 238K oz. Au, 7.6M oz. Ag, plus Cu, Zn in 23 Mt
- PEA underway for thiosulfate leach operation

Core rig at Red Star
BeMetals/Thunder Mtn. Gold: South Mountain, Owyhee Co.; Au, Ag, Zn skarn and replacement ore

- Private Land, underground
- Sept.: Phase 2 drilling
  - 2,400m in 25 holes
- Focus on extending Texas Zone and infill DMEA zone.
- 2019 (Phase 1, 20 DH for 2,290m):
  - SM19-006: 15.7 m at 21% Zn, 147 g/t Ag and 8 g/t Au
- Metallurgy and mineralogy studies, 2021 PEA
BLACK PINE 2020 – 10 M USD Exploration Program

- 46,000 meter Drill Program
- January 2020 - Plan Amendment submitted (+50 acres)
- 3 RC Drills / 1 Core
- Drilling on D1/D2 areas
- New D3 Discovery made
  96 m @ 1.44 g/t Au in Hole 152
- Testing 10 new target areas
- Securing process water - Abundant groundwater in the basin, yet no surface water/pits are dry
- Phase 1 & 2 Metallurgical Results delivered
- 82.1% weighted average gold extraction ranging up to 94.5%
- Phase 3 Met testing commenced
- Maiden Resource Estimate to begin early 2021

Leaching simulation models showing modelled gold mineralization (0.2 g/t Au cut-off) for illustration purposes and are not necessarily indicative of future performance. Gold mineralization models are derived from geologic interpretation. The modeled potential is to illustrate the relative position of gold mineralized zones to historic mining and geology rather than drill targeting. Models are subject to change with ongoing study and drilling.

BLACK PINE 2020 New D3 Discovery

Liberty – deeper drill targets

3 Drills on D-3

- LBP129: 29.0 m @ 1.86 g/t Au incl. 19.8 m @ 2.09 g/t Au
- LBP131: 76.2 m @ 0.82 g/t Au incl. 22.9 m @ 1.65 g/t Au
  - 12.2 m @ 0.58 g/t Au
  - 12.2 m @ 0.77 g/t Au
- LBP152: 96.0 m @ 1.44 g/t Au incl. 32.0 m @ 1.95 g/t Au incl. 29.0 m @ 1.36 g/t Au
- LBP127: 33.5 m @ 1.98 g/t Au incl. 15.3 m @ 3.93 g/t Au
  - 12.2 m @ 1.11 g/t Au
  - 12.2 m @ 2.39 g/t Au
- LBP138: 67.1 m @ 1.20 g/t Au incl. 19.8 m @ 2.57 g/t Au
**Integra Resources: DeLamar Project, Owyhee Co.**  
(also Florida Mtn., War Eagle Mtn.)

- **2020 Integra Program:**
  - Environmental baseline studies – water samples
  - Engineering and metallurgy
    - DeLamar/FM ores
  - Exploration – 3 rigs busy most of year
  - Florida Mtn.
    - Drill at depth, oxide/transitional ore, east anomaly
  - War Eagle Mtn.
    - Follow-up 2019 high grade
    - Drill geochem anomaly east of existing drilling
  - Black Sheep
    - Surface mapping and sampling, greenfield

*Kinross DeLamar mine - closed 1998. District production - 1.6 M oz. Au, >100 M oz. Ag*
See Tim Arnold’s talk for more details
2020-048
Integra - War Eagle Targets:

Extensions of historic veins –
Soil Geochemistry
2 parallel vein structures, multiple intercepts
Previously untested area

11/19/2020 Integra Press Release:

IWE-20-014:
24.2 g/t Au and 655 g/t Ag over 7.6 m

IWE-20-017:
21.85 g/t Au and 76 g/t Ag over 1.52 m

Max Baker is Integra’s Exploration Manager – see his session and Integra website.

Lindgren, 1898: classic descriptions of Silver City veins
THANK YOU!

- www.idahogeology.org

Virginia S. Gillerman, PhD, P.G.
  - Idaho Geological Survey, Boise
  - vgillerm@uidaho.edu
This annual Idaho Mining summary presentation is available in a pre-recorded video format and also as this annotated Powerpoint presentation. A few minor updates have been made in these notes.

Acknowledgements

- AEMA
- Idaho Dept. of Lands staff
- BLM and USFS minerals staff
- Industry geologists and companies
- IGS and Claudio Berti (IGS Director)
- Earl Bennett
- Fieldwork

Thanks to the many people who provided information and helped with this summary presentation.

The year’s biggest news was not mining, but a tiny virus, named Covid-19, which affected industry and life in 2020. But mining and exploration activity in Idaho did continue, particularly in the second half of the year. Highlights are listed. In Idaho, mining was declared a critical industry and continued to operate, but companies had to develop new protocols for health and safety. In late 2019, the Fraser Institute’s survey put Idaho 8th among global jurisdictions in Investment Attractiveness, a combination of mineral potential and public perception of mining.
Combined with rising gold and silver prices, plus a strong phosphate industry, that lead to a good year - except for the pandemic.

The value of Idaho’s non-fuel mineral production, as reported by the U.S. Geological Survey, remained flat, based on estimated 2019 production of about $550 million for raw ores. The value of phosphate processing is not included in these totals. The end of the strike at the Lucky Friday mine in early 2020 meant increased silver production in 2020.

Idaho has two “world-class” mining districts: Coeur d’Alene District (aka Silver Valley) in north Idaho and the Phosphate Reserve in southeastern Idaho. Both districts have been producing for over 100 years and are still active.
Coeur d'Alene district (Silver Valley)

Operating in 2020:
- Lucky Friday mine
- Galena Complex
- Golden Chest (at Murray)

Exploration in 2020:
- Bunker Hill mine

Two classic silver mines, the Lucky Friday and the Galena, operated in the Silver Valley in 2020. They are deep underground mines exploiting the high-grade Ag-Pb-Zn-Cu veins hosted in deformed and weakly metamorphosed Mesoproterozoic strata. Locations are shown in the map. The Bunker Hill mine, home of an exploration project, is shown on the west side of the district, which parallels the Osburn Fault and I-90 which runs along the South Fork of the Coeur d'Alene River. The Golden Chest mine, a gold mine, is located at Murray to the north.

Hecla Mining Company: Lucky Friday mine

2019 (strike): 633,000 ounces Ag by salaried employees
Q2 2020: 470,000 ounces Ag; Full 2020 projection: 1.6M oz. Ag

Mining:
- 30 vein, Gold Hunter, 6400 level and below.
- RVM (Remote Vein Miner): Testing in Sweden; Idaho in 2021

Big news in the Silver Valley was the end to the 2 1/2 year strike at the Lucky Friday. Hecla committed to a return to full production by the end of the year. Covid caused delays to testing and installing the RVM (remote vein miner) machine still being tested in Sweden by Epiroc – formerly Atlas-Copco. Testing of the RVM was done in a silicified limestone mine in Sweden. It is essentially a longwall miner turned vertical. Only one similar machine is operating in a hard rock mine – one of the deep Au reef mines in South Africa. Hecla announced final 2020 production at Lucky Friday mine at Mullan was 2.0 million troy ounces of silver (2,031,873 tr. oz.).
Hecla geologists were working on better ways to quickly locate veins using 3-D compilation of historic records and detailed lithologic characterization in drillholes.

Americas Gold and Silver Corporation operates the Galena mine near the town of Osburn. The mine was busy using last year’s investment by Sprott to repair over 5000 feet of drift and rail infrastructure at the mine. The cash infusion also financed a massive exploration program with over 48,000 feet of drilling during the year – in spite of the Covid protocols needed underground. Announced 4th quarter production at Galena mine increased to approximately 295,000 troy ounces of silver and 5.8 million pounds of lead. Final 2020 production numbers are pending.
There are multiple exploration targets at the Galena, and geologists were especially interested in testing potential below the 5500 level, the deepest at the mine. One example of a + 1000 g/t silver intercept was in DH 55-124 with 1,046 g/t Ag and 2.3% Cu over 2.4m, indicating rich tetrahedrite ore that the district is famous for. Mid-2020 calculations at the mine doubled the silver resource base.

A nice thing about ore and veins at the Coeur d’Alene district is that you can easily see them in the visual logging, as this nice run of galena shows on the 4300 level intercept.

Idaho has two fairly new gold mines in north Idaho. At Murray, a historic placer district, New Jersey operates the Golden Chest mine which includes both an open pit and underground. The company sends the ore to their own mill at Kellogg. A successful financing late in the year was being used for drilling to test down dip targets on the gold-quartz veins at the mine.

At Orogrande, west of Elk City, Endomines, a Finnish company, operated the new Friday mine, a small underground property. The had some
start-up issues, particularly at the mill, but did ship gold concentrates out.

There was no mining at Thompson Creek in Custer County. The large molybdenum mine has been quiet since 2015. However, Centerra, the company who purchased the property started using the mill and company’s Mo expertise to process and beneficiate 3rd party concentrates. Over 20 million lbs./year of cons were shipped to the company’s roaster in Pennsylvania or bagged and shipped direct to the consumer as HPM (high purity molybdenum), used for lubricants.

Idaho’s second world-class district is the Phosphate Reserve in southeastern Idaho near the town of Soda Springs. Ore is in stratigraphic horizons in the Permian Phosphoria Formation, a sedimentary phosphate rock. Three large companies are active: Bayer, formerly Monsanto; Itafos, formerly Agrium; and J.R. Simplot Co., the giant Idaho-based agribusiness company (private). Idaho produces over a fifth of the country’s phosphate. Apatite is the ore mineral. In addition to the mines, there are
Three large processing plants operated in 2020. Two produce phosphoric acid fertilizers, which are mostly used by farmers in the Western US and the Monsanto, now Bayer, plant in Soda Springs is the only producer of elemental phosphorus in the Western hemisphere. Another fertilizer plant, in Pocatello was operated by FMC but it closed in 2001 and part of it remains as a hazardous waste site. (2019: FMC must pay Shoshone-Bannock Tribes $20 million in back fees plus $1.5 million annually in perpetuity. FMC had agreed to the annual payment but tried to argue that it was not obligated to pay it after plant closed. Plant operated, partly on tribal lands, for over 50 years till 2001. Left 22 million tons of hazardous waste stored onsite. EPA says would cost $4.7 billion to remove and is not technologically feasible.)
Simplot’s huge Smoky Canyon mine is near the Wyoming border. They mined in the F and G panel pits in 2020. An environmental issue, recognized in the late 1990s, in the phosphate district is the presence of selenium in the rock, particularly in the waste shale between the two ore horizons. Simplot now separates out the high Se waste and caps it with a more impermeable layer to avoid water infiltration that can oxidize and mobilize the Se. The practice is more expensive but better for the environment.

Permitting a new mine requires long lead times and considerable effort. In July, the BLM released the Record of Decision (ROD) approving the East Smoky panel, shown in the foreground. The current pits are in back. In April, 2020, the BLM/Forest Service released the ROD approving Simplot’s new Dairy Syncline mine plan proposal. This would be a 30-year mine-life project and require moving the facilities to a new location shown in the inset map.
Bayer (formerly Monsanto) and their operating company P4 were mining at the Blackfoot Bridge mine, principally in the Mid-pit while backfilling and reclaiming the North pit. Bayer’s reclamation includes placing impermeable covers on external overburden piles and using lysimeters to monitor their performance.

Bayer’s new mine proposal for the Caldwell Canyon project was approved in August, 2019, and the company did initial surface work and significant development drilling there to assist with mine design.

Itafos who purchased Agrium’s Conda phosphate operations in 2018 is the third company in the district. Itafos mined their Rasmussen Valley mine and also at the Lanes Creek mine, a private parcel. The started reclamation at Lanes Creek.
Itafos: Exploration and Permitting

- Husky 1/North Dry Ridge mine plan
- Husky discontinued permitting there in late 2014
- Itafos requested BLM and Forest Service to restart permitting
- May 2019 ES process resumed
- April 2020 Proposal Mine and Reclamation plan submitted
- Dec. 2020 Public notice
- 14 year mine-life, 1,145 acres

Husky lease area with exploration drill roads.

Post HHS property: Revised exploration permit but no activity.

Idaho has many smaller industrial mineral operations, as shown on this map. They tend to be stable and important local employers in rural areas. Markets include: Construction, Home and Landscaping, Abrasives, Filtration, Soil Amendments, Cattle Food Supplements, Glass-making. In the past few years there have been few changes. However, at Emmett, Unimin now is now part of Covia. Emmett plant – glass-making markets for its feldspathic sands. Some golf course sand.
Aggregate is the second most valuable commodity (after phosphate). With tremendous growth in several parts of Idaho, especially the Treasure Valley (Boise-Nampa metro areas), high quality fluvial sand and gravel, like this pit exposes, were in demand by a busy construction and transportation industry. North Idaho’s aggregate is related to the glacial deposits. Other resources in north Idaho are the unique industrial garnets mined at Emerald Creek, and weathering-related clay deposits being evaluated at the old Helmar-Bovill district in Latah County. i-minerals has spent several years at Bovill and submitted a revised plan to the State, who owns much of the property.

Southern Idaho’s Oakley stone is one of our most famous products. The unique building stone, a thin-splitting micaceous quartzite, is quarried at several pits on Middle Mountain. The stone industry was hit hard by Covid and visa restrictions that prohibited the primarily Mexican workers from starting work for most of the season. Few locals will work in the quarries, and the Mexican stone workers return yearly with their expertise in stone splitting.
A few of Idaho state agency activities in 2020 are summarized in this slide. The Idaho Department of Lands regulates surface disturbance for mining on state and private land. They were engaged in writing new rules to implement legislation of the prior year. The Idaho Geological Survey (IGS) continued its research and public service projects with a few slow downs due to Covid.

Perhaps the most exciting event during 2020 was the March 31 earthquake which struck in the evening and was clearly felt over a wide area of the state from Moscow south to Boise. The shaking emanated from a M6.5 magnitude quake with an epicenter a few miles northwest of the resort town of Stanley in the Sawtooth Valley. The quake was not along a mapped fault but it and a sizeable swarm of aftershocks are along a projection of the Sawtooth Fault on the west side of Sawtooth Valley. Luckily there were no injuries nor significant damage to buildings. IGS worked with seismologists at Boise State University and the USGS to help monitor the aftershocks and review an apparent liquefaction event at Stanley Lake, a popular camping area.
The first half of 2020 was slow, due in large part to seasons and the global Covid-19 pandemic. However, many companies soon developed safety protocols for working and social distancing in Covid world and were quite active in the second half of the year as prices for Au and Ag continued to climb (Au at ~ $1900/oz. and Ag at ~ $24/oz.). In addition to advanced drilling programs, there was a renewal of grass roots exploration with selected historic mining areas getting attention for the first time in 30 to 50 years. The following summaries of larger projects starts in the north and goes south.

The famous Bunker Hill mine, one of the largest in the Coeur d’Alene district, is on the west end of the Silver Valley, and known more for massive lead-zinc production though silver was also mined historically. New management of the Bunker Hill Mining Corporation gained an exploration lease with option to buy the property renegotiated to mid-2022, and continued an aggressive program. The company has input the historic mine maps and drill data into computers and used 3D modelling to plot known ore zone resources and targets with a focus on high-Ag areas and veins. They started a surface drilling program and also drilled from underground.
Bunker Hill - underground

95 years of mining; 3,500 historic drill-holes; multiple vein sets and types; closed in 1981. No serious exploration since. 2020 – 10 DDH to date.

DHH 7035A: 1.5 m at 648 g/t Ag and 8% Pb.

More details are on the Bunker Hill website. Approximately 5000 feet of surface core was drilled and a 4000 – foot underground drill program initiated to evaluate the silver potential of areas closer to the surface in the large mine. Bunker Hill started a new PEA (preliminary economic assessment) with a due date of 3rd quarter 2021 for restarting the mine and mining above the water table.

Elk City Region: Gold Mines, Mapping, Exploration

- Historic Au mines – large placers
- New IGS mapping in progress
- Orogrande Shear Zone (N-S faults)
- Endomines: Friday mine
- Prior permits: Bema – Buffalo Gulch, Erikson Reef (1990s) – never mined
- 2020: Idaho Champion, Bond Resources, Gold Lion, Endomines, New Jersey, others?
- Poor Exposure, metamorphics, intrusive rocks – ID batholith, Tertiary plugs

The Elk City region in Idaho County is one of several historic placer gold-producing areas in Idaho. A major mineralized zone was historically along the Orogrande Shear, a north-south trending structure to the west of Elk City, as seen on the map. The yellow-colored dots are gold mines in the IGS mines and prospects database. IGS has a new mapping project to map and compile the geology of the region. Active exploration was underway by several junior companies and small miners. Endomines’ new Friday mine is one of those along the Orogrande Shear.
Idaho Champion acquired and drilled the old Baner mine in 2018 with good results. The Baner vein is along a subsidiary fault to the Orogrande Shear zone. They returned in 2020 with a 2200-meter drill program, plus surface mapping and geochemistry. The quartz-pyrite-gold veins cut altered and fractured granodiorite. Results pending.

The most closely watched mining project in Idaho is Midas Gold Corporation’s Stibnite Gold Project in Valley County. Midas submitted their mine plan in September 2016 as a Plan of Restoration and Operations (PRO) to combine mining with reclamation in the Au-Sb-W district which has serious impacts from historic mining. Much of the Yellow Pine pit, shown here, dates from the 1940s war effort when it was the nation’s leading tungsten supplier. The long-awaited Draft Environmental Impact Statement (DEIS) was released by the Payette National Forest in August, 2020, and followed by a 75-day public comment period. Those comments will be reviewed by the Forest Service and other state and federal regulators with a Final EIS and record of decision expected in the 3rd quarter of 2021. The proposed project will recover about 5 million troy ounces of gold and significant antimony (a critical mineral) over the 15-year mine-life. Major points of contention with environmental groups and public include water quality, tribal fishing jurisdiction, increased human presence in a remote area, and
numerous technical issues. Paulsen and Co. bought 44% of the corporate shares in early 2020. Capital costs of the complex project are in the range of $1 billion.

The area of Lemhi County and the region near the town of Salmon are one of the most mineralized and prospected portions of Idaho. Salmon was a hotbed of action in the second half of 2020, with three principal commodities of interest: cobalt-copper, gold, and rare earths. New Jersey Mining expanded their interests by acquiring the Diamond Creek and Roberts rare earth claims north of Salmon. The red dots on the map are the rare earth (REE) occurrences. New Jersey conducted surface mapping and sampling. Diamond Creek most recently saw work a few years ago. The NW-trending Idaho Cobalt Belt hosts the nation’s only primary cobalt deposits (the blue dots on the map). The Cu-Co deposits are stratabound horizons in the Mesoproterozoic Apple Creek formation banded siltite units. Activity in the belt decreased from the previous two years as the price of cobalt slumped, plus the effect of Covid delays. Only the two largest projects were worked. Jervois Mining, an Australian company, had acquired eCobalt’s fully permitted project next to the old Blackbird mine in mid-2019.
Jervois Mining, an Australian company, had acquired eCobalt’s fully permitted project next to the old Blackbird mine in mid-2019. Drilling in 2019 expanded the resource at the RAM deposit and Jervois released a Feasibility Study in September and looked at optimizing the mine plan and mill design, with intentions for more on-the-ground construction work in 2021. The quoted 43-101 resource of 5.24 million metric tons (Measured and Indicated) at 0.44% Co, 0.69% Cu, and 0.53 g/t Au, comes with additional inferred material and is open along strike and at depth. Additional mineralized horizons are present within the land package. Prior operator eCobalt (the renamed Formation Capital Corp. who discovered the RAM in 1997) had constructed water treatment ponds and initial earthworks at the site. The Co-bearing mineral is cobaltite, CoAsS. Copper is largely in chalcopyrite.
The second advanced project in the Idaho Cobalt belt is on the southeast end at Iron Creek where First Cobalt, a Canadian Company, had an extensive drill program in 2018-2019. Their updated 43-101 lists a 4.8 Mt resource at 0.3 CoEq. The company did an Induced Polarization(IP)-Resistivity in the fall with the goal of tracing the ore horizon under Tertiary volcanic cover. Results are pending. They also are working with Colorado School of Mines on metallurgical research. The Ruby zone is newly discovered Co-Cu mineralization on a logging road east of the property and that area was sampled with individual samples as much as 0.48% Co. Mineralization at Iron Creek is in cobaltiferous pyrite with magnetite zones also present in the stratigraphy. Permitting is underway for future drilling.

Gold has long been a target in the Salmon region. Revival Gold had the largest program in 2020 with two adjacent projects near the closed Beartrack mine, formerly operated by Meridian Gold, and the Leesburg placers.

Revival released a new 43-101 resource in February with 36 Mt indicated at 1.16 g/t Au, and 47 Mt inferred resource at the Beartrack mine. However, their 10,000-meter drill program will certainly change those numbers. They company was working to infill mineralization between the pits and prospect new areas with IP-Resistivity and structural mapping. A new interpretation of the NE-trending Panther Creek Fault,
which has been said to control mineralization, is that it is a bend off the N-S trending Coiner Fault, south of the mine.

Revival’s second project is only a few miles west of Beartrack up a subsidiary drainage called Arnett Creek. The area hosts historic placers and was drilled initially about 25-30 years ago by AGR (American Gold Resources). The poorly exposed system hosts gold in oxidized veins. Revival completed surface mapping and drilled 30 holes plus running 65 kilometers of IP-Resistivity to expand the leachable gold resource. One result of the infill drilling at the Haidee target was AC20-48D with 0.93 g/t Au over 28 meters. They released a positive Preliminary Economic Assessment (PEA) in November for a Phase 1 leach operation. The type of mineralizing system is enigmatic. Intrusives in the area have been dated as Paleozoic with the Cretaceous Idaho batholith not far away.
Another major gold project was being drilled by Freeman Gold Corporation at Ditch Creek, a tributary of Hughes Creek near North Fork. This large area, now called the Lemhi Gold Project, was placered extensively and also explored by AGR and others (1984-2013), resulting in 355 historic drill holes. Oxide gold is the target with mineralization in structurally controlled quartz veins which are well-oxidized near surface. Freeman had drilled 16 core holes, totaling 3328 m of a 5000 meter program by fall.

Several smaller gold projects were acquired and drilled in 2020. These tended to be high-grade, historic underground mines without recent exploration work. They included Gaia Metals northeast of Salmon up Carmen and Freeman Creeks at their Gold Dyke property. They drilled four core holes late in the year. Hawkstone Mining, an Australian company, picked up the Lone Pine project near the King Solomon mine, northwest of Salmon. Surface sampling near the adit returned over 10 g/t gold. Ophir Gold (formerly Minkap Resources) picked up the Breccia project near the old Gahsmith mine south of Musgrove Creek and did sampling. The epithermal prospect was (I think) formerly known as Porphyry Ridge (?). US Gold acquired the Johnny’s Point resource, also called Musgrove Creek. West of Challis, at a cherrystem into wilderness at Parker Mountain, a small company ran a VLF geophysical survey over epithermal veins in volcanics.
Moving south and east, another large precious metal project is at Kilgore which hosts a million ounce gold resource (indicated and inferred) in Tertiary volcanics and sediments. In Clark County Excellon Resources acquired Otis Gold in February in an all-shares transaction. Excellon is well-funded with assets and experience in Mexico and Germany. Otis also had claims in Cassia County south of Oakley near Cold and Blue Hill Creeks, and those were optioned to Centerra, who planned to drill targets suggested from an IP Survey. The area hosts large areas of silicified limestones. Another south Idaho project near Burley was acquired by newcomer to Idaho, Gold Lion Resources. Their Robbers Gulch project was sampled and trenched with a Carlin-style target model. They were permitting for drilling in early 2021.
Idaho Champion picked up claims around and including the old Champagne mine in the Lava Creek district, west of Arco. The small heap leach open pit mine was worked by Bema Gold but closed in 1992 at a time of low gold prices. Idaho Champion instituted an aggressive program that included 5,000 meters of drilling with a second core rig mobilized in late October, along with a surface IP-Resistivity survey and soil sampling. They enlarged their claim block to encompass a number of historic mines and targets in the district. Mineralization is epigenetic and hosted in Tertiary volcanics with some indications of being a high-sulfidation system. The company sees major potential in the district which has not seen any serious exploration since about 1990.

Phoenix Copper Ltd. continued work at their Empire mine project, the core of which includes patented and private parcels just west of Mackay. The Empire mine proper hosts skarn ore but their nearby Red Star prospect is an Ag-Pb vein. The company had a 32-hole drill program of RC and lesser core footage. One hole (KX20-26) intersected 7.6 meters of 4.38 g/t Au from shallow depths. An updated 43-101 resource noted a 19% increase in...
resources to 23 million tons with 238,000 ounces of gold, 7.6 million oz. Ag, and Cu and Zn. The company started a PEA for a thiosulfate leach operation at the Empire.

Another polymetallic district was being drilled by BeMetals at the South Mountain property of Thunder Mountain Gold. The private land parcel hosts a zinc skarn, well known to mineral collectors for its ilvaite crystals. But the skarn and related replacement deposits also have high precious metal grades. After some Covid-related delays, the company started a Phase 2 drilling program of 2,400 m in 25 holes from underground workings to extend the Texas zone and infill the DMEA zones. By late in the year, they had drilled 7200 feet of the planned 8000 feet. This was follow up to the 2019 drilling. One intercept, SM19-006, assayed 21% Zn with 147 g/t Ag and 8 g/t Au over 15.7 meters. Metallurgy and mineralogical studies were started with the aim of releasing a PEA in 2021.
Finally, southern Idaho had two very large gold projects in the advanced exploration/development stage in 2020. In southeastern Idaho’s Cassia County, Liberty Gold continued with a very large program at the Black Pine project. The former Pegasus mine operated for about five years, producing about 600,000 ounces from a heap leach mine that closed in 1997. Black Pine is a Carlin-type disseminated gold deposit in silty carbonate rocks. Liberty received permits for an expanded drill program in January and had 3 RC rigs and a core rig working most of the year. The property has a number of shallow, historic Pegasus pits and additional targets. Drilling focused on the D1 and D2 trends with new discoveries in the D3 area (96 m at 1.44 g/t Au in hole 152). Metallurgical test results were positive. The company and agencies were also looking at permits and sources for water supply if mining is implemented.

One of Liberty’s strategies was simple: drill deeper. The Pegasus drilling was shallow and Liberty has found mineralization in a lower limestone unit (blue in the cross-section) below the old pits. A number of intercepts have grades of over 1 g/t gold. The Pegasus mine closed in 1997 at a time of very low gold prices.
Last but definitely not least is Integra Resources’ DeLamar Project in Owyhee County in southwestern Idaho. It actually consists of four subprojects, two of which (DeLamar and Florida Mountain) could be considered development projects and two of which are more exploration (War Eagle, a known historic producer, and Black Sheep). Like other companies, Integra is looking at prior mines that closed at times of low gold prices but still had significant exploration potential. District production is approximately 1.6 million troy ounces of gold and over 100 million ounces of silver. The epithermal district includes the Kinross DeLamar mine which closed in 1998, the Florida Mountain resource permitted by Kinross as the Stone Cabin mine, the historic and first-mined high grade veins on War Eagle Mountain and a large area of greenfield targets, collectively called Black Sheep, which has numerous sinter and alteration signatures of epithermal and hot spring deposits. Integra had 3 drill rigs working most of the year, along with engineering and metallurgical studies and environmental baseline work. A regional geologic mapping project by the Idaho Geological Survey with the help of Integra is planned for completion in 2021.
Integra was using 3D modelling of the resources drilled. This image shows different ore classes in different colors (red would be oxide ore with green transitional and blue sulfidic) as well as potential locations of processing and mine facilities in gray. Florida Mountain lies a few miles to the west of the DeLamar facility with an existing haul road along the ridge top. The Kinross mine closed in 2000.

The DeLamar district, also known as the Silver City district, was discovered and worked initially in the late 1800s, first on War Eagle Mountain.

Lindgren’s excellent description in 1898 is a classic of economic geology and led to his epithermal vein model, much of which is still in use today around the world. Integra consolidated the land position on War Eagle last year, and drilling there has returned some “bonanza” intercepts, such as these with over 20 g/t Au (~ ¾ troy ounce/ton) from November 2020. Hole IWE-20-014 intersected 24.2 g/t Au, and 655 g/t Ag over 7.6 m. Hole IWE-20-017 hit 21.85 g/t Au and 76 g/t Ag over 1.52 m. Integra’s soil geochemistry sampling helped indicate parallel vein structures and extensions in the previously untested areas. Much more information is on their website.
Visit the Idaho Geological Survey website (www.idahogeology.org) and contact the Survey’s economic geologist (Dr. Virginia Gillerman) and other staff for more information on Idaho mines and geology. Stay safe.
Annual Idaho Regional Development presentation to American Exploration and Mining Association, 2021

Virginia S. Gillerman
Earl H. Bennett
Alexis Clark
Mark Barton
Idaho Mining and Exploration, 2021

VIRGINIA S. GILLERMAN
IDAHO GEOLOGICAL SURVEY, BOISE
2021 Highlights

- Back to Business – Covid an issue, but dealing with it; Omicron?
- Lucky Friday mine – Strike ended
- Phosphate – Full production; new mines in permitting

- Metal Prices –
  - Cobalt: ~ $26/lb. vs. $18 at end of 2020
  - Moly Oxide: ~ $12 - 13/lb.

- Critical Minerals – Federal Awareness; Idaho Prospects: Co, REEs, Zn
- Exploration – Advanced Projects & Resources: Au-Ag focused

Late November omicron slump?
2020 and prior year’s mining talks are on the IGS website Mines & Minerals page.
Coeur d’Alene District: in Top Ten Globally for Total Silver Production

1,256,612,343 troy ounces Ag (39,085 metric tons Ag metal)

Updated Historic Silver Production (1884 – 2020)
@ today’s Ag price ($24/oz.) that equates to > $30 billion from the 20 mile x 30 mile box
7.8 million metric tons Pb; 3 million metric tons Zn; 191 thousand metric tons Cu; + Sb

Idaho has Produced Silver Since 1860s (More Ag than Nevada at ~ 600 million oz. Ag)

2020 USGS Summary: Four primary Ag mines in US; 2 of those are in Idaho
  ▶ Lucky Friday mine and Galena mine

Multiple Ag Deposit Types and Geologic Settings to Explore
Idaho Silver Production, 1978 – 2020

Compiled by IGS from USBM and Company Data

Price is yearly average from kitco.com
Coeur d’Alene District (CDA)

Today’s mines (red) and projects

Historic larger Ag producers (over 2 million tr. ounces Ag)

Ninemile Creek waste dumps and jig tailings clean-up (IDEQ, 2021)

2021-007
Hecla: Lucky Friday Mine

2021 Update:
- Full year of full production after labor strike, 2017-2020. Approx. 3.5 M oz. Ag in 2021.
- Infrastructure improvements.
- New longhole blasting method.
- Underhand Closed Bench Mining method.

CDA veins are quartz (white)-siderite (tan) – sulfides. Gray in this photo is galena (PbS).
Americas Gold and Silver Corp.: Galena mine
(Joint venture investment with Eric Sprott)

- **Phase 1** (18 months ending June 2021); Phase 2 starting
- Massive, successful exploration
- **120,000 feet drilling**
- Replaced reserves and increased resource (+38% P&P; +72% increase M&I, +36% inf. Ag)
- Rehab and development work on 7500 feet of drift, hoist replacement underway
- New mining equipment
Galena mine - long section

Completed Phase 1 exploration drilling in blue.

Mine has two vein types:
- **Silver-copper** (tetrahedrite-rich)
- **Lead-silver veins** (Ag-bearing galena)
Silver vein trend closeup

5500 Level

150 Ft

Silver HW Vein
(New Discovery)

Long Section
Looking North

270 Ft

55-174
7.2' @ 51.1 oz/t Ag,
2.0% Cu

55-144
2.8' @ 22.5 oz/t Ag,
0.7% Cu

55-178
2.8' @ 125.5 oz/t Ag,
3.1% Cu

55-148
2.5' @ 157.6 oz/t Ag,
4.2% Cu

55-176
6.0' @ 92.3 oz/t Ag,
2.4% Cu

55-147
8.3' @ 96.2 oz/t Ag,
3.8% Cu

55-146
6.5' @ 24.6 oz/t Ag,
3.1% Cu

55-178A
9.0' @ 215 oz/t Ag,
6.4% Cu

2021-011

Silver vein trend closeup

Siderite-tetrahedrite vein

55-144: 2.8 ft. of 22 opt Ag, 0.7% Cu
New Jersey Mining: Golden Chest mine

Au in 2021: NJMC increased mining and milling tons, working toward 20,000 oz./yr. Owns drill rig; drilled new high grade on Klondike, Joe Dandy, and Paymaster veins. End of Q3, completed 25 core holes (6507m) with intercepts of 2 – 12 g/t range). Acquired new Alder Creek prospect at Murray.

REEs: (Roberts/Diamond Creek): $ and permit to drill in 2022.

NJMC future name change to Idaho Strategic Resources, Inc.

New Jersey mill at Kellogg, Idaho

Endomines
Friday mine, Elk City

- Orogrande Shear
- Underground
- Shipped 1st Au Con, Q2, 2020
- Mill start-up issues in 2020; closed
- Re-opened 2021
Idaho Industrial Minerals

- Wide variety of commodities
- Garnet production and clay in north
- Building stone in south – multiple types
- Limestone and calcium products
- Pumice and perlite at Malad (Hess Pumice and associated companies)
- Zeolite in SE and SW

**AGGREGATE** – sand and gravel, crushed stone in Idaho’s top 5 commodities

- SW Idaho: 3 New aggregate pits approved; more leases requested
- (Over $ 125 million in 2019)
Hess Pumice

- Good year
- Perlite demand up significantly
- Had to increase winter stockpile

Others:
- Covia – sand, doing good
- Bear River Zeolite – market good but maintenance and labor issues
- Concrete use and aggregate demand – way up!
**Phosphate: the “biggie”**

**Phosphoria Formation:** Permian Age (265 Ma) black phosphatic shale of regional extent. Ore is approximately 25% $P_2O_5$ and various strata are enriched in trace elements including V, REEs, Se, U, etc. Mine 4 – 5 million tons/year.

2021 – Phosphate is largest segment of the mining industry. 3 large processing plants, 3 large open pit mines, new mines in construction, southeastern Idaho. Approx. 4-5 million tons/year.

**Products:**
- Phosphoric Acid Fertilizer
- Elemental Phosphorus
Phosphate Plants: Fertilizer and Elemental P

Simplot’s Don Plant, Pocatello

Itafos’ Conda Fertilizer Plant (mid-left)

Soda Springs, Idaho

Bayer Elemental P Plant (lower right)
J.R. Simplot Company: Smoky Canyon mine

- Surveying by drone
- Finished mining F2 pit
- Mining F3, G2 and G3
- Pad preparation G4
- Reclamation North Panel F
- Development East Smoky B
- Maintenance slurry pipeline to Conda

January, 2021: F2 pit, looking toward F3
Bayer (formerly Monsanto): Blackfoot Bridge mine

- Mining last phase of Mid pit.
- Will transition to South pit (final one).
- Concurrent Reclamation with 20 acres of geosynthetic cover.
- Anticipate completion in 2024.
- Transition to Approved Mine Plan at Caldwell Canyon (40-year project) located near old Dry Valley mine of FMC.
RECORD OF DECISION (BLM Approval): August, 2019

- Mine-life approx. 40 years, 1,559 acres, of which only 160 acres are federal land. Mostly private, owned by P4 Production LLC.

- Developed first mining areas, constructed haul road, ore stockpile at Dry Valley rail terminus, overburden area in old D pit of closed Dry Valley mine.

April 27, 2021: Lawsuit by three environmental NGOs (incl. 2 out of state) against BLM claiming flawed EIS analysis of sage grouse and selenium contamination potential. No stay; work continues.
Itafos: Rasmussen Valley mine

IGS examining ore bed stratigraphy with Joel (mine geo), Aug. 2021

Backfilled area behind blasthole rig, 2021
Itafos – Reclamation and Permitting

- Reclamation and cover installation at South Rasmussen Ridge mine
- Also reclaiming Lanes Creek mine (private)
- **Permitting:** Husky 1/North Dry Ridge mine application (14-year mine life on 1,145 acres)
  - NOI to start formal EIS, Dec. 2020
  - Draft EIS released Oct. 22, 2021 (BLM/USFS)
  - Soliciting public comments to support project, with over 500 jobs and $50 million in local wages and benefits
  - BLM anticipates mid-2022 for Final EIS
Southwestern Idaho Gas Play - 2021 Activity

✓ Commenced production of the Barlow 1-14 (12) in 01/2021. Well currently producing 2,500 mcf gas and 60 bbls of condensate per day.

✓ Drilled and completed the Barlow 2-14 (13) in 10/2021.

✓ Drilled and completed the Fallow 1-11 (14) in 11/2021.

✓ Permitted to drill the Dutch-Lane 1-13 (15) in 12/2021.
Idaho State Activities

IDAHO GEOLOGICAL SURVEY 2021:

- Geological Mapping and Research
  - Statemap, EMRI: IGS-USGS
  - Industry Collaborators: Integra Resources, others
  - Data Preservation: IGS-USGSIDL

- Mines & Minerals
  - Regional Developments/Annual Reports – on website
  - Ore Deposits Research, GSA Lemhi Pass talk
  - Critical Minerals – USGS-IGS (Earth MRI); Salmon Field Conference, Cobalt Belt Mapping

- Earthquake Response and Research
  - USGS-IGS-BSU: Aftershocks continue
  - Groundwater Projects: Raft River, Big Lost River basin

- Geologic Hazards: landslide database

- www.idahogeology.org

Geologic map of De Lamar & Swisher Mt. quadrangles

Reed Lewis mapping near Salmon, Idaho

DWM-193 (2021)
Data Preservation Program:

- Christopher Tate
- Jess Starnes

GO ONLINE: IGS website

- www.idahogeology.org

- Search > 8000 mines and prospects by location, commodity, name

- Scanned property files

- Annual mining presentations online

- Free downloads

Searched Mines tab by keyword “Sunshine” – green circles are matches. Zoom in to specific property.

Mineral Property File Scans
Exploration 2021

- High Metal Prices – precious and base metals
- Critical Mineral Interest – REEs and battery metals
- Lots of Drilling
  - Good Drill Results
- Underground Targets and Feeder Zones (Grade is king!)
- New Generative Areas based on Varied Deposit Models
- Evaluating Metallurgy, Processing, Off-take Agreements in Global Marketplaces
- Permitting – One advanced EIS proposal; still difficult and time-consuming at mine plan stage
Bunker Hill Mining Corp.: Bunker Hill mine

- 3D modelling of historic stopes, DH, mine workings: UTZ, Newgard, Quill ore zones.
- New focus on Ag at historic Pb-Zn mine (36mt of Pb-Zn-Ag ore). 43-101 and favorable PEA done. Known 8 mt Zn ore.
- Drilling – Phase II complete: 16 holes (3000 ft.) with intercepts of Ag-Pb-Zn in Jersey and Deadwood veins on 9-level.
- Completed 23-line IP/resistivity survey in fall.
- Rapid Restart; water management.

Silver Valley Metals
- Ranger-Page Project – just west of Bunker Hill
- Recent Acquisition - multiple targets, historic mines
Silver Hammer Mining Corp.: Silver Strand mine – near CDA

- Formerly Lakewood Exploration
  - Name Change this fall
- Past-producer, worked by New Jersey Mining
- Revett Quartzite host
- High-grade, underground grab samples to 2744 g/t Ag and 4.8 g/t Au
- Quartz veins in shear zones
- Rehabilitated underground
- Drill program started October, 2021 (2700m)
  - Test for deeper mineralization
  - Platform Drills – less ground disturbance
Perpetua Resources (Midas Gold):
Stibnite Gold Project

- Name Change in Feb. 2021.
- Moved Corporate HQ to Boise.
- EIS process (Payette NF) extended with supplemental EIS in early 2022.
- **Target:** ROD in early 2023.
- Agreement with EPA for pre-mining removal actions of historic WW2 mine wastes/failings over 3 years.
- Tribal issues from Nez Perce treaty fishing lands?

P & P Reserve: 4.8 M ozs Au @ 1.43 g/t; 148 M lbs Sb, plus additional resource
Stallion Gold: Horse Heaven Project

- West of Stibnite and south of town of Yellow Pine
- Historic Sb, Au and W workings and production
- Along Golden Gate Shear zone
- New IGS geologic map of Yellow Pine quad (DWM-190) funded by Stallion’s precursor private group. (Thanks!)
- Working off intrusion-related gold system model, but also on Golden Gate Fault zone, an Idaho shear zone
- Historic data in IGS database

695 claims, staked 2012

Antimony Ridge

Au in soils
Sb in soils

2021-029
Revival Gold:
Beartrack mine; Arnett Creek

- PEA – late 2020, for heap leach
- Updated resource & PFS in 2022
- 2021: 20 DDH (4,880m) program
- Haidee Target (Arnett): 15 core holes in near-surface oxidized zone. Infill/exploration, some geotechnical. Heap Leach.
- Beartrack: Joss area had 5 DDH for 2,380m. High-grade, underground Au over 1-km strike. Prior intercepts 4-9 g/t Au over 1-5m.
  - BT21-237D hit 11.79 g/t Au over 2.5 meters within 84 m of 2.67 g/t Au.
- 3-D Modeling by Mira Geoscience Ltd.
- Fire Season!
Revival Gold: Beartrack Joss Zone

“Panther Creek Fault Zone” – SW of Beartrack south pit

**Late-breaking:** BT21-240D hit 4.3 g/t Au of 110 meters, inc. 12 g/t over 13.7 meters.

**Joss Zone:** Sheared, altered Yellowjacket Formation. In interval of 6.84 g/t Au over 3.9m drilled width.
Freeman Gold
Lemhi Gold Project

- Former Ditch Creek property near North Fork, N of Salmon.
- Historic placers and drilling by AGR/FMC
- 2020: 7,149m of drilling in 35 holes
  - FG20-001C had 25m of 3.3 g/tAu
- Highly oxidized and faulted areas; flat-lying mineralized near surface. Mag suggests intrusion at depth to SE.
- July, 2021: NI 43-101
- October: Beauty Zone surface rock-chip/soil anomaly, inc. 28 samples > 10 g/t Au. (+ Ag, Cu credit)
  - Trenching underway
Ophir Gold Corp.: Breccia Property (Musgrove Creek/Porphyry Ridge)

- Historic workings south of Musgrove Creek and north of Porphyry Creek, 40 km SW of Salmon.
- 1.5 km Au-bearing trend with historic bulk sample (11 g/t Au).
- East Breccia zone – 2020 discovery.
- Low sulfidation, epithermal deposit.
- Diamond Drill Program – About 3,200m in 10-15 holes delayed by fires but underway in fall.
- CSAMT survey started in September (15 lines).
- Additional silicified breccia outcrops.
Idaho Cobalt Belt

- Mesoproterozoic banded/coarse siltite, Apple Creek Fm.
- NW-trending 30-km linear belt.
- Co, Cu prices up: critical mineral. Also Cu, Au, local REEs.
- Current mapping by IGS.
- Two large projects:
  - Jervois Mining ICO (RAM deposit, N of Blackbird mine (B))
  - First Cobalt (Iron Creek, IC)

*Bookstrom, et al., 2016: GSA Special Paper 522*
Jervois Global Ltd.:
Idaho Cobalt Operations (ICO)

- 1997 RAM discovery by Formation Capital Corp./eCobalt. Extension of Blackbird Cu-Co horizons. (Cu-Co-Au)
  - Permitted with some earthwork completed prior to purchase by Jervois. Financing.
- Board approval of full construction; Contractors: Klepfer Mining Services, M3.
- Site infrastructure: Mill/concentrator foundations, lined TWSF, water treatment plant, portal bench, buildings, initial ug.
- Jervois has refinery in Brazil; acquired Freeport Cobalt, a Finnish Co business in Finland.
- Anticipated start of production: Mid-2022.
  - Delayed depending on winter issues.
East portal opened at Idaho Cobalt Operations; November 2021. West portal development is in 110 feet.
Electra (First Cobalt Corp.):
Iron Creek (Co-Cu) Deposit

- Large drill program (43 DDH) in 2019 and 43-101 resource; 2020 IP/Resistivity survey; metallurgy for cobaltian pyrite.
- Ruby zone – 2020; doubled land position in May. Surface sampling.
- 2021 Drilling (Sept.): ~6 holes with 8500 feet of oriented core. Goal to extend resource E and W. Open down-dip and along strike.
  - Chargeability anomalies
  - Ore zone projections (Cu and Co distinct but adjacent)
  - Challis volcanic covered areas
- Continued metallurgy (CSM) and research.
- Company has hydromet refinery in Cobalt, Ontario – restart, marketing agreements.
  - Battery grade Co-sulfate for EV Li-ion battery market

November: Name change to Electra Battery Materials
Idaho Champion: Champagne Project
Precious and base metals: magmatic related

Champagne mine: Bema Gold (Au-Ag, closed 1992)

2021:
• 10 DDH (3432 m) just completed
• Two new IP lines (7800m) to expand IP survey to N and W
• Coincident Surface Geochem, IP

Preliminary Results: Anomalous alteration, base metals, Ag in first 2 holes, outer porphyry zoning interpretation.

• Structurally detached at depth
• Very large chargeability 1600mElev
• Check website for details
Phoenix Copper Ltd. (Konnex): Empire mine, Mackay

2021

- 4,500 m Deep Sulfide Program
  - 979 m completed as of late November
  - 4 holes hit high-grade Au, Ag, Cu, Pb, Zn plus W below open pit oxide resources
- Also Hydrologic Characterization
- Planned RC at Navarre Creek and core at Red Star and other areas
- Hosted TRGS tour
- Working on PEA for open-pit, oxide copper mine

Empire Tram House

Low-tech Cu prospecting
Liberty Gold: Black Pine project

Former Pegasus mine; Carlin-type Au deposit with cluster of multiple deposits; oxide.

Over 263,000 meters drilling

July, 2021: Initial Mineral Resource of 1.7M ounces Au indicated @ 0.5 gt Au.

Drill on Discovery Ridge (D-1, D-2, D-3 zones below)

14 sq. km district

2021 RC drilling in DZ: 70,000 m.

Completed at end November.

New PEA: 2022, 3Q

CD Pit with rangefront fault

Stacked plates of Oquirrh Fm. clastics, limestones

2021-041
Liberty Gold: Black Pine

3 Drills working on Rangefront area – will continue through winter

New Rangefront D-4 discovery (LBP358: 1.23 g/t Au over 24 m + 1.37 g/t Au over 50 m.)

New Back Range intercepts (late Nov. 2021)

From Liberty Gold website – recent results and cross-sections there
Integra Resources:  
*De Lamar and Florida Mtn. projects*

- Three mineralizing centers: De Lamar mine, Florida Mountain, War Eagle plus greenfield targets.
- Surface oxide; underground targets; multiple high-grade intercepts.
- Low sulfidation, epithermal Au-Ag veins.
- Drilling all year, permitting, metallurgy and engineering studies.
- October: Increased scope (tonnage) of PFS to ~ 32,000 tonnes per day heap leach and 8,000 tpd mill. Increases Ag recovery.
- PFS by end of 2021.

**FME 21-118, 819.5 – 831 ft.** Intrusive rhyolite dike with quartz-adularia flooding, quartz-adularia-pyrite-AgS veining and fault breccia. Up to ~5% AgS in central vein (inset).
Integra Resources: Silver City District
Florida Mountain Deposit

Stone Cabin pit (former Kinross mine)

New IGS map DWM-193 De Lamar quad regional geology

FME-21 127, 544-545⁰ @ 28.3 g/t AuEq in crustiform quartz vein with Ag sulfide, pyrite infilling.
IGS DWM – 193

Geologic Map of De Lamar and Swisher Mtn. Quadrangles, Owyhee County, Idaho

(Plate 1 of 2)

Download pdf from IGS website
Released Early Summer, 2021

2021-045
BeMetals/Thunder Mtn. Gold: South Mountain

- 2021: 3,500 feet of surface core drilling
- Initial metallurgy
- Started South Mtn. PEA
- June: Updated NI 43-101

- 2020: 8,000 feet of underground core drilling
- Updated resource model
- Initiated preliminary scoping and mine/mill design

Zinc skarn and replacements: + Au, Ag, Pb

Owyhee County, Idaho
South Mountain

**Legend:***
- **2020 Drill Hole with Intercept**
- **CM**
- **DD**
- **2020 Drill Hole with Intercept (2019-S labeled)**
- **C**
- **2019 Drill Hole with Intercept (2019-S labeled)**
- **D**
- **Comprehensive Resource Location**
- **Composite Trench Sample**
- **2020 Measured and Indicated Resource (1,877,300 tonnes @ 2.85% ZnEq)**
- **2020 Inferred Resource (2,763,300 tonnes @ 1.8% ZnEq)**
- **2012 Measured and Indicated Resource**
- **2012 Inferred Resource**
- **2020 Inferred Resource**
- **2020 Reactivated mine drift**

**BeMETALS HAS DELIVERED**

- **21.8% INCREASE IN MEASURED & INDICATED TONNAGE**
- **129.5% INCREASE IN INFERRED TONNAGE SINCE THE 2019 MRE**

2021-047
Thanks!

- **Other Projects:**
  - **Kilgore: Excellon Resources – Permit for exploration drilling received from USFS in November.**
  - Western accreted terrane potential: Bald Eagle at Hercules Ag mine, Constantine (VMS?)
  - **Au in far south?**
  - Rare earths in Lemhi County
  - And more

- vgiilerm@uidaho.edu

[Website]: www.idahogeology.org
2021 Highlights

- Back to Business – Covid is over, but dealing with it. Omicron?
- Lucky Friday mine – Strike ended
- Phosphate – Full production, new mines in permitting
- Metal Prices:
- Cobalt: ~ $26/lb. vs. $18 at end of 2020
- Moly Oxide: ~ $12 - $13/lb.
- Critical Minerals – Federal Awareness; Idaho Prospects: Co, REEs, Zn
- Exploration – Advanced Projects & Resources: Au-Ag focused
- Late November omicron slump?
Coeur d’Alene District: in Top Ten Globally for Total Silver Production

- 1,256,612,343 troy ounces Ag (39,085 metric tons Ag metal)

- Updated Historic Silver Production (1884 – 2020)
  - 81 million troy ounces Ag
  - 7.8 million metric tons Pb; 3 million metric tons Zn; 191 thousand metric tons Cu; + Sb

- Idaho has Produced Silver Since 1860s
  (More Ag than Nevada at ~ 600 million oz. Ag)

- 2020 USGS Summary: Four primary Ag mines in US; 2 of those are in Idaho
  - Lucky Friday and Galena mines

- Multiple Ag Deposit Types and Geologic Settings to Explore

---

Idaho Silver Production, 1978 – 2020

- Price is yearly average from kitco.com

---

Coeur d’Alene District (CDA)

- Today’s mines (red) and projects

---

2021-050
Hecla: Lucky Friday Mine

- Full year of full production after labor strike, 2017-2020. Approx. 3.5 M oz. Ag in 2021.
- Infrastructure improvements.
- New longhole blasting method.
- Underhand Closed Bench Mining method.

CDA veins are quartz (white) - siderite (tan) – sulfides. Gray in the photo is galena (PbS).

Americas Gold and Silver Corp.: Galena mine

- Joint venture investment with Eric Sprott
- Phase 1 (18 months ending June 2021); Phase 2 starting
- Massive, successful exploration
- 120,000 feet drilling
- Replaced reserves and increased resource (+38% P & P; +72% increase M&I, +36% inf. Ag)
- Rehab and development work on 7500 feet of drift, hoist replacement underway
- New mining equipment

Galena mine - long section

- Mine has two vein types:
  - Silver-copper (tetrahedrite-rich)
  - Lead-silver veins (Ag-bearing galena)
Slide 13

- Hess Pumice
  - Good year
  - Product demand up significantly
  - Had to increase winter stockpile

- Wrights Creek mine
- Others:
  - Covia - sand, doing good
  - Bear River Zeolite - market good but maintenance and labor issues
  - Concrete use and aggregate demand - recede

Slide 14

- Phosphate Formation: Permian Age (265 Ma)
- Black phosphatic shale of regional extent. Ore is approximately 20% P₂O₅ and various strata are enriched in trace elements including V, REEs, Se, U, etc. Mine 4-5 million tons/year.

- Phosphate: the "biggie"
- 2021 - Phosphate is largest segment of the mining industry.
- 3 large processing plants, 3 large open pit mines, new mines in construction, southeastern Idaho. Approx. 4-5 million tons/year.
- Products:
  - Phosphoric Acid Fertilizer
  - Elemental Phosphorus

Slide 15

- Phosphate Plants: Fertilizer and Elemental P
- Simplot's Don Plant, Pocatello
- Itafos' Conda Fertilizer Plant (mid-left)
- Bayer Elemental P Plant (lower right)
Slide 16

J.R. Simplot Company:
Smoky Canyon mine
- Surveying by drone
- Reclaimed pit F2
- Mining in areas G2 and G3
- Post-reclamation
- Reclamation North Panel F
- Development East Smoky A
- Maintenance early pipeline to Conda

January, 2021: F2 pit, looking toward F3

Slide 17

Bayer (formerly Monsanto):
Blackfoot Bridge mine
- Mine at phases: F2, F3, F4
- Work transitioning to South pit (final)
- Concurrent reclamation with 31 acres of government-owned
- Anticipate completion in 2024
- Reclamation approaches the East Smoky Canyon area. Completed reclamation work and task by Valley Mine of BLM

Blackfoot Bridge mine

Slide 18

RECORD OF DECISION (BLM Approval): August, 2017
- Mine life expectancy: 45 years, 1,800 acres, of which original 1,559 acres the federal mining patents owned by P4 Production LLC
- Developed mining works: constructed haul roads, ore shooters, 100-mile rail transport, construction of two pit tunnelling facilities, pit fill
- No stay; work continues.

April 27, 2021: Groundbreaking by three environmental groups, opposed by mining company. Agreement of three groups and BLM (environmental groups) to stop work continues.

Bayer’s new Caldwell Canyon mine

2021-054
Slide 19

Itafos: Rasmussen Valley mine

Slide 20

Itafos – Reclamation and Permitting

- Reclamation and cover installation at South Rasmussen Ridge mine
- Also reclaiming Lanes Creek mine (private)
- Permitting: Husky 1/North Dry Ridge mine application (14-year mine life on 1145 acres)
  - NOI released Oct. 22, 2021 [BLM/USFS]
  - Soliciting public comments to support project, with over 500 jobs and $50 million in local wages and benefits
  - BLM anticipates mid-2022 for Final ES

Slide 21

Southwestern Idaho Gas Play - 2021 Activity

- Commenced production of the Barrow 1-14 (12) in 01/2021. Well currently producing 2,500 mcf gas and 60 bbls of condensate per day
- Drilled and completed the Barrow 2-14 (13) in 10/2021
- Drilled and completed the Barrow 3-14 (14) in 11/2021
- Permitted to drill the Dutch Lane 1-10 (15) in 12/2021

2021-055
Idaho State Activities

IDAHO GEOLOGICAL SURVEY

2021:

- Geological Mapping and Research
- Statemap, EMRI: IGS-USGS
- Industry Collaborators: Integra Resources, others
- Data Preservation: IGS-USGS

Mines & Minerals

Regional Developments/Annual Reports – on website

Ore Deposits Research, GSA Lemhi Pass talk

Critical Minerals – USGS-IGS (Earth MRI); Salmon Field Conference, Cobalt Belt Mapping

Earthquake Response and Research

USGS-IGS-BSU: Aftershocks continue

Groundwater Projects: Raft River, Big Lost River basin

Geologic Hazards: landslide database

www.idahogeology.org

Geologic map of De Lamar & Swisher Mtn. quadrangles

DWM-193 (2021)

Reed Lewis mapping near Salmon, Idaho

Data Preservation Program:

- Christopher Tate
- Jess Starnes

GO ONLINE: IGS website

www.idahogeology.org

Search > 8000 mines and prospects by location, commodity, name

Scanned property files

Annual mining presentations online

Free downloads

Mineral Property File Scans

www.idahogeology.org

Idaho Geological Survey

Exploration 2021

- High metal prices – precious and base metals
- Critical resource metals – Niobium and battery metals
- Lots of drilling
- Good drill results
- Underground targets and feeder zones (Stalin is king)
- New immersive area-based on vertical deposit
- Core storage
- Permitting
- Metallurgy and processing
- Off-take agreements in global market

2021-056
Bunker Hill Mining Corp.: Bunker Hill mine

- Funding aggressive exploration all areas. Management. Option to acquire till 2022. Existing teams.
- 3D modeling of historic stopes, DH, mine workings. UTZ, Newgard, Quill ore zones.
- New focus on Ag-Au-Ag at mine.
- Drilling - Phase 3 campaign (14 holes). 2021-
- Mining - Phase 2 campaign (14 holes). 2021.
- Inks-Gold mine. Assay Fund.
- Completed reserve reclassification survey.
- 43-101 and favorable PEA done. Known 8 mt Zn.
- Drilling Phase II complete: 16 holes (3000 ft.)
- Jersey and Deadwood veins on 9 level.
- Completed 23-line IP/resistivity survey in fall.
- Rapid Restart; water management.
- Silver Valley Metals
  - Ranger-Page Project - just west of Bunker Hill
  - Recent Acquisition - multiple targets, historic sites.

Silver Hammer Mining Corp.: Silver Strand mine – near CDA

- Formerly Lakewood Exploration
- Name Change this fall
- Past producer, worked by New Jersey Mining
- Revett Quartzite host
- High-grade underground grab samples to 2744 g/t Ag and 4.8 g/t Au
- Quartz veins in shear zones
- Rehabilitated underground
- Drill program started October, 2021 (2700m)
- Test for deeper mineralization
- Platform Drills - less ground disturbance.

Perpetua Resources (Midas Gold):

- Stibnite Gold Project
- Name Change in Feb. 2021.
- Moved Corporate HQ to Boise.
- EIS process (Payette NF) extended with supplemental EIS in early 2022.
- Multi-million ounces Au plus strategic and critical antimony (Sb) resource. Only near-term US source.
- Agreement with Ambri – Sb for battery manufacturing.
- Agreement with EPA for pre-mining removal actions of historic WW2 mine wastes/tailings over 3 years.
- Tribal issues from Nez Perce treaty fishing?

• P & P Reserve: 4.8 M ozs Au @ 1.43 g/t; 148 M lbs Sb, plus additional resource.
Slide 28

Stallion Gold: Horse Heaven Project

- West of Stibnite and south of town of Yellow Pine
- Historic Sb, Au and W workings and production
- Along Golden Gate Shear Zone
- New IGS geologic map of Yellowjacket area (2021-150) funded by Stallion's predecessor private group
- Working off intrusion-related gold system model, but also on Golden Gate Fault zone
- Historic data in IGS database

- Antimony Ridge
- 695 claims, staked 2012

Slide 29

Revival Gold: Beartrack mine; Arnett Creek

- PEA – late 2020, feasibility study
- Updated resource & PFS in 2022
- 3,800 m 2021 drilling program
- Haidee Target (Arnett): 15 core holes in near-surface oxidized zone, infill/exploration
- Beartrack Joss: 5 DDH for 2,380 m, discovery hole 2021-058
- BT21-237D hit 11.79 g/t Au over 2.5 meters within 84 m of 2.67 g/t Au
- 3-D Modeling by Mira Geoscience Ltd.

- Beartrack: Joss area had 5 DDH for 2,380 m. High-grade, underground Au over 1 km strike. Prior intercepts 4-9 g/t Au over 1-5 m.

- Fire Season!

Slide 30

Revival Gold: Beartrack Joss Zone

- Joss Zone: sheared, altered Yellowjacket Formation.
- In interval of 6.84 g/t Au over 3.9 m drilled width
- "Panther Creek Fault Zone" – SW of Beartrack south pit
- Latest: BT21-240D hit 4.3 g/t Au over 110 m, inc. 12 g/t Au over 13.7 m
- True intervals

2021-058
Slide 31

Freeman Gold
Lemhi Gold Project

- Former Ditch Creek property near North Fork, N of Salmon.
- Historic placers and drilling by AGR/FMC.
- 2020: 7,149m of drilling in 35 holes
  - FG20-001C had 25m of 3.3 g/t Au
- Highly oxidized and faulted areas; flat-lying mineralized near surface. Mag suggests intrusion of depth to SE.
- July, 2021: NI 43-101
- October: Beauty Zone surface rock chip/soil anomaly, inc. 28 samples > 10 g/t Au. (+ Ag, Cu credits)
- Trenching underway.

Slide 32

Ophir Gold Corp.:
Breccia Property (Musgrove Creek/Porphyry Ridge)

- Historic workings south of Musgrove Creek and north of Porphyry Creek, 40 km SW of Salmon.
- 1.5 km Au-bearing trend with historic bulk sample (11 g/t Au).
- East Breccia zone – 2020 discovery.
- Low sulfidation, epithermal deposit.
- Diamond Drill Program – About 3,200m in 10-15 holes delayed by fires but underway in fall.
- CSAMT survey started in September (15 lines).
- Additional silicified breccia outcrops.

Slide 33

OPHIR GOLD: Breccia Project 2021

2021-059
NW-trending belt of Co occurrences: ~30 miles long by 5 miles wide. Host is Mesoproterozoic “Yellowjacket” metaseds. Siltites, argillites with biotitites (possible exhalative stratabound zones).

Minerals: cobaltite, chalcopyrite with gold, and minor pyrite, arsenopyrite, and pyrrhotite. Mineralogy changes on belt. Blackbird mine (1902-1968). 2017 Co is critical mineral according to US Government. Metamorphic grade increases to NW along belt, as get closer to Cretaceous intrusions and more regionally metamorphosed rocks. Not sure about origin of mineralization or trend. May reflect orientation of original Proterozoic rift???? Structurally complex. Blackbird District is largest. Noranda defined about 18 million ton reserve there in ~1970s before Co prices collapsed and it was never mined. Now patented district has permanent water treatment plant and old tailings reclaimed. See 2016 paper on district by Bookstrom and others in GSA Special Paper.
Jervois Global Ltd.:
Idaho Cobalt Operations (ICO)

- 1997 RAM discovery by Formation Capital Corp./eCobalt. Extension of Blackbird Cu-Co-Au horizons.
- Permitted with some earthwork completed prior to purchase by Jervois. Financing.
- Board approval of full construction. Contractors: Klepfer Mining Services, M3.
- Site infrastructure: Mill/concentrator foundations, lined TWSF, water treatment plant, portal bench, buildings, initial ug.
- Jervois has refinery in Brazil; acquired Freeport Cobalt, a Finnish Co business in Finland.
- Anticipated start of production: Mid-2022. Delayed depending on winter issues.

Jervois: Idaho Cobalt Operation RAM Portals December 2021

Jervois Global Ltd.:
Idaho Cobalt Operations (ICO)
- 1997 RAM discovery by Formation Capital Corp./eCobalt.
- Extension of Blackbird Cu-Co-Au horizons.
- Permitted with some earthwork prior to purchase by Jervois.
- Financing approved.
- Board approval of full construction.
- Contractors: Klepfer Mining Services, M3.
- Site infrastructure: Mill/concentrator foundations, lined TWSF, water treatment plant, portal bench, buildings.
- Jervois has refinery in Brazil; acquired Freeport Cobalt, a Finnish Co business in Finland.
- Anticipated start of production: Mid-2022.
- Delayed depending on winter issues.

Jervois: Idaho Cobalt Operations RAM Portals
- East portal opened at Idaho Cobalt Operations, November 2021; west portal development in progress.
- Battery grade Co sulfate for EV Li-ion battery market.

Electra (First Cobalt Corp.):
Iron Creek (Co-Cu) Deposit
- Large drill program (43 DDH) in 2019 and 43-101 resource; 2020 IP/Resistivity survey; metallurgy for cobaltian pyrite.
- Ruby zone 2020; doubled land position in May. Surface sampling.
- 2021 Drilling (Sept.): ~ 6 holes with 8500 feet of oriented core. Goal to extend resource E and W. Open down-dip and along strike.
- Chargeability anomalies.
- Ore zone projections (Cu and Co distinct but adjacent).
- Challis volcanic covered areas.
- Continued metallurgy (CSM) and research.
- Company has hydromet refinery in Cobalt, Ontario – restart, marketing agreements.
**Slide 38**

**Idaho Champion: Champagne Project**

*Precious and base metals: magmatic related*

- **Preliminary Results:** Anomalous alteration, base metals, Ag in first 2 holes, outer porphyry zoning interpretation.

- **Champagne mine:** Bema Gold (Au, Ag, closed 1992)

- **2021:**
  - 10 DDH (3432 m) just completed
  - Two new IP lines (7800 m) to expand IP survey to N and W
  - Coincident Surface Geochem, IP
  - Structurally detached at depth
  - Very large chargeability
  - 1600m Elev
  - Check website for details

**Slide 39**

**Phoenix Copper Ltd. (Konnex): Empire mine, Mackay**

- **2021**
  - 4,500 m Deep Sulfide Program
  - 979 m completed as of late November
  - 4 holes hit high-grade Au, Ag, Cu, Pb, Zn plus W below open pit oxide resources
  - Also Hydrologic Characterization
  - Planned RC at Navarre Creek and core at Red Star and other areas
  - Hosted TRGS tour
  - Working on PEA for open-pit, oxide copper mine

**Slide 40**

**Liberty Gold: Black Pine project**

- **July, 2021:** Initial Mineral Resource of 1.7M ounces Au indicated @ 0.5 g/t Au.
  - 14 sq. km district
  - Over 263,000 meters drilling
  - 2021 RC drilling in DZ: 70,000 m.
  - Completed at end November.
  - New PEA: 2022, 3Q

- **CD Pit with range front fault**
  - Stacked plates of Oquirrh Fm. clastics, limestones
Liberty Gold: Black Pine

New Back Range discovery (LBP358: 1.23 g/t Au over 24 m + 1.37 g/t Au over 50 m).

From Liberty Gold website - recent results and cross-sections there

3 Drills working on Rangefront area - will continue through winter

Integra Resources: De Lamar and Florida Mtn. projects

- Three mineralizing centers: De Lamar mine, Florida Mountain, Pink Mountain, West Bingo plus greenfield targets.
- Surface oxide, underground targets, multiple high-grade intercepts.
- Low sulfidation, epithermal Au-Ag veins.
- Geophysical, permitting, metallurgy and engineering studies.
- December, increased drilling (5,000 ft), 15,000 ft. Total: 22,000 ft.
- PFS by end of 2021.

Integra Resources: Silver City District

Florida Mountain Deposit

Stone Cabin pit (former Kinross mine)

New IGS map DRM-193, De Lamar area regional geology

2021-064
IGS DWM – 193

Geologic Map of DeLamar and Swisher Mtn. Quadrangles, Owyhee County, Idaho

Slide 44

BeMetals/Thunder Mtn. Gold: South Mountain

- 2021: 3,500 feet of surface core drilling
- Initial metallurgy
- Started South Mt. PEA
- June: Updated NI 43-101
- 2020: 8,000 feet of underground core drilling
- Updated resource model
- Initiated preliminary scoping and mine design

South Mountain 2021-065

Slide 45

2021-065
Thanks!

- Kilgore: Excellon Resources—Permit for regional drilling submitted June 2021, in November.
- Western accreted terrane potential: Bald Eagle at Hercules Ag zone, Constantine (VMS?)
- Au in far south?
-REE wealth in Lemhi County
- Au in far south?
- vgillem@uidaho.edu

www.idahogeology.org