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** – **Au**: $1801/tr. oz., **Ag**: $24.07/tr. oz., **Cu**: $4.90/lb., **Zn**: $1.55/lb., **Pb**: $1.11/lb. (10/28/2021 spot on kitco.com)
  - **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

Lucky Friday mine – Strike ended
2020 and prior year’s mining talks are on the IGS website Mines & Minerals page.
Idaho Silver Facts

- 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)
  - At 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 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

Mine has two vein types:

- **Silver-copper** (tetrahedrite-rich)
- **Lead-silver veins** (Ag-bearing galena)

Completed Phase 1 exploration drilling in blue.
Silver vein trend closeup

Silver HW Vein (New Discovery)

55-176: 6.0' @ 3, 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
55-178: 2.8' @ 125.5 oz/t Ag, 3.1% Cu
55-175A: 9.0' @ 215 oz/t Ag, 6.4% Cu
55-148: 2.5' @ 157.6 oz/t Ag, 4.2% Cu

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

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!
Phosphoria Formation: Permian Age (265 Ma) black phosphatic shale of regional extent. Ore is approximately 25% $\text{P}_2\text{O}_5$ 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.
Bayer’s new Caldwell Canyon mine

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

Backfilled area behind blasthole rig, 2021

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

Reclaimed area with 1-year grass growth
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

IDAHOGEOLOGICAL SURVEY
2021:

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

- 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

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

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

Mineral Property File Scans
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/tailings 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
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/t Au
- 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
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

Only domestic Co reserves
Primary Co resource

- 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)

Regional geologic-map inset (after O’Neill & others, 2007), showing the Belt-Purcell basin, the Lemhi sub-basin, and the Idaho cobalt belt. Geologic Map of the Eastern Salmon River Mountains, (after Evans and Green, 2003), showing Co-Cu deposits and Cu-Co prospects of the Idaho cobalt belt. From SE to NW, prospects and deposits are:
- IC = Iron Creek prospect (p)
- BP = Black Pine deposit (d)
- CNC = CoNiCu (p)
- HS = Haynes-Stellite mine (d)
- B = Blackbird Deposit (D)
- SR = Sweet Repose (p)
- TP = Tinkers Pride (p)
- EHC = Elkhorn Cr. (p)
- SCC = Salmon Canyon Cu (p)

Metamorphic grade increases from SE to NW (Nold, 1990).

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.
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
Liberty Gold: 
Black Pine project

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

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

Over 263,000 meters drilling

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

2021 RC drilling in DZ: 70,000 m.
Completed at end November.

New PEA: 2022, 3Q

CD Pit with rangefront fault

14 sq. km district

Stacked plates of Oquirrh Fm. clastics, limestones
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

New IGS map DWM-193 De Lamar quad regional geology

FME-21_127, 544-545' @ 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
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
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

vgillerm@uidaho.edu

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