

BUTTE HIGHLANDS JOINT VENTURE



Butte Highlands Joint Venture Mine Design, Operations, and Closure Conference Mine Water Treatment Short Course

May 3, 2015

Butte Highlands Joint Venture



Highland Mining (ISR Capital)

- ISR Capital a private investment and merchant-banking firm headquartered in Boise, Idaho
- Funding development of Butte Highlands Project to commercial production

> Timberline Resources

- Gold Focused Advanced-Stage Exploration & Development in Western U.S.
- Butte Highlands Joint Venture in Montana
- Talapoosa, Eureka, and Seven Troughs Projects, Nevada

Project Location





Highlands History



- > 1866—discovery of placer gold on Fish Creek 1866
- Highlands City grew to 4000 +
- Nevins discovers bedrock gold and by 1868 shafts and arrastras are established
- > 1919 Highlands Mine Tunnel developed
- Intermittent mining into the 1930's. By late 1937 Highlands Mine operating and producing ore from a "modern" cyanide mill
- 1942 Butte Highlands terminates operations due to L - 208





Surface Geology





Mineralization, Typical Section Looking 310°





Development Concept



3D Model Looking Northwest



Permitting Status



Exploration License

- Allows development work, but no surface discharge to drainages
- Allows monitored discharge to LADs
- MPDES Permit—DEQ Water Protection Bureau, August, 2013
 - Compliance to meet State Non-Degradation Water Quality Standards
- Hard Rock Operating Permit—DEQ Hard Rock Mining Program,
 - Final EIS, ROD received January, 2015
 - Final Permit pending bond payment

USFS Plan of Operations—Beaverhead Deer Lodge National Forest

- Draft Decision Notice, March, 2015
- Final: May or June, 2015
- EPA UIC Class V update August, 2014

Permitting— Hydrogeology and Discharge



Current groundwater surface at ~7,339 ft elev.

- Controlled by historic Highlands Mine adit
- Discharge as Basin Creek headwaters

Aquifer dewatering test

- Predicts up to 750 gpm dewatering rate
- ~7-8 years estimated postmining groundwater recovery



Permitting—Operational Water Discharge and Monitoring

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Surface and Groundwater Monitoring

- 2008–2013: 16 sites
- Monthly to quarterly sampling
- >350 samples collected

MPDES Permit-Final August, 2013

- Weekly water quality monitoring required
- <u>Whole Effluent Toxicity</u> Testing
- Steam-bed composition monitoring



MPDES Water Discharge Limits

750 GPM maximum

- Non-Degradation water quality standards
- Outfalls in Basin Creek,
 Moose Creek, and Fish Creek
- Flow Criteria
- Determination of Nonsignificance on Basin Creek

Parameter and Code	<u>Units</u>	<u>MPDES</u> <u>Target</u> Limits
Ammonia, Total (as N)	mg/L	0.07
Arsenic, (Total)	µg/L	2.0
Cadmium, (Total)	µg/L	0.03
Chromium, (Total)	µg/L	10
Copper, (Total)	µg/L	2
Fluoride	µg/L	200
Lead, (Total)	µg/L	0.3
Mercury, (Total)	µg/L	0.01
Nickel, (Total)	µg/L	2
Nitrite + Nitrate (as N)	mg/L	0.11
Nitrogen, Total (as N)	mg/L	0.15
Phosphorus, Total (as P)	mg/L	0.008
Selenium, (Total)	µg/L	1
Zinc, (Total)	µg/L	8.0
рН	S.U.	7.0-8.5
Total Suspended solids (TSS)	mg/L	0.4

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Water Quality



Current Basin Creek Discharge from historic Old Highlands Mine Portal

- Meets Montana Drinking Water Standards
- Historic development into sulfide zone

Anticipated Dewatering

- Likely would meet Montana Drinking Water Standards
- Required to meet Non-Degradation Discharge Standards

Surface Water Monitoring

- Strong seasonal variation in flow on Moose and Fish Creek
- Relatively constant flow at Basin Creek outfall

Estimated Dewatering Water Quality and Non-Degradation Discharge Limits (-)







Estimated Dewatering Water Quality and Non-Degradation Discharge Limits (-)



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Outfall Water Quality and Discharge Limits





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- Critical Parameters requiring treatment
 - As, Cu, Pb, Ni,
 - Zn, Hg, P, N

Water Management and Treatment Strategy



- TSS removal through coagulation/filtration
- Ion Exchange treatment bench and pilot testing
 - 16 regulated contaminants with 10-100x spikes for fluoride, ammonia, nitrate, and total Nitrogen
 - Resin working capacity estimates:
 - Cation resin: ~1.3 Eq/L (strong acid cation exchange)
 - Anion resin: ~1.5 Eq/L (weak base anion exchange)
- CO₂ stripping
- pH adjustment

Water Treatment: Ion Exchange



- Severn Trent Higgins Loop
- > 750 GPM capacity



Water Treatment: Ion Exchange Process Flow Diagram

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Treated Water Management



> Treated water discharge:

- Basin Creek: release inside historic portal
- Moose Creek: pipe to Outfalls 003 and 004
- Fish Creek: pipe to Outfall 002



Mine sump water: potentially pipe to LAD infiltration system under EPA UIC Permit

Will require DEQ approval

Water Management — Closure Planning

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Hydrologic Mitigation—Post-Mining

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Basin Creek

- Anticipate ~20 gpm flow at headwaters (~1/5th of current)
- How to avoid Non-Deg violation
- Blacktail Creek stream habitat support

Fish Creek

- Supplemental flow from Butte-Silver Bow's Emerald Lake aqueduct
- Support FWP's long-term stream restoration efforts



Basin Creek Mitigation



Supplemental Monitoring

- Monitoring Well MW13-001
- Flow weir installation and monitoring

Impacts Compensation

- Fish, Wildlife and Parks: Blacktail Creek mitigation
- Culvert improvements
- Sediment control



Potential Regulatory Changes on Water Quality Standards and impact on Mining



Non- Degradation Standard

- Water Quality
- Flow Criteria

Senate Bill No 325 (Keane and Vincent)

Bring to consistency with EPA Standards

Future Production

