

Cunningham Hill Mine Reclamation Project

BARRICK



LAC



Site Overview November 2, 2022

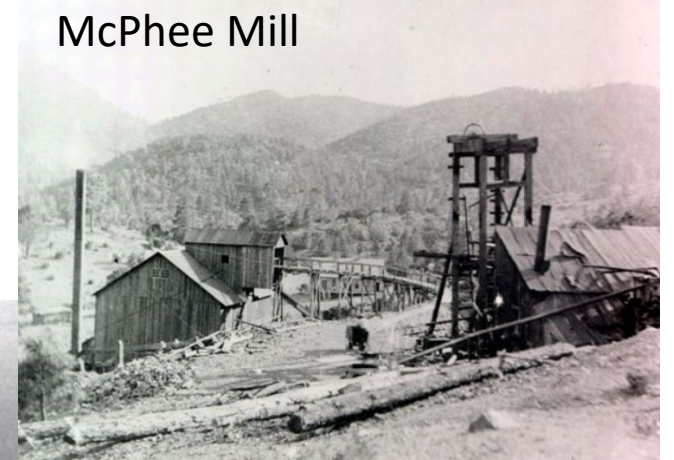
Overview

- ▀ Mining History
- ▀ Site Features & Information
- ▀ Regulatory Oversight
- ▀ Site Reclamation
- ▀ Path Forward

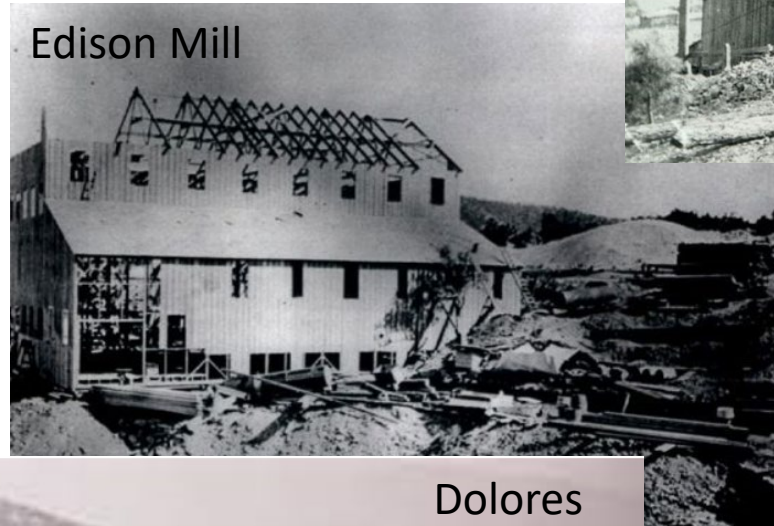
Mining History

- ✓ Santa Fe County had the first western gold rush dating back to the early 1820's when gold was discovered by Mexican citizens.
- ✓ By 1865 the first stamp mill was operating with Thomas Edison's Mill constructed in 1898.
- ✓ Modern-day mining occurred 1979-1987 which is the focus of current reclamation.

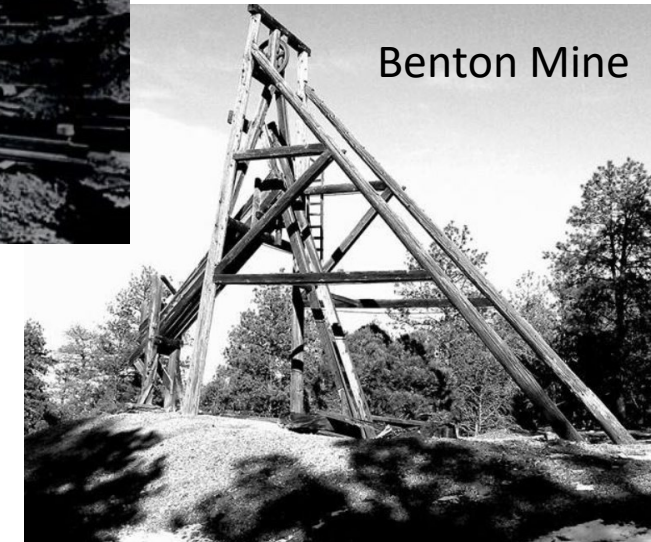
McPhee Mill



Edison Mill



Benton Mine



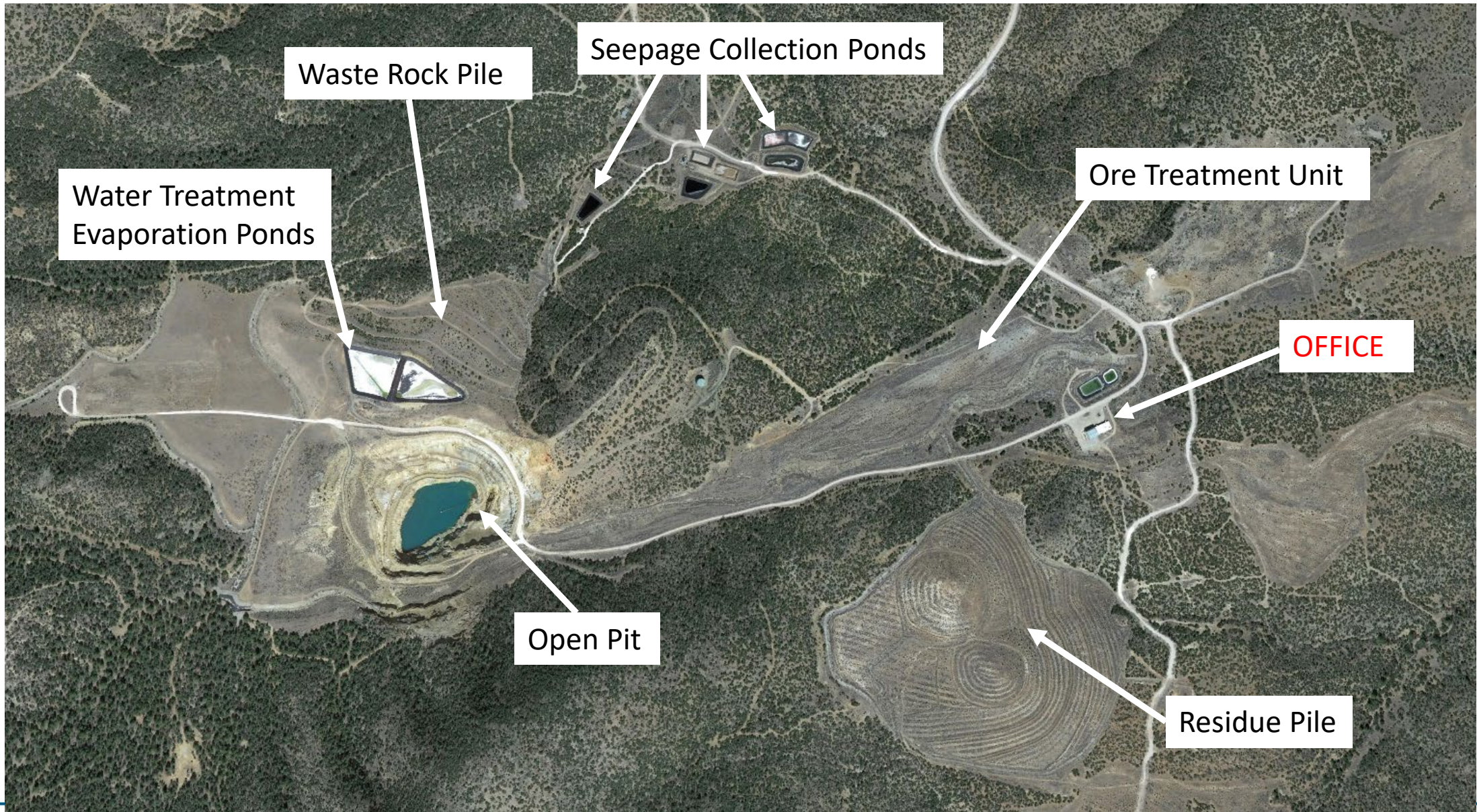
Dolores



Site Information

- ✓ Located on 3,000 acres of private land at an elevation of approximately 7,000 ft.
 - ✓ Originally mine boundary included 4,350 acres of land; however, 1,350 acres have since been donated by Barrick to the Santa Fe Botanical Garden for the Ortiz Mountain Educational Preserve.
 - ✓ The mine was developed and operated 1979 thru 1987. Waste rock material was placed in Dolores Gulch which formed the Waste Rock Pile. Ore mined from the open pit was crushed and placed on an impervious asphalt leach pad where it was leached with a dilute cyanide solution to extract recoverable gold. Spent ore was then rinsed with fresh water and relocated to the residue pile.
 - ✓ LAC Minerals was acquired by Barrick in 1994 seven years after mining ceased. Barrick has been progressively cleaning up the site ever since.
-

Site Facilities



Regulatory Oversight

- ✓ NMED Discharge Permit DP-55 - Waste Rock Pile and Residue Pile
- ✓ NMED Abatement Plan AP-27 - Open Pit
- ✓ NM Mining & Minerals Division Reclamation Permit SF002RE - reclamation of disturbance
- ✓ NMOSE Water Right Permit - RG-32970 et al
- ✓ EPA NPDES Permit Open Pit Discharge
- ✓ EPA National Stormwater Discharge Permit



Regulatory Monitoring/Reporting

✓ **NMED Discharge Permit DP-55 - Waste Rock Pile and Residue Pile**

- ✓ Quarterly groundwater monitoring (27 wells, 3 springs)
- ✓ Monthly inspections
- ✓ Quarterly and Annual reports

✓ **NMED Abatement Plan AP-27 - Open Pit**

- ✓ Quarterly groundwater monitoring requirements (4 wells, open pit depth sampling)
- ✓ Quarterly reports

✓ **NM Mining & Minerals Division Reclamation Permit SF002RE - Sitewide**

- ✓ Post storm event, monthly and annual inspections
 - ✓ Annual reports
-

Reclamation History

- ✓ 1987 - Mining Ceased which had created approximately 362.96 acres of disturbance
- ✓ Successful reclamation of the facility primarily occurred in mid the 1990s after Barrick's acquisition of LAC.
- ✓ Reclamation was recognized by the New Mexico Mining and Minerals Division Excellence in Reclamation awards in 1996 and 1998.
- ✓ Thus far, of the 331.99 acres to be reclaimed, approximately 325.88 acres have been reclaimed (98% complete).

Open Pit Reclamation

- ✓ Approximately 34.13 acres disturbed, and 14.76 acres successfully reclaimed
- ✓ In accordance with the state approved reclamation plan, reclamation activities performed have created as stable and steady state condition. Key activities completed include:
 - ✓ Exclusion berms/fencing
 - ✓ Source controls reducing Acid Wall Seepage (AWS)
 - ✓ Stormwater controls reducing AWS
 - ✓ Periodic water treatment
- ✓ Result is that the Open Pit that is compliant with AP-27 surface water standards

Open Pit Reclamation

1996

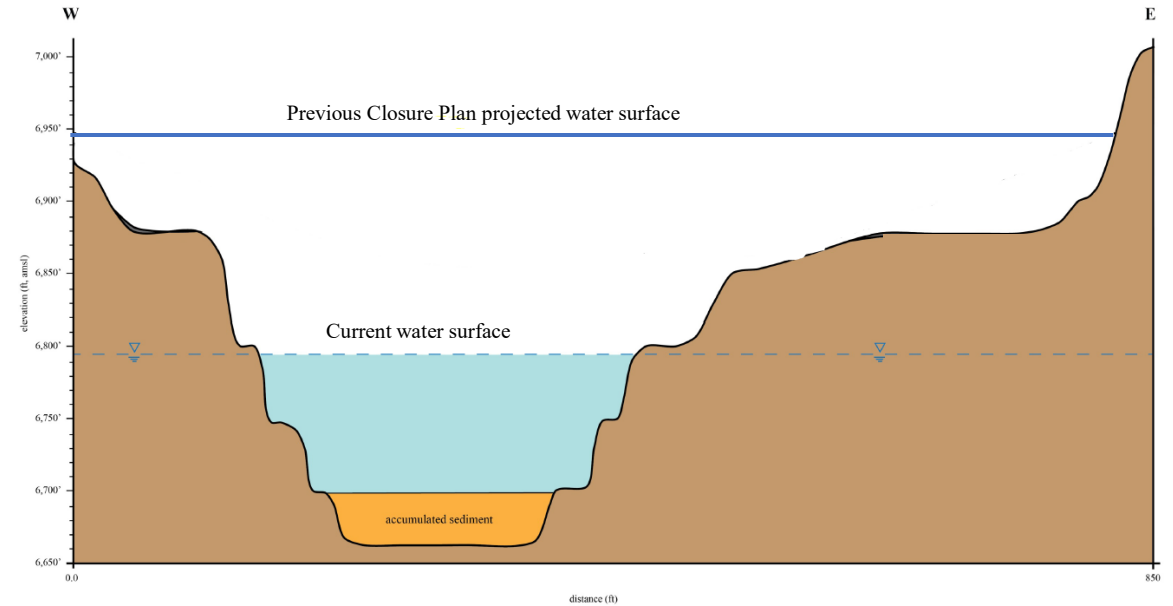


2022



Open Pit Reclamation (cont.)

- Previous closure plan projected stormwater would fill the pit to an elevation of 6,945 ft inundating a significant portion of the pit walls and benches. Plan was based upon precipitation data of the time (pre-1998 average annual precipitation of 17 inches) and past watershed conditions.
- Present day steady-state surface water elevation is approx. 6,795 ft. Changes in climate have been observed as the 1998-2021 average annual precipitation is 13 inches, and watershed vegetation has significantly overgrown.



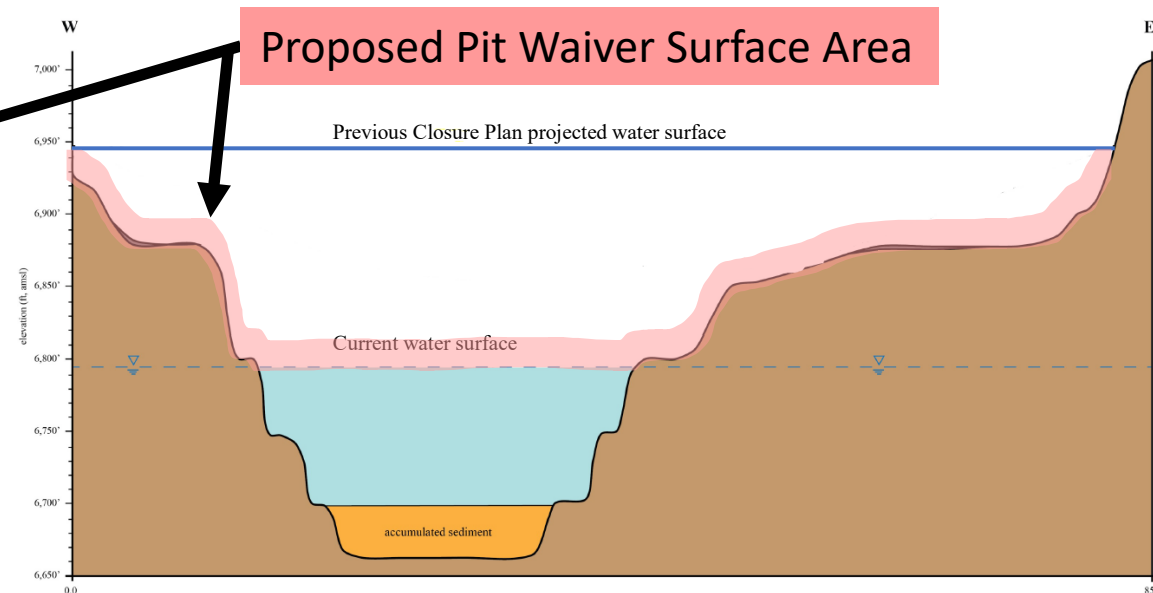
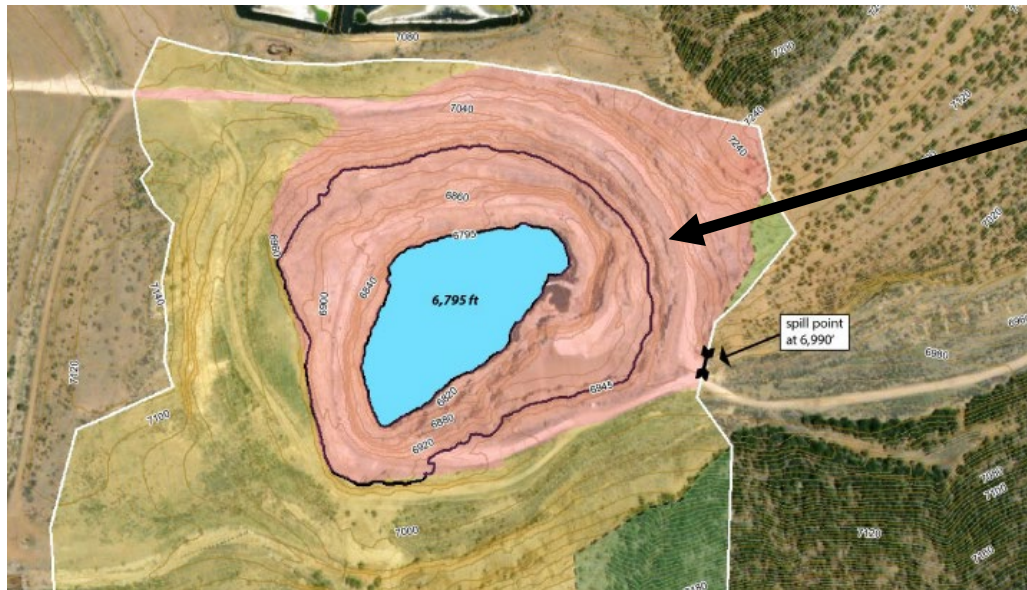
Open Pit – SSE Waiver Alternates

- ✓ The pit has not and likely will not fill to the 6,945 ft-amsl elevation; therefore, there is an area of pit walls and benches that will not be covered by water as originally planned. As a result, an analysis was conducted to look at alternate reclamation for these areas.
- ✓ Four reclamation options for achieving a post-mining land use or self-sustaining ecosystem were evaluated. Each option was evaluated for technical feasibility, economical feasible, and environmentally soundness in accordance with Mining & Minerals Division regulations.

Open Pit reclamation option	technically feasible	economically feasible	environmentally sound
Fill with storm water	no	yes	yes
Fill with groundwater	no	no	no
Partial backfill	no	no	no
Backfill to 6,945 ft elev	no	no	no
Backfill to 6,990 ft elev	no	no	no

Open Pit – SSE Waiver

- A pit waiver is necessary because achieving a self-sustaining ecosystem (SSE) is not technically or economically feasible and is environmentally unsound for the water surface, vertical rock walls and benches. The area proposed for the waiver is approximately 16.55-acres of pit walls/benches and 2.82-acres of water surface (conceptually shown below).
- A pit waiver only modifies the requirement of physical reclamation of the surface disturbance area.
- Water quality will continue to be regulated by and maintained to meet NMED AP-27.

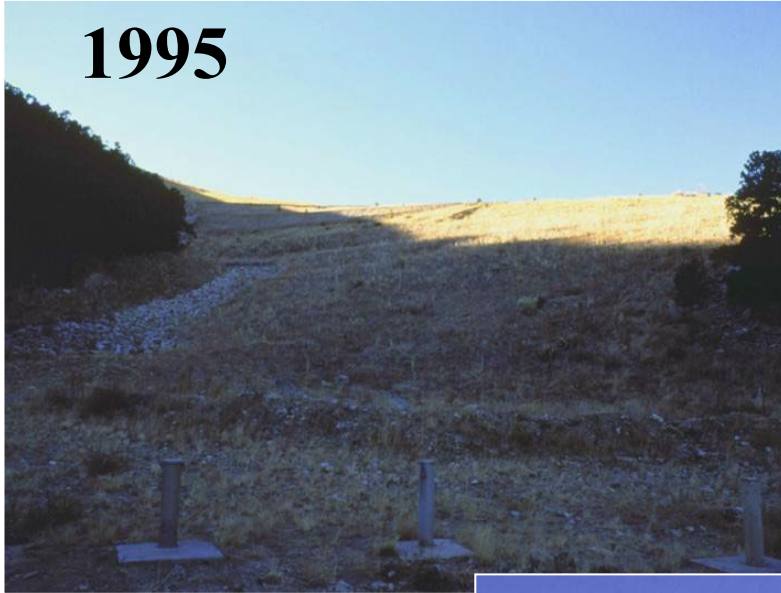


Waste Rock Pile

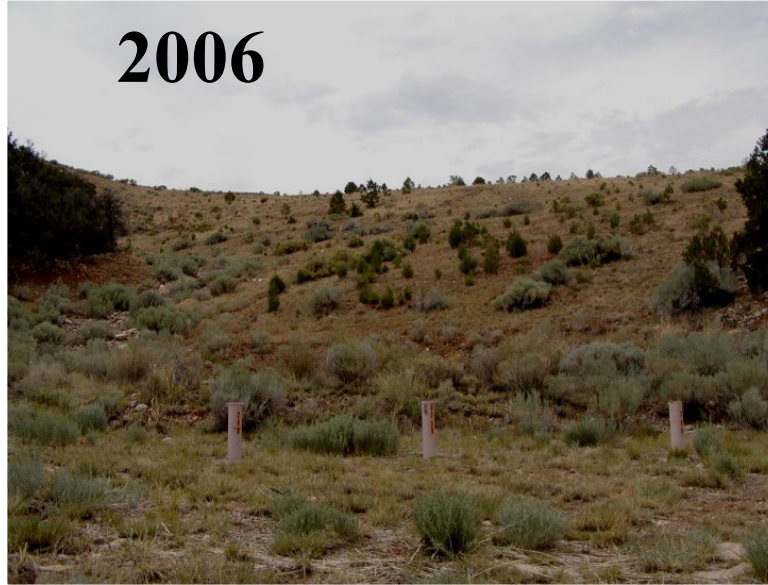
- Approximately 71.43 acres disturbed, and 67.58 acres successfully reclaimed
- In accordance with the state approved reclamation plan, reclamation activities performed have created a stable and steady state condition. Key activities completed include:
 - Interceptor wall and treatment system to capture and treat the impacted water
 - Recontouring, cover placement and revegetation (approx. 15,800 tree and shrub seedlings planted)
 - Design and implementation of stormwater diversions/controls
 - Dolores Gulch residual groundwater plume clean-up
- Result is successful revegetation and DP-55 compliant facility with diminished impacted water flow.

Waste Rock Pile

1995



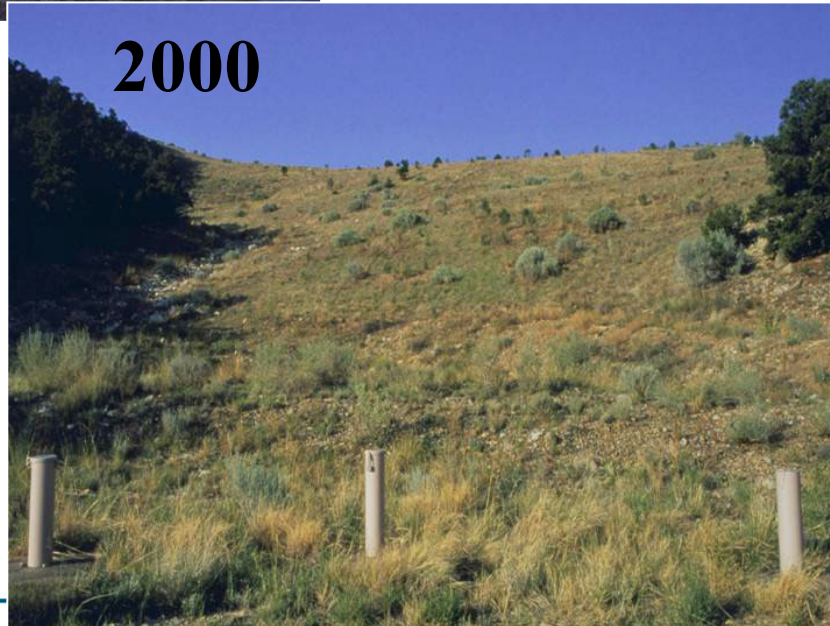
2006



2022



2000



Ore Treatment Unit & Surface Facilities

- ✓ Approximately 75.02 acres disturbed, and all 75.02 acres successfully reclaimed
- ✓ In accordance with the state approved reclamation plan, reclamation activities performed have created a stable and steady state condition. Key activities completed include:
 - ✓ Demolition and removal of the crushing facility, ore conveyor system, process plant and asphalt heap leach pad
 - ✓ Removal of impacted sub-soil
 - ✓ Recontouring, cover placement and revegetation
 - ✓ Stormwater diversions/controls
- ✓ Result is a reclaimed area released by MMD

Ore Treatment Unit & Surface Facilities

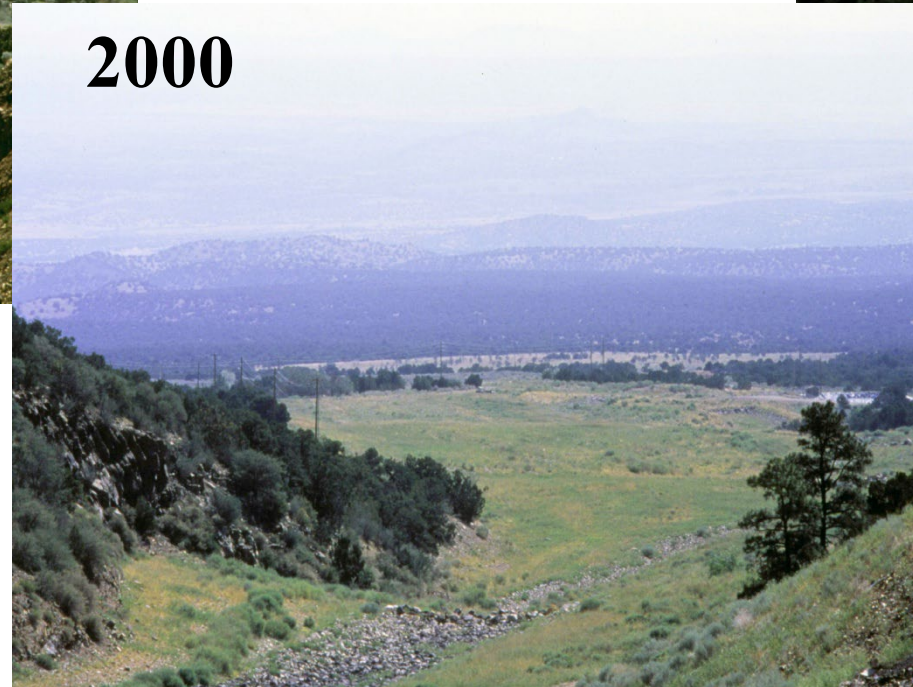
1995



2022



2000



Residue Pile

- ✓ Approximately 47.82 acres disturbed , and all 47.82 acres successfully reclaimed.
- ✓ In accordance with the state approved reclamation plan, reclamation activities performed have created a stable and steady state condition. Key activities completed include:
 - ✓ Recontouring, cover placement and revegetation
 - ✓ Stormwater diversions/controls
 - ✓ Accelerated clean up of Residual groundwater plume (continues to be regulated under NMED DP-55).
- ✓ Result is a reclaimed area released by MMD

Residue Pile

1995



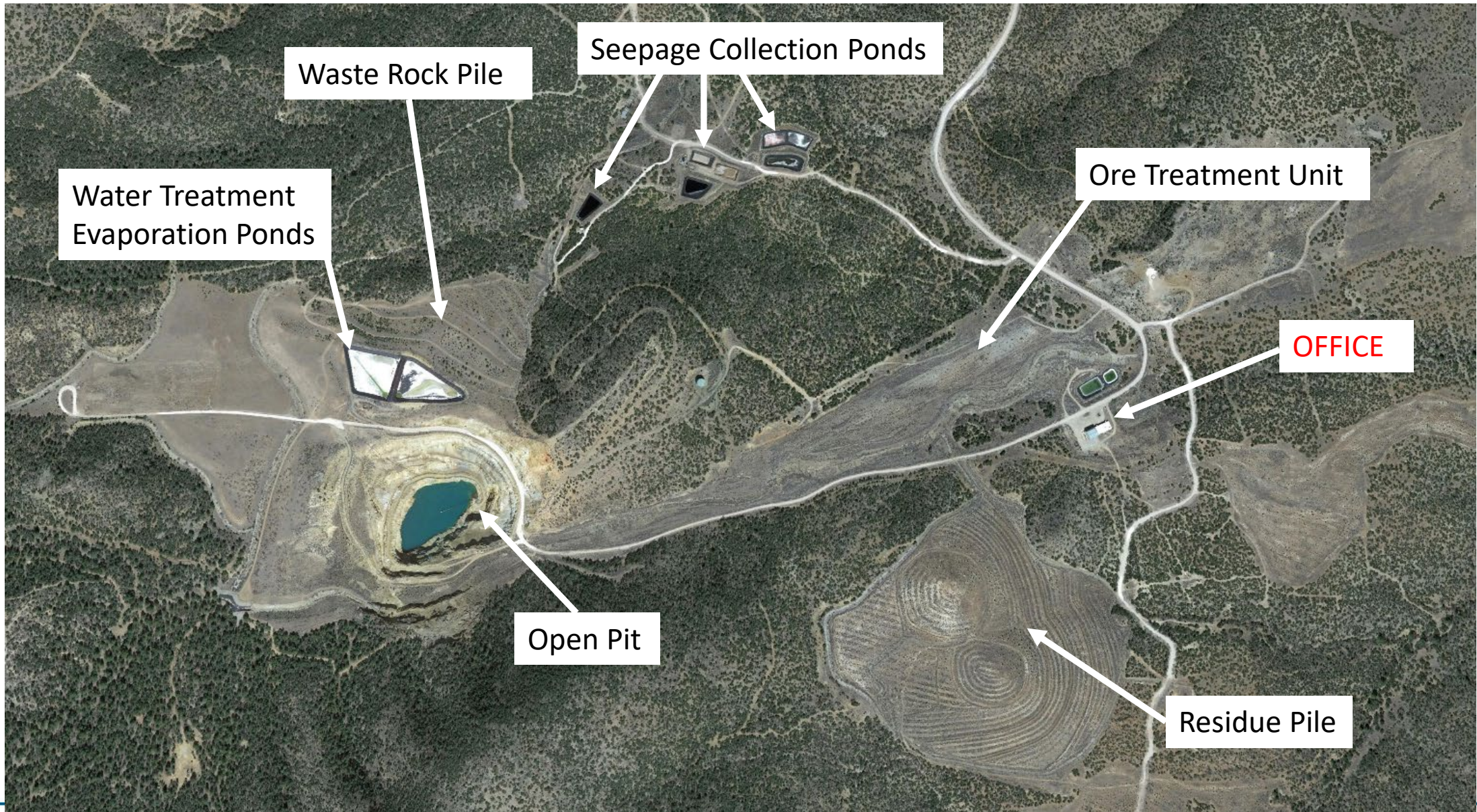
2022



2000



Site Facilities



Path Forward

✓ Open Pit

- ✓ Pit waiver for surface reclamation
- ✓ Water treatment as needed
- ✓ Maintenance of source controls as needed

✓ Waste Rock Pile

- ✓ Reclamation of water treatment ponds (approx. 3.85 acres)
- ✓ Dolores Gulch residual groundwater plume clean-up
- ✓ Maintenance of cover as needed
- ✓ Reclamation of ARD treatment system and associated ponds (approx. 2.26 acres)

✓ Residue Pile

- ✓ Reclamation of Residue Pile Remediation ponds (approx. 0.3 acre)
- ✓ Residual groundwater plume clean-up.

Forest Management Plan

- ✓ LAC Invested in a Forest Management Plan (not required by existing permits)
- ✓ Selective forest thinning is performed to accomplish the following:
 - ✓ 1) enhance the stand composition,
 - ✓ 2) return ecosystem function by improving habitat and food for wildlife, and
 - ✓ 3) reduce the risk of uncharacteristic fire.
- ✓ Over 200 acres have been thinned in past several years.

Daniel D. Lattin, P.E.

1655 Mountain City Hwy
Elko NV 89801
dlattin@barrick.com
775-397-7215

Education **B.S. in Civil Engineering 2007**
University of Nevada, Reno

State of Nevada – Engineer In Training (EIT) 2007
State of Nevada – Professional Engineer (PE) 2013

Summary Biography

Mr. Lattin has over 20 years of mining experience the areas of design, permitting, construction, operations, reclamation, closure, and long-term remediation. Mr. Lattin has overseen technical and financial delivery of large-scale mine operations, reclamation, and closure projects. Specific mining experience areas include design, permitting and construction of waste management facilities (leach pads, tailings dams and waste rock facilities), operational environmental compliance monitoring/reporting, reclamation alternatives analysis permitting and execution, post reclamation closure and long-term remediation. Mr. Lattin has worked under numerous federal and state environmental regulations including CERCLA, UMTRCA and RCRA in Nevada, California, and New Mexico. He is also experienced in community outreach and engagement associated with environmental remedial actions. He also serves on University of Nevada College of Engineering Advisory Board.

Experience

Sr. Program Manager

Barrick Gold of North America
1655 Mountain City Hwy
Elko NV 89801

April 2020 – Present

- Portfolio and Project Management
- Management of Multiple CERCLA Superfund Sites
- Management of an UMTRCA Site
- Project Management
- Talent Management
- Risk Management
- Environmental Compliance & Permitting
- Financial Evaluation and Budgeting
- Public and Government Affairs
- Policy and Program Evaluation

Project Evaluation Manager

Barrick Gold of North America
905 West Main Street
Elko, NV 89803

July 2017 – April 2020

- Project Management
- Construction Management
- Reclamation Bonding/Closure Management
- Formal Risk Assessment Development & Facilitation

- Construction Quality Assurance
- Environmental Compliance & Permitting
- Project Evaluations (Scoping, Prefeasibility, and Feasibility Studies)

Senior Environmental Engineer III

Homestake Mining Company of California
26775 Morgan Valley Road
Lower Lake, CA 95457

July 2015 – July 2017

- Development, Implementation, and Maintenance of Short / Long Term Planning and Budgeting
- Supervise Site Monitoring and Sampling Programs
- Project Management
- Construction Management
- Reclamation Bonding/ Closure Management
- Permit Non-Conformance Investigation Management
- Development of Engineering Design Changes
- Supervise Dam Safety Program
- RIMS & EMS Management
- Safety Training and Meetings
- Formal Risk Assessment Development & Facilitation
- Construction Quality Assurance
- Environmental Compliance & Permitting

Senior Environmental Engineer III

Barrick Goldstrike Mines Inc.
905 E. Main Street
Elko, NV 89801

October 2013 – July 2015

- Life Cycle Tailings Management
- Tailings Facility Expansion Projects Strategic Planning, Budgeting, Design, Permitting & Management
- Reclamation Bonding/ Closure
- Development of Engineering Design Changes
- Decommissioning of Jurisdictional Dams
- Jurisdictional Dam Inspections & EAP updates
- Management of Change
- Formal Risk Assessment Development & Facilitation
- Authorization for Expenditure (AFE) Development
- Construction Quality Assurance
- Mine Site Civil Engineering
- Project Manager Dry Hills Mercury Treatment and Storage Facility Project
- Environmental Compliance & Permitting

Civil Engineering Lead

Barrick Gold North America
905 E. Main Street
Elko, NV 89801

May 2013 – October 2013

- Life Cycle Tailings Management
- Regional Tailings Facility & Heap Leach Expansion Projects Design, Permitting and Execution Management
- Reclamation Bonding/ Closure Management
- Development of Engineering Design Changes

- Decommissioning of Jurisdictional Dams
- Jurisdictional Dam Inspections & EAP updates
- Safety Training and Meetings
- Management of Change
- Formal Risk Assessment Development & Facilitation
- AFE Development
- Construction Quality Assurance
- Environmental Compliance & Permitting

Senior Environmental Engineer II

Barrick Goldstrike Mines Inc.

October 2011 – April 2013

905 E. Main Street

Elko, NV 89801

- Life Cycle Tailings Management
- Tailings Facility Expansion Projects Permitting & Management
- Reclamation Bonding/ Closure Management
- Permit Non-Conformance Investigation Management
- Development of Engineering Design Changes
- Decommissioning of Jurisdictional Dams
- Jurisdictional Dam Inspections & EAP updates
- RIMS & EMS Management
- Safety Training and Meetings
- Management of Change
- Formal Risk Assessment Development & Facilitation
- AFE Development
- Construction Quality Assurance
- Environmental Compliance & Permitting

Contracts Administrator

Barrick Goldstrike Mines Inc.

April 2010 – October 2011

905 E. Main Street

Elko, NV 89801

- Contracts Administration
- Project Management
- Supply Chain Program/Policy Development & Training
- Safety Training and Meetings
- Scope of Work Development

Project Engineer

High Mark Construction, LLC

2001-May 2007 & Oct 2007–April 2010

2112 Wildwood Way

Elko, NV 89801

- Equipment Operation
- Project Management
- Value Engineering
- Construction survey
- Estimating & Take Offs
- Scheduling
- Cost Control
- Purchasing

Consultant

Steffen Robertson & Kirsten Consulting
5250 Neil Rd #300
Reno, NV 89502

May - October 2007

- Permitting
- Mine Reclamation/Closure
- Design
- Drafting
- Construction Management

Training

- AutoCAD LT 2007 Training
- 2-Day TapRoot Incident Investigation/Root Cause Analysis Course
- Project Management Institute (PMI) - Comprehensive Project Management
- Formal Risk Assessment Facilitator Training
- Crucial Conversations
- 10 Keys to Powerful Presenting
- Queens University - The Professional Supervisor
- Project Manager in Action (PMiA)
- Courageous Leadership
- Crisis Management Incident Command System
- Americans with Disabilities Act: An Introduction
- MSHA/OSHA
- George Washington University – Earned Value management
- AutoCAD Civil 3D
- ASDSO Technical Seminar Seepage Through Earth Dams
- ASDSO Technical Seminar Plans and Specifications Review and Construction
- ASDSO Technical Seminar Inspections for Dams and Ancillary Structures
- Monte-Carlo Analysis 101 Application to Projects Course
- Innovations in Heap Leaching and Mine Waste Practices
- Introduction to Primavera
- Barrick Reclamation Cost Estimation Training
- California Surveying & Seismic
- Emotional Intelligence
- Colorado School of Mines - Economic Evaluation & Investment Decision Methods
- Business Leader Finance Training

Affiliations

- University of Nevada – College of Engineering Advisory Board

Publications

- Years of Evapotranspiration Cover Performance of the Leach Pads at Richmond Hill Mine: Zhan J., Lattin D., Keller J., Milczarek M.; Mine Water and the Environment (2019) 38:402–409; 20
- Monitoring of waste rock dump surface water drainage and channel infiltration: Keller J., Banuelos J., Bunting L., Milczarek M., Rice R., Lattin D.; 11th International Conference on Acid Rock Drainage Conference (2018)

Environmental Permitting Experience

- Nevada Department of Environmental Protection- Bureau of Mining Regulation & Reclamation - Water Pollution Control Permitting & Compliance
 - Minor Modifications
 - Notice of Intent to Construct
 - Engineering Design Change
 - Construction As-Built Report
 - Quarterly & Semi-Annual Reporting
- Nevada Division of Water Resources - Jurisdictional Dam Permitting & Compliance
 - Jurisdiction Dam (J-Permit) Application
 - Construction As-built Report
 - Certification of Construction Completion & Temporary Authorization to Impound
 - Dam Decommissioning Application
 - Annual Dam Inspections & Reporting
- Nevada Department of Environmental Protection- Bureau of Mining Regulation & Reclamation – Reclamation/Closure Permitting
 - Tentative Closure Plan
 - Reclamation Permit Modifications
 - Final Permanent Closure Plan
 - Closure As-Built Report
 - Financial Assurance
- Nevada Department of Environmental Protection- Bureau of Waste Management – Resource Conservation Recovery Act Permitting & Compliance
 - Subtitle C Permit & Annual Reporting
 - Subtitle C Class II Permit Modification
- Nevada Department of Environmental Protection- Chemical Accident Prevention Program (CAPP)
 - Pre-Application Meeting
 - Process Hazard Analysis
 - Permit to Construct Application
- Nevada Department of Environmental Protection- Bureau of Air Pollution Control
 - Class II Air Permit
- Bureau of Land Management (Federal)
 - Determination of National Environmental Policy Act (NEPA) Adequacy
 - Right of Grant
- California Division Safety of Dams - Jurisdictional Dam Permitting & Compliance
 - Annual Dam Inspections & Reporting
- California Central Valley Regional Water Quality Control Board
 - Annual & Semi-Annual Water Quality Reporting
 - Annual Financial Assurance Estimate
- California Surface Mining and Reclamation Act – Lake & Napa County
 - Annual Inspections & Reporting
 - Annual Financial Assurance Estimate
- New Mexico State Lands Office
 - Geotechnical Right of Entry on State Trust Lands

- New Mexico Environment Department
 - Abatement Plan
 - Discharge Permit
 - Quarterly and Semi-Annual Monitoring Reporting

- New Mexico Mining and Minerals Division
 - Reclamation Permit
 - Financial Assurance
 - Annual Reporting

- United States Environmental Protection Agency
 - Administrative Settlement and Order on Consent
 - Remedial Investigation
 - Feasibility Study
 - Technical Impracticability Waiver
 - Non-time Critical Removal Actions
 - Removal Site Evaluation
 - Engineering Evaluation/Cost Analysis
 - Human Health Risk Assessment
 - Ecological Risk Assessment
 - Financial Assurance

- United States Nuclear Regulatory Commission
 - Radioactive Materials License
 - Groundwater Corrective Action Program
 - Decommissioning & Reclamation Plan
 - Semi-Annual and Annual Environmental Monitoring Reporting
 - Safety and Environmental Review Panel
 - Alternate Concentration Limit Application
 - Financial Surety

Cunningham Hill Mine Reclamation Project

CLOSURE/CLOSEOUT PLAN UPDATE SF002RE

Steven T Finch, CPG, PG
October 27, 2022





Expertise

Education

- ✓ B.S. Geology from Sul Ross State University, 1985
- ✓ M.S. Geology from Northern Arizona University, 1991

Professional Certifications and Registrations

- ✓ American Institute of Professional Geologists CPG-9590
- ✓ Texas Professional Geoscientist PG-5302

Relevant Experience

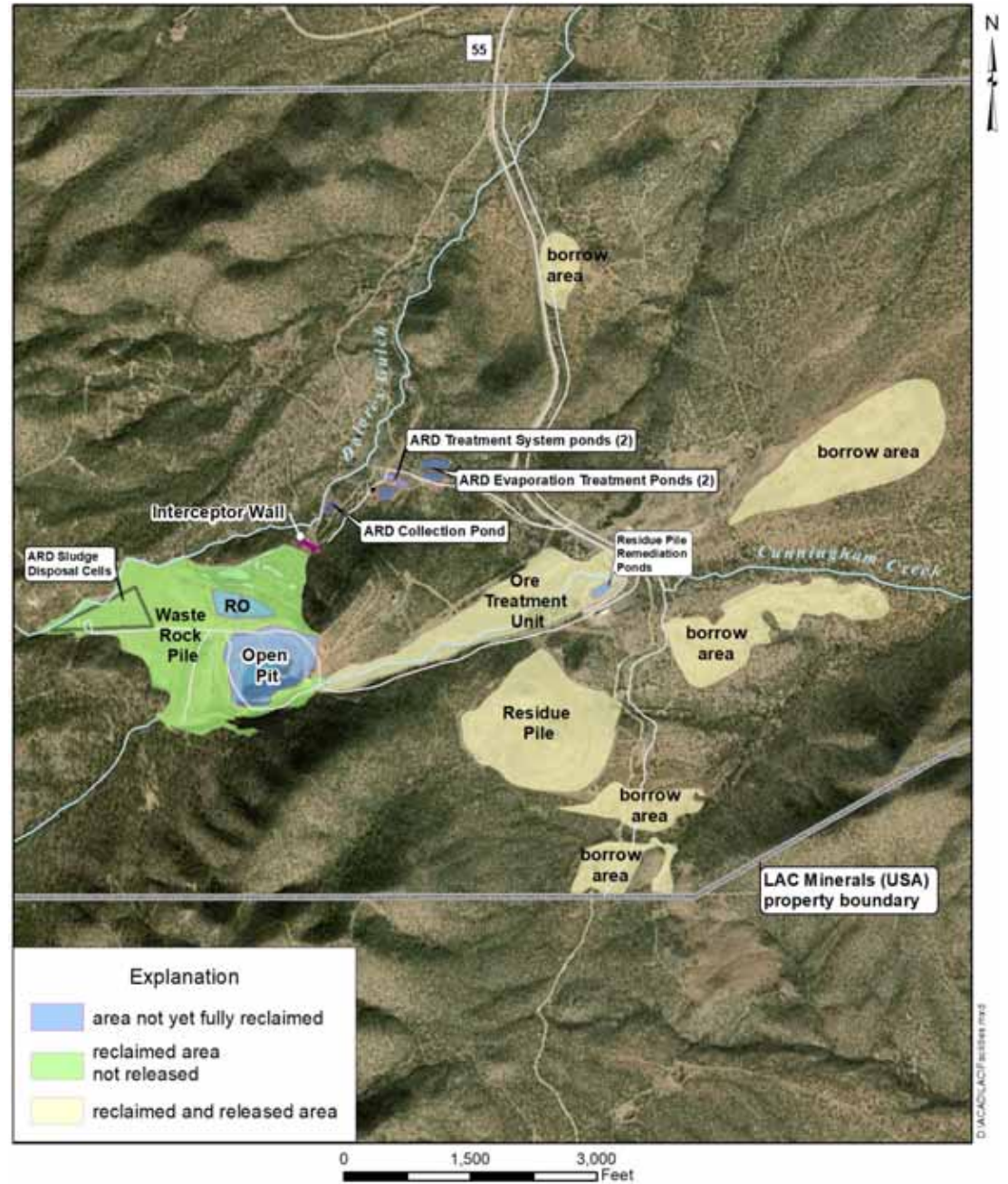
- ✓ 32+ years as Hydrogeologist-Geochemist at JSAI
- ✓ Copper Rule Technical Advisory Committee
- ✓ Experience with CHMRP property – 1991 to current

Closure/Closeout Plan Update MMD Permit SF002RE

Purpose: to reclaim disturbed lands from Gold Fields Operations that occurred from 1979 to 1987

Facilities:

- Open Pit
- Waste Rock Pile
- Residue Pile
- Ore Treatment Unit

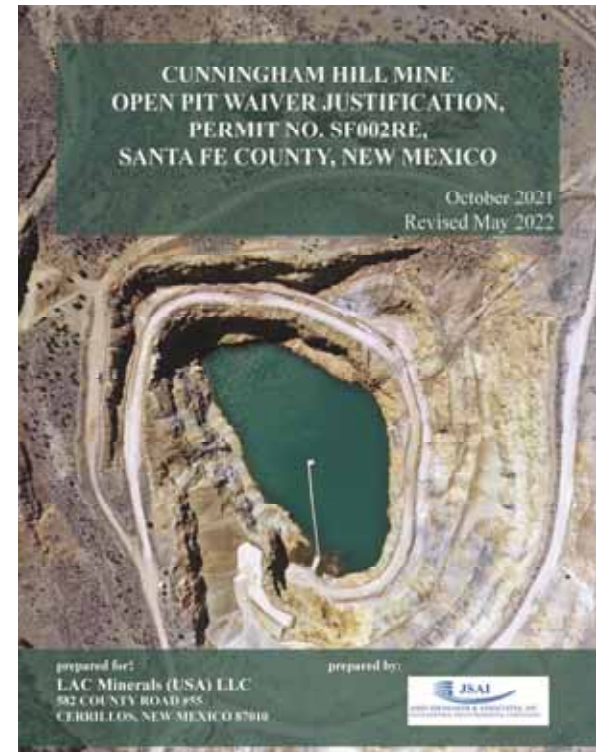
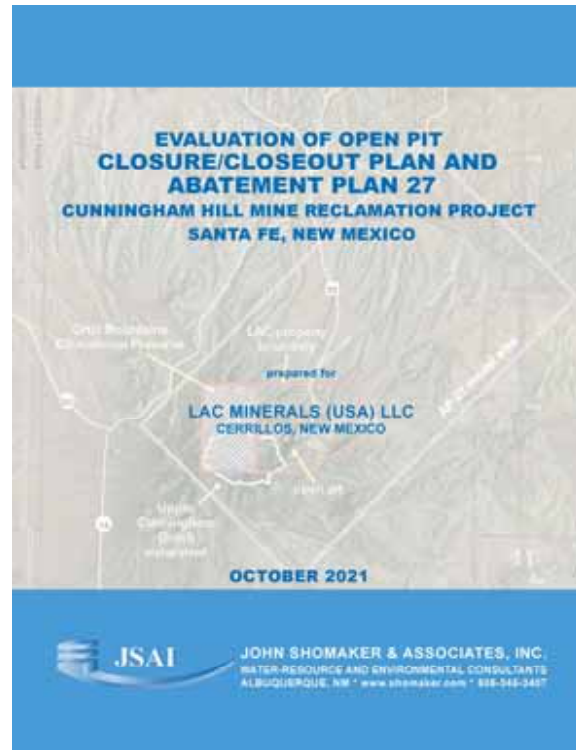
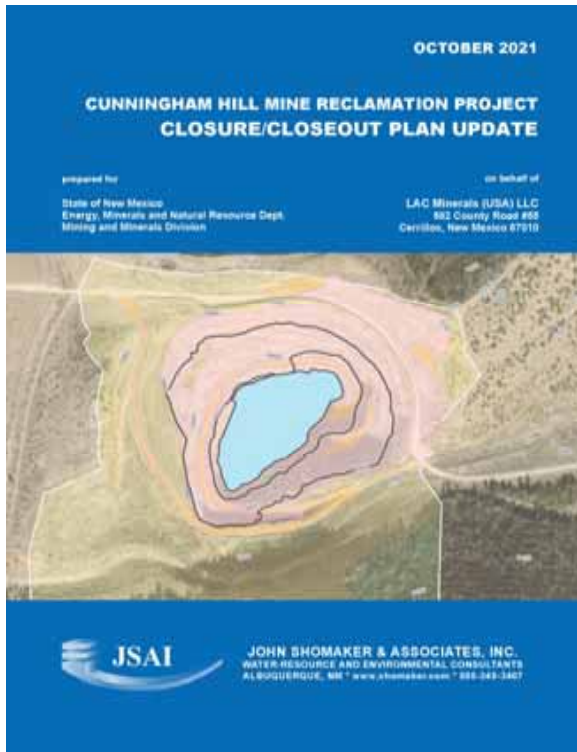


Reclamation Areas


unit	acreage disturbed	acres reclaimed	acres to be reclaimed	acres to remain for PMLU	acres for requested pit waiver	acres released
Open Pit	34.13	14.76	0		19.37	0
Waste Rock Pile	67.58	67.58	0	0	---	0
RO evap ponds	3.85	0	3.85	0	---	0
Residue Pile	47.82	47.82	0	0	---	47.82
Ore Treatment Unit and surface facilities	75.02	75.02	0	0	---	75.02
borrow areas	120.70	120.70	0	0	---	120.70
roads	11.60	0	0	11.60	---	0
ARD Treatment Facility	2.26	0	2.26	0	---	0
TOTAL	362.96	325.88	6.11	11.60	19.37	243.54



Key References



Outline

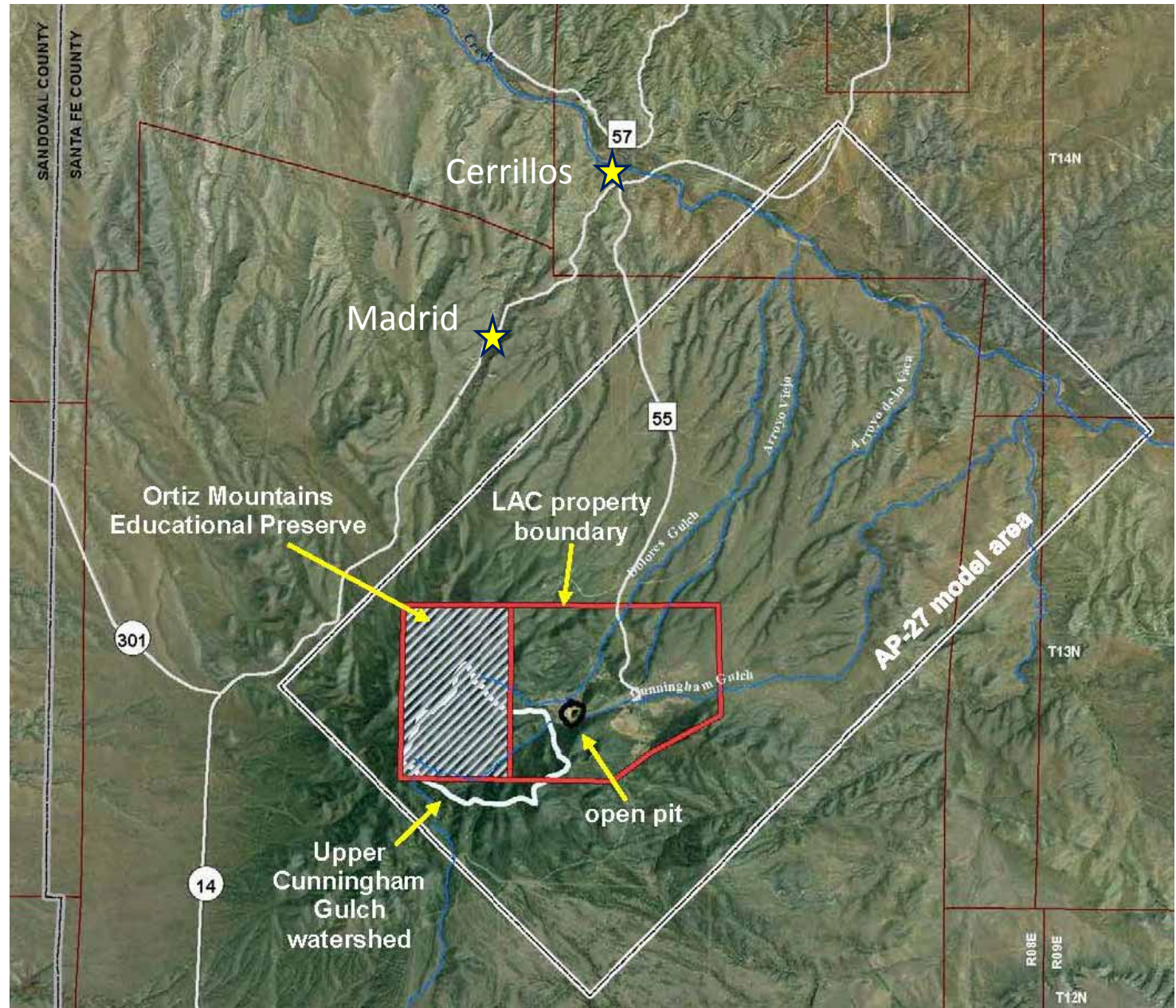
1. Open Pit Reclamation
 2. Waste Rock Pile Reclamation
 3. Sitewide Monitoring
 4. Closure/Closeout Plan Update
- 

Open Pit

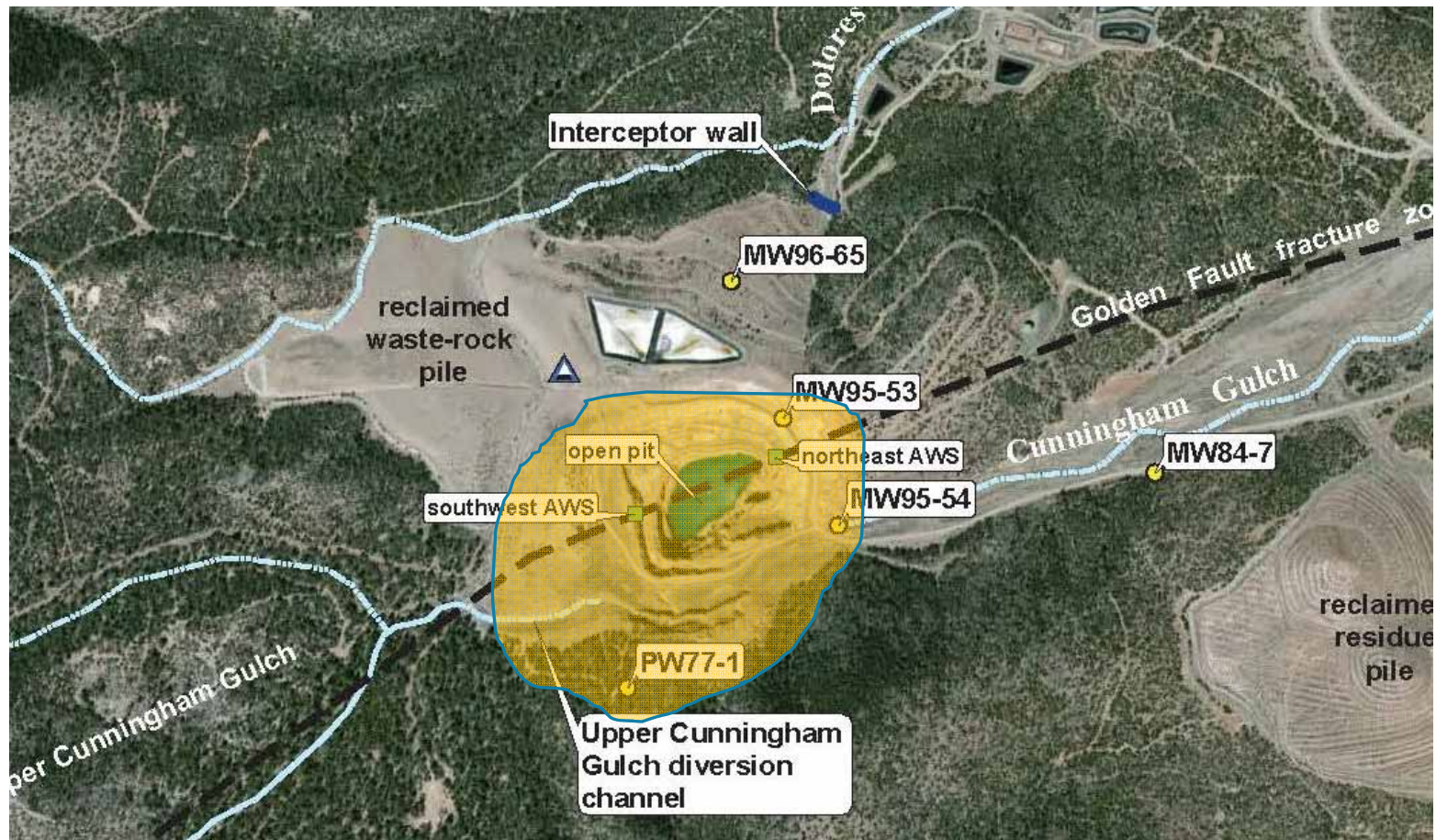
35 YEAR OF DATA



Geographic Context



Open Pit Features



Acid Wall Seeps (AWS)



The 1996 Plan was for the open pit to fill with stormwater runoff to the 6,990 ft elevation

Open Pit Water Body – AWS Source Controls

1. Repairs to Upper Cunningham Gulch diversion Structure to mitigate Southwest AWS (2011-2016)
2. Stormwater controls for receiving runoff area west of pit to mitigate Northeast AWS (2016)
3. In pit stormwater controls to keep stormwater off benches and roads
4. Repair access roads by installing caliche base
5. Cap largest remaining bench area with caliche and construct runoff controls



Pit watershed storm-water controls



UCG Diversion Repairs



Repairs to Diversion



Reclaimed surfaces
with Caliche

Open Pit Wall Stability

Call & Nichols (1994) evaluation

Rock is competent and stable

Reclamation efforts have stabilized south and west slopes

Stormwater controls limits weathering and slope failure

35 years of pit wall stability even after 100-yr event in 2019

Sediment in bottom of pit is from stormwater runoff not from slope failure of pit walls

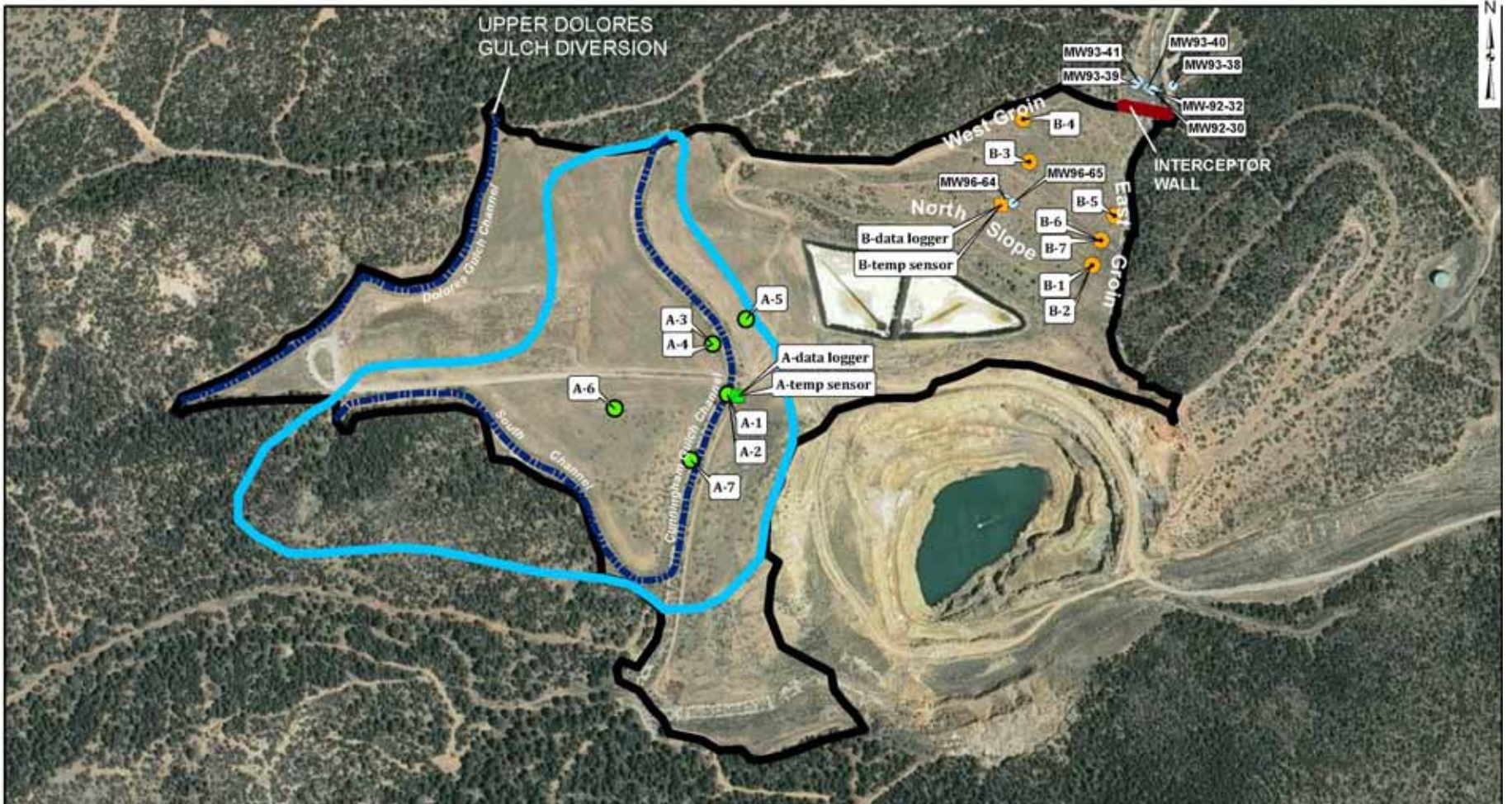


Reclaimed Waste-Rock Pile



Key References





Explanation

Series A

- soil moisture sensor
- soil temperature sensor
- data logger

Series B

- soil moisture sensor
- soil temperature sensor
- data logger

- monitoring well
- interceptor wall
- lined diversion channel

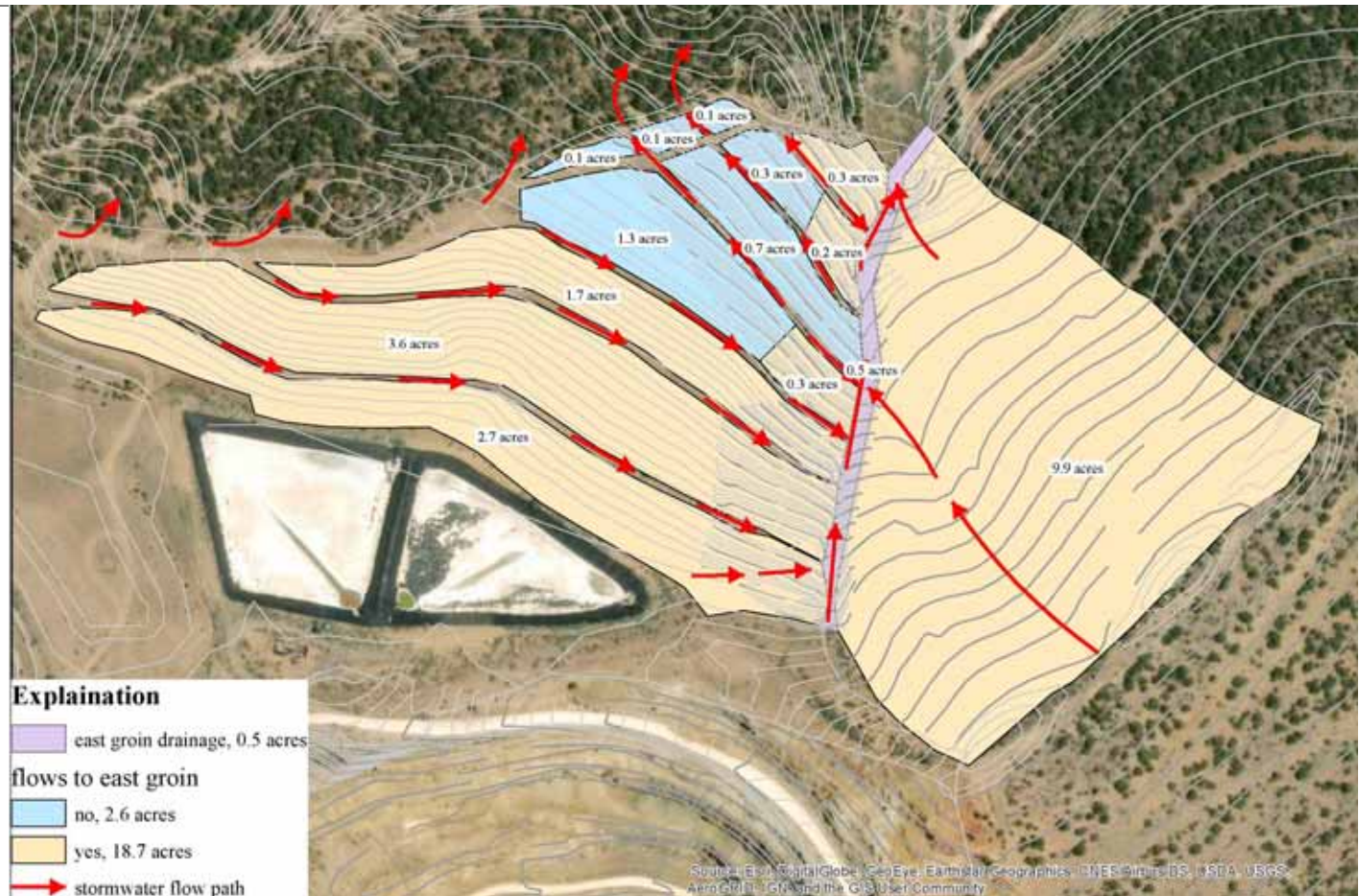
- Cunningham Gulch Channel watershed
- waste rock pile



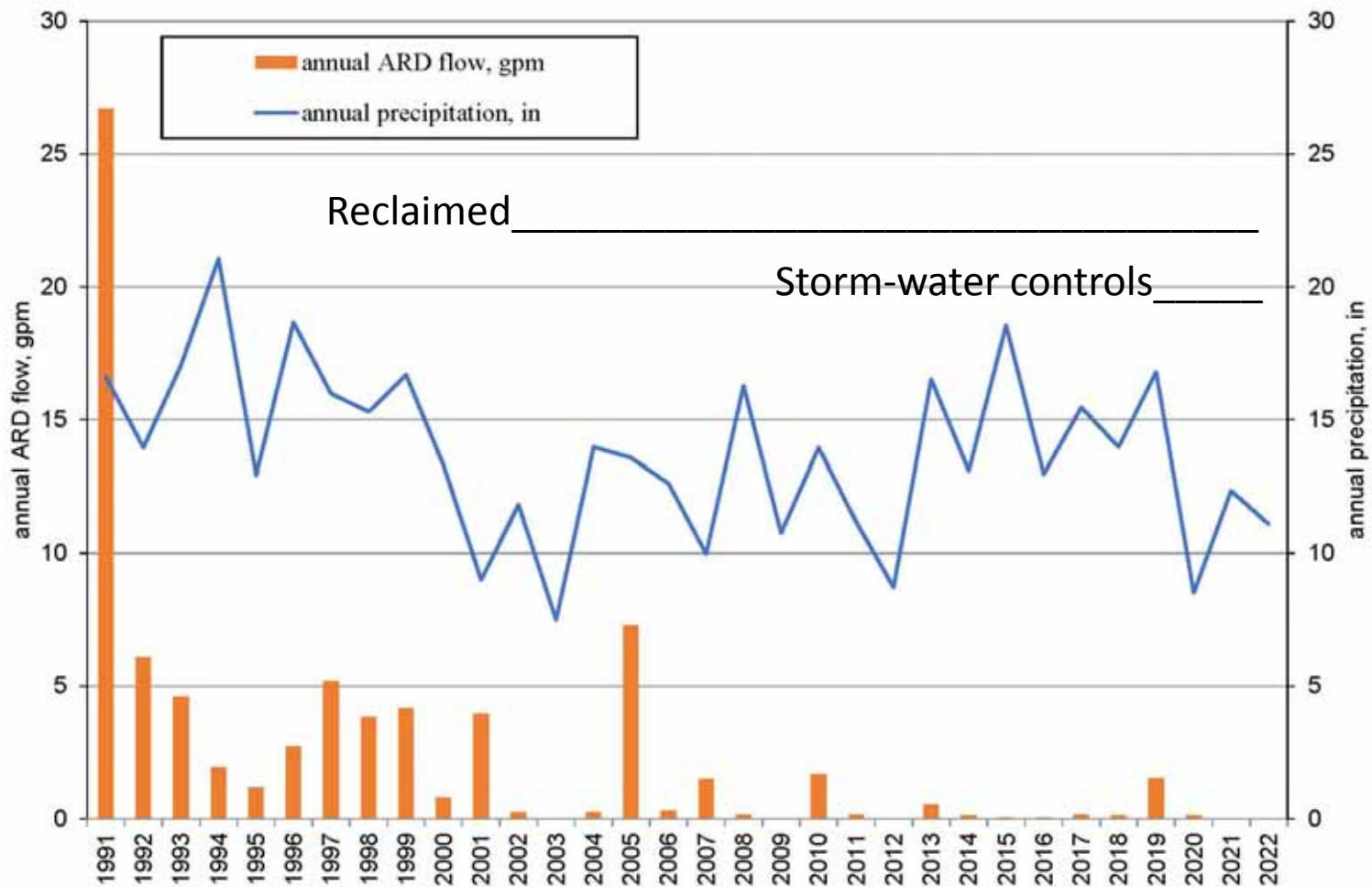
Stormwater Controls

Diversion
berms along
West Groin

Piping and
channel
repairs to
East Groin



History of ARD Flow



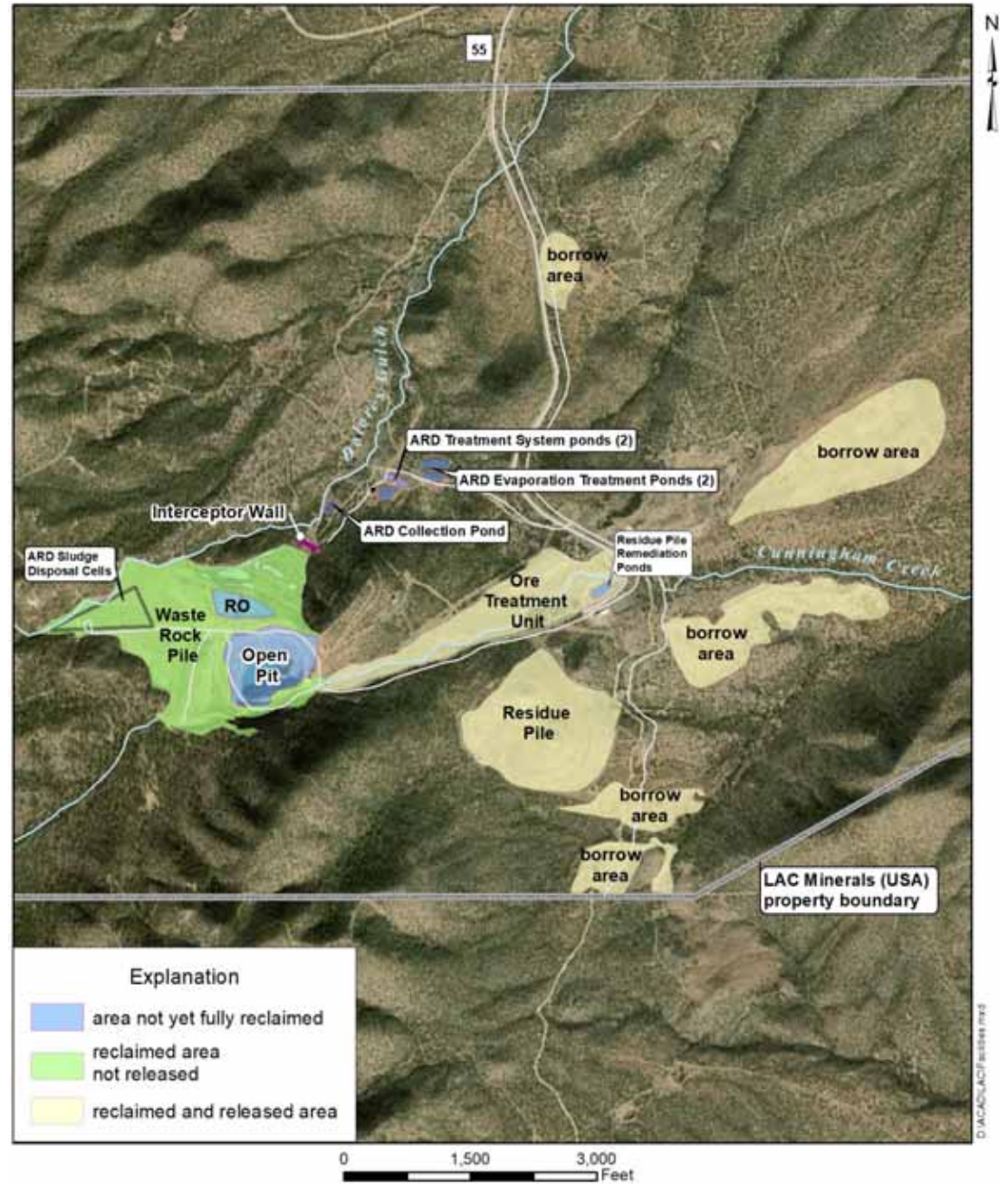
Sitewide Monitoring

AP-27 – DP-55 - CCP



Sitewide Monitoring

1. Monthly visual inspections of facilities
2. Two weather stations
3. Meter readings
4. Groundwater monitoring network




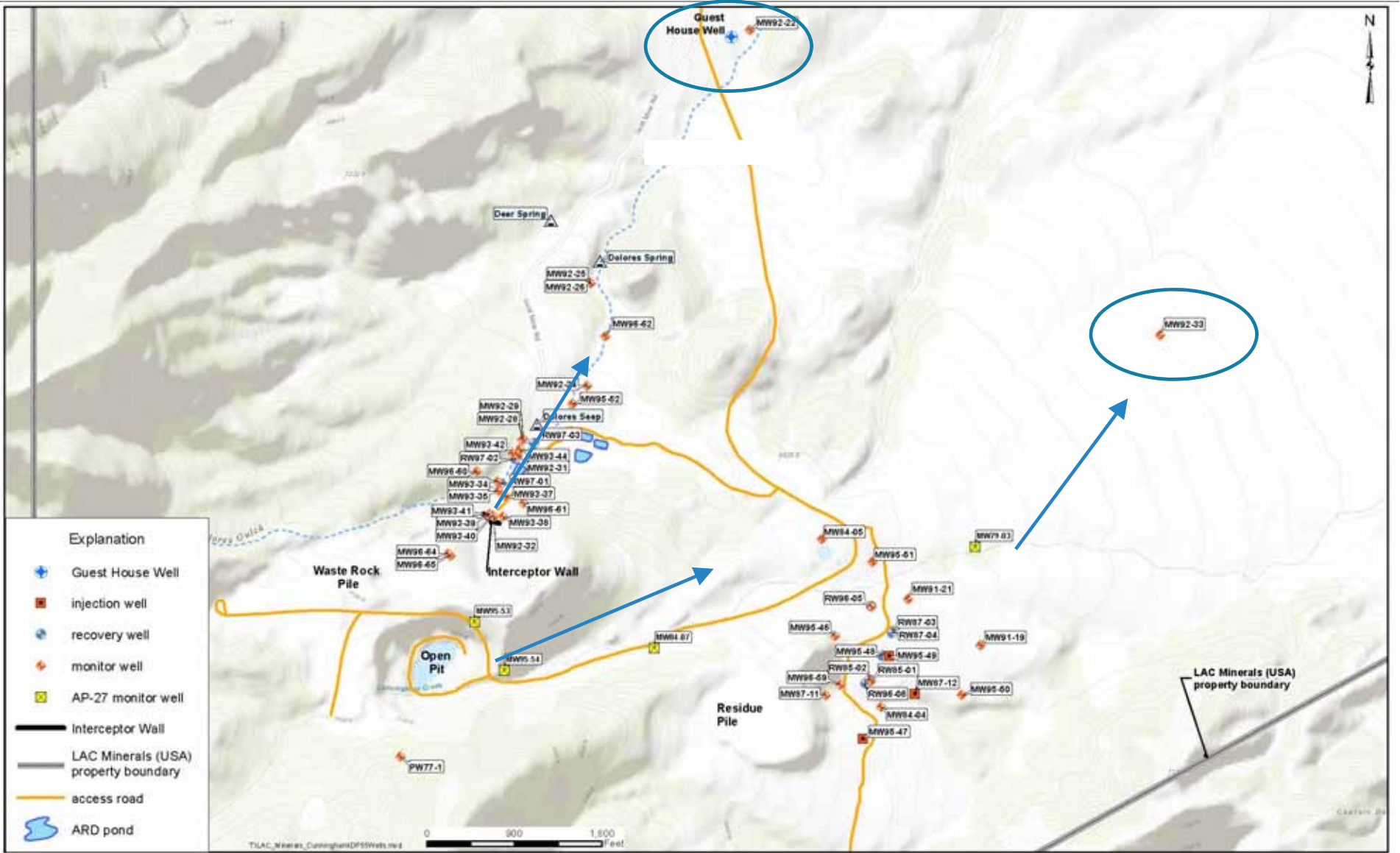
Water Quality Constituents of Concern

SURFACE WATER STANDARDS

- Open pit meets NMED SWB surface standards

GROUNDWATER STANDARDS

- Open Pit Water Body – TDS, Sulfate, and manganese
 - Reclaimed Residue Pile Plume – Nitrate and Cobalt (< 5 acre area)
 - WRP/Dolores Gulch – TDS, sulfate, pH, aluminum, manganese, iron, cadmium (< 4 acre area)
- 



Closure/Closeout Plan Update

REMAINING RECLAMATION AND PIT WAIVER
REQUEST

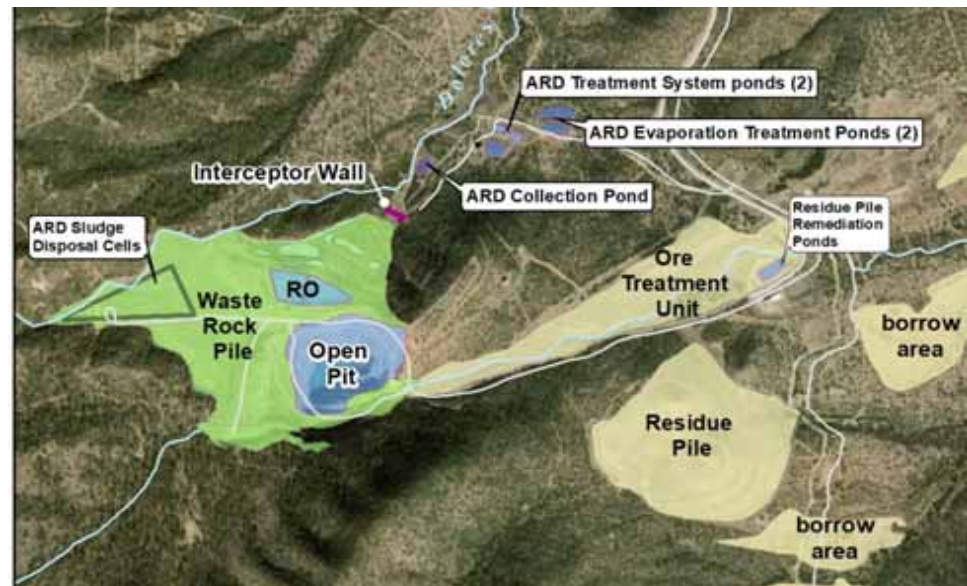


Updated Plan

To address the remaining facilities undergoing final reclamation efforts for:

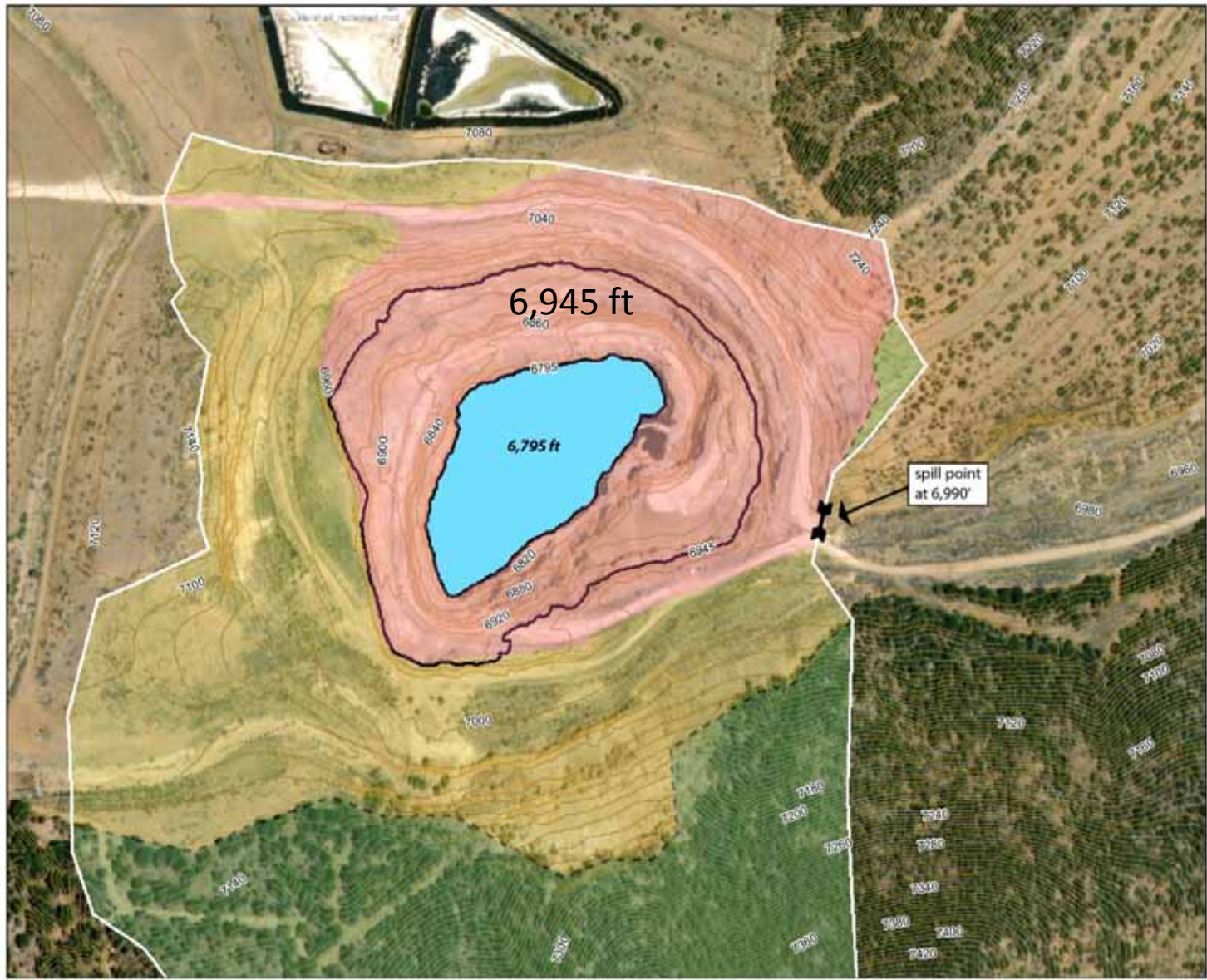
1. Open Pit
2. Waste Rock Pile
3. ARD Treatment Facility
4. Ponds
5. P&A wells

UPDATED CCP FIG 3



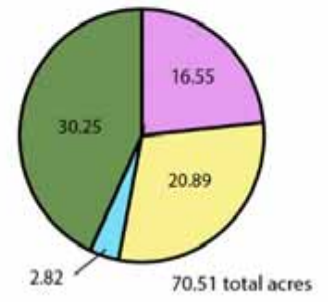
Total disturbed area = 363 acres
Reclaimed area pending = 82.3 acres

Reclaimed areas released = 243.5 acres
Area to be reclaimed = 6.1 acres

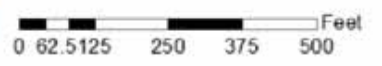


Cunningham Hill Mine Reclamation Project

Watershed total area	70.51 acres
Undisturbed area	30.25 acres
Reclaimed area	20.89 acres
Un-reclaimed area	16.55 acres
open pit pool	2.82 acres



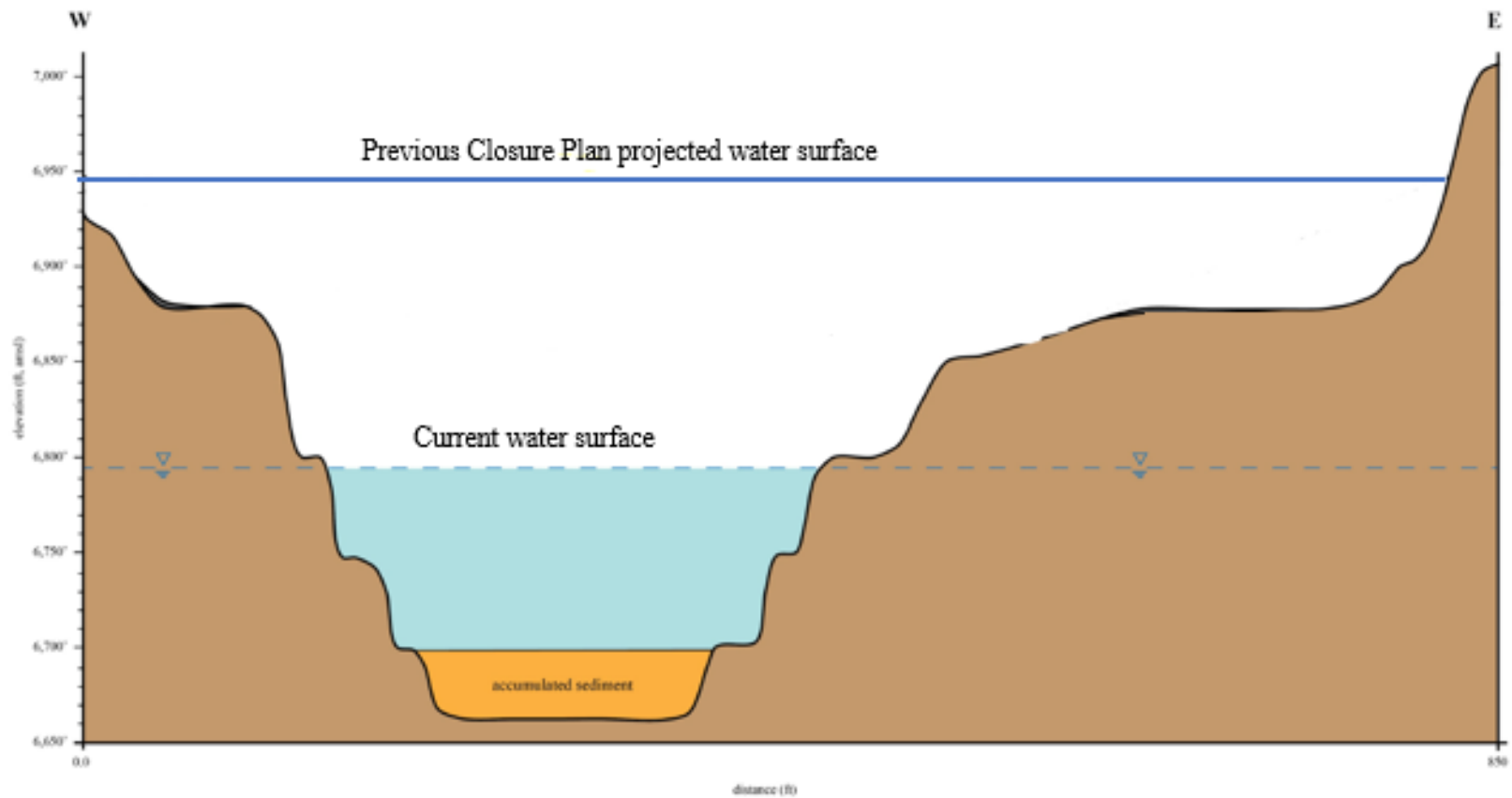
- Explanation**
- Watershed total area
 - Undisturbed area
 - Reclaimed area
 - Disturbed area, un-reclaimed
 - open pit water surface area (6,795 amsl)



Pit waiver request 19.37 acres from Self-Sustaining Ecosystem Requirements




Open Pit Geometry



MMD Pit Waiver

19.10.5.507.B NMAC

Waiver for Pits and Waste Units An operator may apply for a waiver for open pits or waste units from the requirement of achieving a ~~post-mining land use~~ or **self-sustaining ecosystem**. The operator must show that achieving a post-mining land use or **self-sustaining ecosystem is not technically or economically feasible or is environmentally unsound**. The Director may grant the waiver for an open pit or waste unit if he finds:

- (1) measures will be taken to ensure that **the open pit** or waste unit **will meet all applicable federal and state laws, regulations and standards for air, surface water and ground water protection following closure**; and
 - (2) **the open pit** or waste unit **will not pose a current or future hazard to public health or safety**
- 

Alternatives for Pit Filling

1. Stormwater
2. Groundwater onsite
3. Groundwater imported
4. Backfilling onsite material
5. Backfilling with imported material

Alternatives Analysis

Technically Feasible	Economically feasible	Environmentally sound
Are the materials available?	What are the financial implications?	Does it impact the neighboring community?
Can it be implemented?	Does the costs out weigh the benefit?	What affect doe the alternative have on natural resources?
Will it be self sustaining?	Cost per unit area reclaimed?	Climate change impacts – carbon footprint

Summary of Open Pit Reclamation Options

Open pit reclamation option	technically feasible	economically feasible	environmentally sound
Fill with storm water	no	yes	yes
Fill with groundwater	no	no	no
Partial backfill	no	no	no
Backfill to 6,945 ft elev	no	no	no
Backfill to 6,990 ft elev	no	no	no

The only alternative with a “yes” is filling with storm water however it is been deemed technically infeasible

Costs for backfilling is \$20,000,000 per acre or greater

Backfilling would generate about 30,000,000 lbs of CO₂

Best Course of Action

Post Mining Land Use for Wildlife and livestock will be achieved with updated Closure/Closeout plan

MMD Self Sustaining Ecosystem requirements will be met for all disturbed and reclaimed areas (362.96 acres) except for 19.37 acres of open pit benches, walls, and open pit water body. The 1996 CCP allowed for 4.5 acres of pit walls to remain un-reclaimed.

AP-27 permit requirements will ensure the Open Pit water body will meet surface water and groundwater protection standards

There are no pit filling alternatives that are technically feasible, economically feasible, or environmentally sound

A Pit Waiver will allow for applicable permit requirements to be achieved and will be in the best interest of wildlife, stakeholders, adjacent communities, and land owner



Steven T. Finch, Jr., CPG, PG

V.P., Principal Hydrogeologist-Geochemist

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Steve Finch has more than 30 years of experience in many parts of New Mexico, Texas, and the Southwestern United States. His work has included hydrogeologic investigations for operating and reclaimed mining operations, groundwater resource development, aquifer-test interpretation, groundwater flow and contaminant-transport modeling, geochemical modeling, water-quality investigations, water-resource analysis, and well-site hydrogeology.

Summary of Mining Related Projects

- 1991 -92: Hydrogeologic and geochemical analysis of Waste Rock Pile Acid Rock Drainage, Cunningham Hill Mine, Santa Fe County, NM.
- 1992 -1993: Hydrogeologic and geochemical characterization of open pit water body, tailing impoundment, and other associated facilities at Copper Flat Mine, Sierra County, NM.
- 1994 – Current: Performance evaluation of Tailings Pond 7 Interceptor Well Field, DP-484, Chino Mines Company, Hurley, New Mexico.
- 1998 - Current: Hydrogeochemical analysis of Cunningham Hill Open Pit reclamation in support of AP-27
- 1995 – 99: Evaluation of mine dewatering options for Main Pit, Tyrone Mining, Grant County, NM
- 1999 – Current: Hydrogeologic and geochemical analysis in support of DP-214 renewal and compliance, Chino Mines Company, Grant County, NM
- 2005 -06 Hydrogeologic and groundwater sustainability analysis for Chino Mines Company, and development of regional groundwater flow and solute transport model of the Mimbres Basin, southwestern, New Mexico.
- 2006 – Current: Hydrogeologic and geochemical analysis in support of DP-55 compliance, Cunningham Hill Mine Reclamation Project, Santa Fe County, NM
- 2007 -12: Hydrogeochemical assessment of reclaimed Colosseum open pit mine and tailings impoundment, San Bernardino County, CA
- 2009: Hydrogeologic evaluation of interceptor well system for La Copia Mine, Kinross, Chile
- 2011 -12: Geochemical assessment of seepage elevated with selenium, Reclaimed East Ravine Stockpile, Homestake Mine, South Dakota
- 2011 – Current: Hydrogeologic and geochemical analysis in support of Copper Flat Project, NMCC, Sierra County, NM
- 2012: Hydrologic impact of El Segundo Mine water supply well, McKinley County, NM
- 2012: Hydrologic analysis and development of dewatering plan for Summit Mine, Grant County, NM
- 2012: Participated on the Technical Advisory committee for developing the NMED Copper Rules
- 2013 -14: Hydrogeochemical assessment of dewatering effects on springs, Ruby Hill Mine, NV
- 2014 – Current: Technical support for development of water supply options to support Cobre Mine expansion, Grant County, NM

EDUCATION

M.S., Geology
(Hydrogeochemistry), 1991
Northern Arizona University
Flagstaff, Arizona

B.S., Geology, 1985
Sul Ross State University
Alpine, Texas

REGISTRATIONS

Professional Geoscientist,
Texas, No. 5302

*American Institute of Professional
Geologists, CPG-9590*

Summary of Water Resource Related Projects

- Aquifer storage and recovery feasibility analysis and pilot study for La Luz Well Field, City of Alamogordo, New Mexico.
- Develop groundwater flow model for the Jornada Basin, Dona Ana County, New Mexico.
- Sustainability analysis of groundwater supply and groundwater exploration program for Cobre Mining Company Operations.
- Water-resource assessment for the Tularosa-Salt Basins and Alamogordo 40-year water plans.
- Project Manager on hydrogeologic studies relating to La Luz Well Field, City of Alamogordo.
- Desalination feasibility study for the Tularosa Basin, subcontracted to Livingston Associates.
- Hydrogeologic analysis and groundwater flow model of Eldorado Area, Santa Fe County, NM.
- Hydrogeologic analysis and development of groundwater flow model for Wild Horse Flat area, Culberson County Groundwater Conservation District, Far West Texas.
- Hydrogeologic analysis and development of groundwater flow model of Salt Underground Water Basin, Otero County, New Mexico.
- Hydrogeologic framework for the Igneous-Bolson Groundwater Availability Model, Far West Texas, subcontracted to LBG-Guyton.
- Project manager for the drilling, construction, development, and testing of Buckman Wells 10 through 13, City of Santa Fe, New Mexico.
- Hydrogeologic and water-right evaluation of irrigated lands in Estancia Basin as alternative water supply for City of Santa Fe.
- Hydrogeologic analysis and groundwater flow model of Jal basin, City of Jal, New Mexico.
- Hydrogeologic analysis of water supply for Tularosa and Salt Basin Regional Water Plan.
- Project manager for the development of a groundwater flow and solute transport model of the Griggs and Walnut Superfund Site, Lac Cruces, New Mexico.
- Refined the Geologic Framework for the Capitan Reef aquifer, Far West Texas.
- Hydrogeologic assessment and water development plan for 223,000 acre La Escalera Ranch, southern Pecos County, Texas
- Hydrogeologic assessment and water protection plan for 122,000 acre Lado Ranch, Culberson County, Texas
- Hydrogeologic assessment of 163,000 acre Apache Ranch, Culberson County, Texas
- Analysis of return flow options using treated effluent from the City of Santa Fe Paseo Real WWTP, Santa Fe County, NM
- Groundwater assessment of the Devil Ridge Thrust Zone, Hudspeth County, Texas
- Development of source water and wellhead protection plan for Chino Mines Water system, Grant County, NM.
- Implementation of water level monitoring program for City of Las Cruces, Dona Ana County, NM
- Hydrogeologic and geochemical characterization of the Blaine Aquifer System for the Texas Water Development Board, north-central Texas
- Hydrogeologic characterization of the Santa Rosa Sandstone aquifer in southeastern NM

Professional Societies and Certifications

- Geological Society of America
Certificate of Appreciation as Distinguished Mentor
- U.S. Department of Interior Geological Survey Certificate of Appreciation as
Volunteer for Science Program
- International Association of Geochemistry and Cosmochemistry
- American Water Resources Association, New Mexico Section (Past President)
- National Ground Water Association
- American Chemical Society award for Outstanding Achievement in Chemistry

Professional Development

- Scientist at Bilby Research Center Geochemistry Lab, Northern Arizona University (1987 -90)
- Course work at University of New Mexico: Vadose-Zone Hydrology (Spring 1993)
- Environmental Education Enterprises' course on Modeling Groundwater Flow and Contaminant
Transport (July 1995)
- Visual MODFLOW: The most widely used software package for MODFLOW, MODPATH, and MT3D,
National Ground Water Association (Feb. 1999)
- Environmental Isotopes in Ground Water Resource and Contaminant Hydrogeology,
National Ground Water Association course #394 (March 2002)
- CLE INTERNATIONAL, New Mexico Water Law, Santa Fe, New Mexico (Aug. 2005)
- Applications of Ground Water Geochemistry, Scottsdale, Arizona, National Ground Water Association
Course #485, (Nov. 2006)
- Nevada Water Resource Association, Day of Pit Lakes Symposium, January 26, 2015

Expert Testimony

Provided sworn testimony before Bernalillo, La Plata, Rio Arriba, and Santa Fe County Commissions

Provided sworn testimony before Middle Pecos Groundwater Conservation District, Pecos County, TX

Provided sworn testimony before Culberson County Groundwater Conservation District, Culberson County, TX

Provided sworn testimony in administrative proceedings before hearing examiners of New Mexico State Engineer
Office, New Mexico Environment Department, Mining and Minerals Division, and New Mexico Oil and
Gas Conservation Commission

Provided sworn testimony in *Lermayer v. Davalos*, Cause No. D-1215-CV-1998-00442

Selected Publications

- Finch, S. T., Jr., 1991, Characterization of geochemical processes in a sensitive alpine watershed dominated by sulfide-bearing
alkaline rocks, San Juan Mountains, Colorado: Thesis submitted in partial fulfillment of the requirements for the
Degree of Master of Science in Geology, Northern Arizona University, 1991.
- Finch, S. T., Jr., 1997, Identification of arsenic-rich ground water using geochemical signatures and geophysical log analysis,
Albuquerque, New Mexico: U. S Geological Society, Open File Report 97-496.
- Finch, Steven T., Jr., 2011, Hydrogeology of the Tusas Mountains, Rio Arriba County, New Mexico, *in*: Geology of the Tusas
Mountains and Ojo Caliente Area, New Mexico Geological Society, Guidebook, 62nd Field Conference, pp. 317-328.