



Water Quality Predictions and Impacts at Mine Sites: Case Studies Royal Mountain King Mine, California

Characterizing, Predicting, and Modeling Water from Mine Sites

Royal Mountain King Mine, California

- Owned by Meridian Gold, Inc.
- In Operation from 1990 to 1995
- Primary commodity mined was gold from open pit mining and vat leach processing operations
- Disturbed 650 acres on private land
- Financial assurance amount of $3.3 million (2005)
- El Dorado County lead agency
- CEQA – EIR was completed in 1987

Royal Mountain King Mine – Water Quality Predictions, 1987 EIR

- Limited static acid-base accounting tests were performed
- EIR did not identify any particular constituents of concern
- Based on static acid-base accounting test results, the EIS/EIR concluded that there was no net acid forming potential associated with the overburden materials
- No information was provided on contaminant leaching potential
- The EIS/EIR stated that the waste management units will contain chemicals and reagents that have the potential to contaminate the groundwater system
- No information was provided on mitigation, with the exception of stormwater management approaches

Royal Mountain King Mine – Water Quality Predictions, 1987 Waste Discharge Report

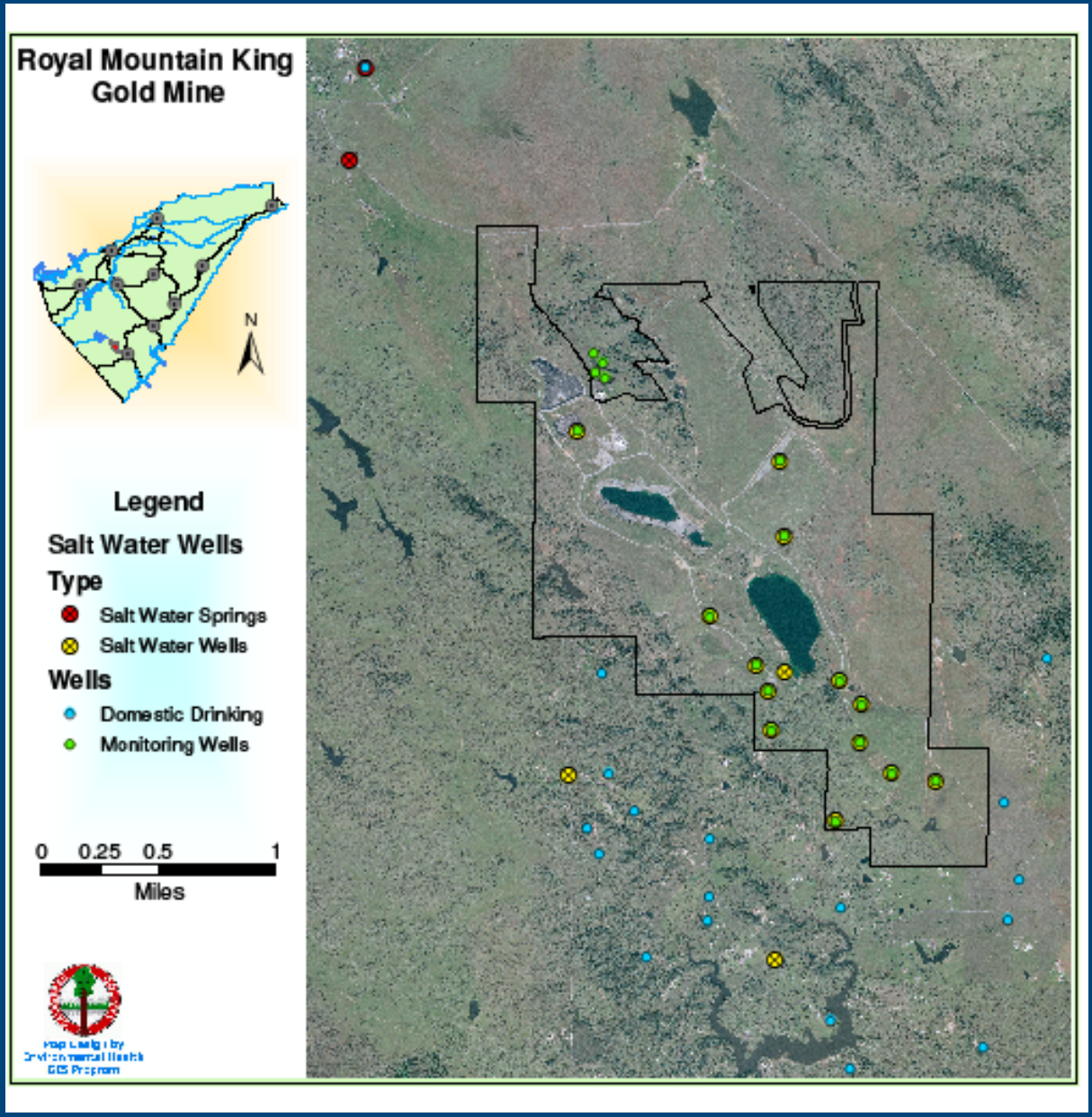
- Each type of waste was subjected to:
  - Acid-base accounting (hot hydrogen peroxide oxidation)
  - Total metal content
  - Short-term leach (WET, DI water extract)
  - Sulfuric-acid extractable metal concentration for samples with acid-forming potential
  - Bioassay studies on all wastes except overburden
- The testing results showed the contaminant potential to be high for all materials.
- All overburden lithologies and flotation tailings samples had excess neutralization potential
  - NP:AP ratios were approximately 40:1 or higher, indicating that acid generation was unlikely

Royal Mountain King Mine – Water Quality Predictions, 1988 Baker Report

- Geochemical characterization testing consisted of:
  - Digestions of tailings and waste rock samples
  - WET tests on waste rock
  - Deionized Water Extraction test on waste rock
- Total digestion leachate values for tailings were elevated for antimony, arsenic, beryllium, cadmium, chromium, cobalt, copper, lead, mercury, molybdenum, nickel, selenium, silver, vanadium and zinc (>10 to 100 times MCL/SMCL values)
- Total digestion and WET test values for waste rock leachate were elevated for antimony, arsenic, beryllium (total digestion only), cadmium (total digestion only), chromium, cobalt, copper, lead, mercury (total digestion only), nickel, silver (total digestion only), vanadium (total digestion only) and zinc
- Deionized water extract concentrations for waste rock were elevated for arsenic.

Royal Mountain King Mine – Actual Water Quality 1987-2004

- Tailings monitoring wells showed exceedences of drinking water standards for chloride, nitrate, nickel, selenium, sulfate, TDS and manganese
- Heap leach concentrate area monitoring wells had exceedences of drinking water standards for antimony, arsenic, chromium, manganese, copper, nickel, nitrate, selenium, sulfate, TDS, and total and WAD cyanide
- Waste rock monitoring wells showed exceedences of drinking water standards for nitrate, TDS, sulfate, arsenic, chloride and selenium
- Surface water monitoring showed exceedences of drinking water standards for nitrate, sulfate, TDS and arsenic
- Pit water monitoring shows exceedences of sulfate and TDS SMCL values in North Pit; exceedences of arsenic, sulfate, TDS, and chloride drinking water standards in Skyrocket Pit


Royal Mountain King
Gold Mine
N
Legend
Salt Water Wells
Type
Salt Water Springs
Salt Water Wells
Wells
Domestic Drinking
Monitoring Wells
0 0.25 0.5 1
Miles

Royal Mountain King Mine – Actual Water Quality 1987-2004

- Meridian Gold received the California Mining Association Reclamation Award in 1994
- The mine area has been subject to historic mining, so baseline water quality (pre-historic mining) is difficult to determine
- The mine claims that elevated groundwater concentrations are background levels
- The RWQCB proved, using Piper diagrams, that the groundwater had changed over time as a result of mining activity (RWQCB interview, 10/15/04)
- The State Water Control Board vacated the 2003 cease and desist
  - Company could not achieve compliance
- Present Status – ???