

SUGGESTED GUIDELINES FOR  
EVALUATING GROUNDWATER  
RESOURCES IN NEPA DOCUMENTS  
ADDRESSING HARDROCK  
EXPLORATION PROJECTS ON NFS  
LANDS: AN UPDATE IN LIGHT OF  
RECENT COURT DECISIONS

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# Overview of Recent Court Decisions

- ▣ Recent adverse District Court decisions
  - Idaho Conservation League et al. v. USFS and Mosquito Mining Corporation (Boise NF, ID)
    - ▣ Case 1:11-CV-00341-EJL, 2012 (D. Idaho)
  - Gifford Pinchot Task Force v. BLM, USFS, and Ascot Resources (Gifford Pinchot NF, WA)
    - ▣ Case 3:13-cv-00810-HZ, 2014 (D. Oregon)
- ▣ Findings pertinent to groundwater resources
  - Mitigation measures alone are insufficient to supply a convincing statement of reasons or satisfy the “hard look” required under NEPA
  - Groundwater baseline data and effects analysis are necessary
  - Effectiveness of mitigation measures should be evaluated
  - Monitoring, commensurate with project impacts, during project implementation is needed to validate assumptions upon which analysis is based

# Objectives

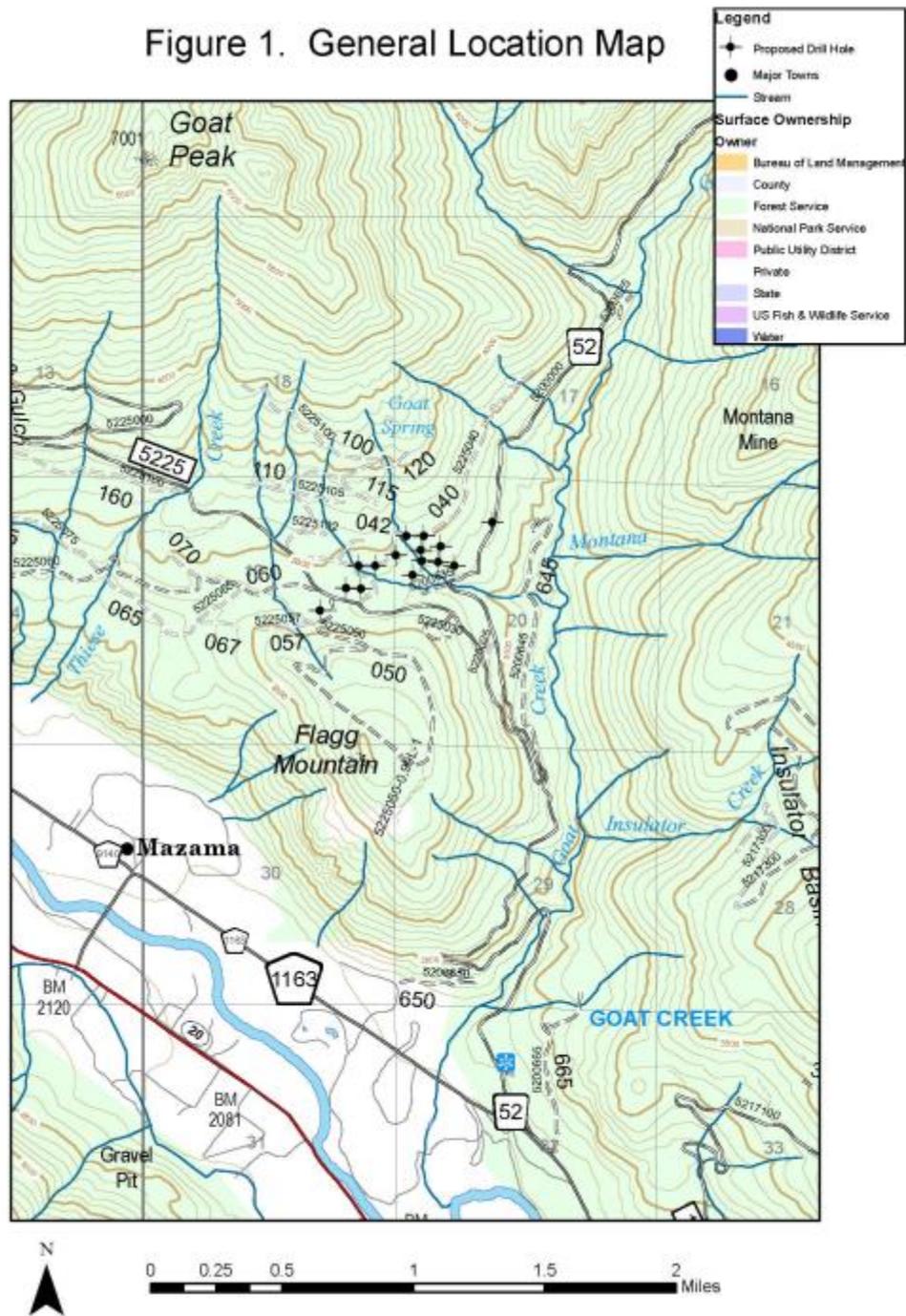
- ▣ Use the Mazama exploration drilling proposed plan of operations as a case study to evaluate the following aspects in NEPA documents:
  - Description of the proposed action
  - Typical scoping comments/substantive issues
  - Baseline data collection methods/approaches
  - Use of hydrogeologic conceptual models to describe the affected environment and support effects analysis
  - Effects analysis
  - Mitigation and monitoring
  - Recommendations for project proponents

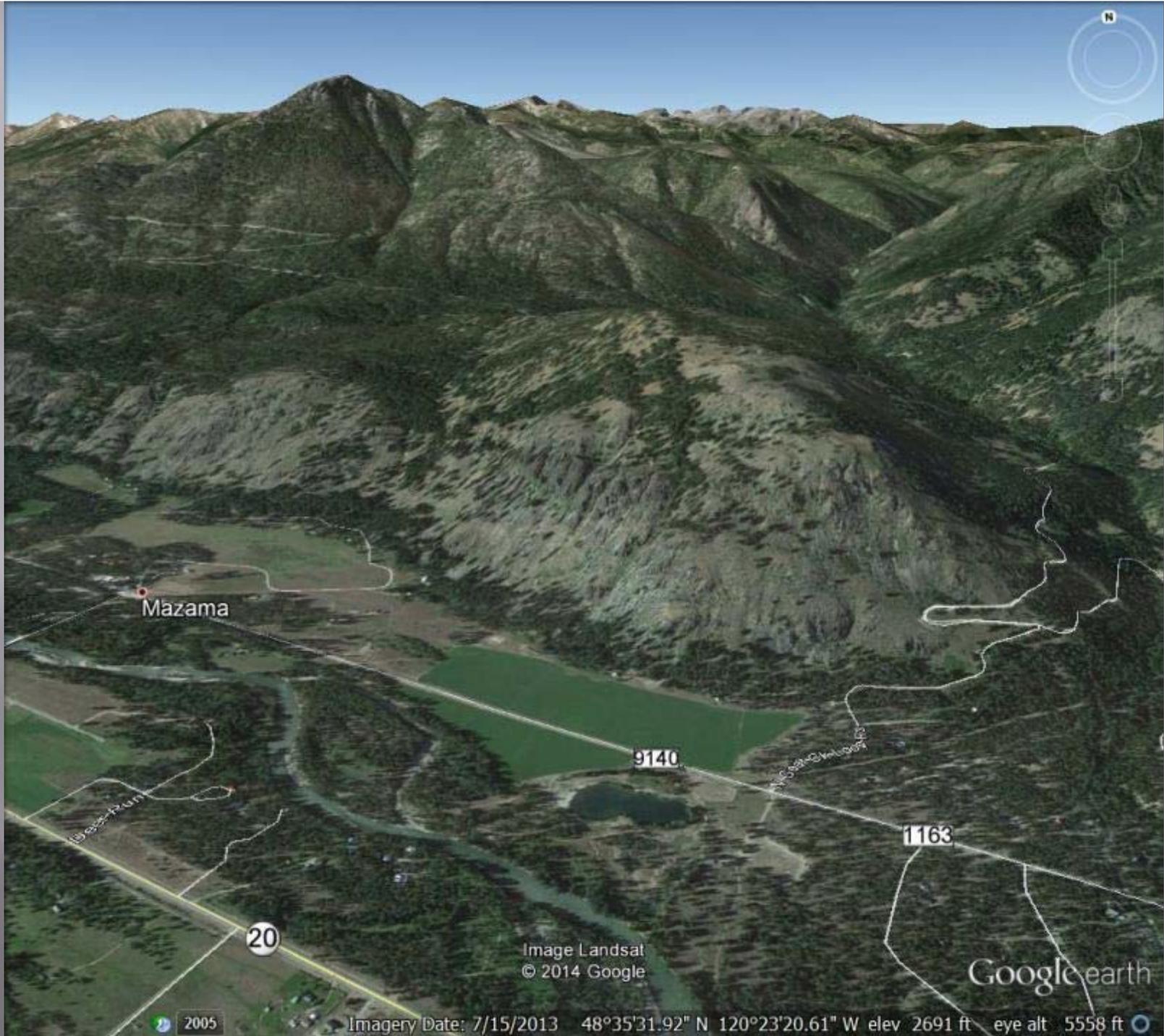
CANADA

Project Area



Figure 1. General Location Map





Mazama

9140

1163

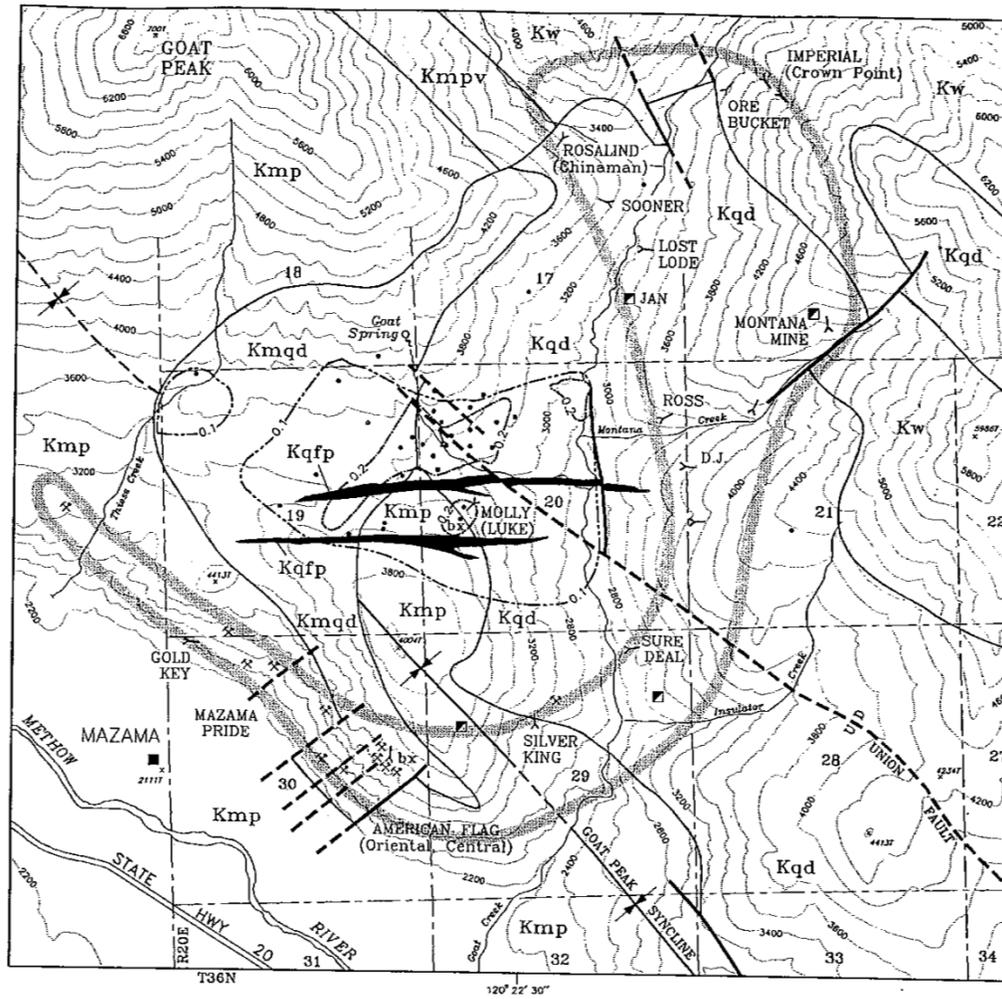
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Image Landsat  
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Google earth

2005

Imagery Date: 7/15/2013 48°35'31.92" N 120°23'20.61" W elev 2691 ft eye alt 5558 ft



Late Cretaceous intrusive rocks

FAWN CREEK COMPLEX

**Kqfp** Quartz feldspar porphyry dikes

**Kmqd** Quartz diorite, medium grained

**Kqd** Diorite, fine to coarse grained

Cretaceous volcanic and sedimentary rocks

**Kmp** Midnight Peak Formation

**Kmpv** Midnight Peak Formation, Ventura member

**Kw** Winthrop Sandstone

> 0.1% copper

> 0.2% copper

Extent of veins

Contact

Fault, dashed where approximately located

Syncline, dashed where approximately located

Prospect

Mine shaft location

Mine adit location

Drill Hole

Breccia

Elevation point (Feet)

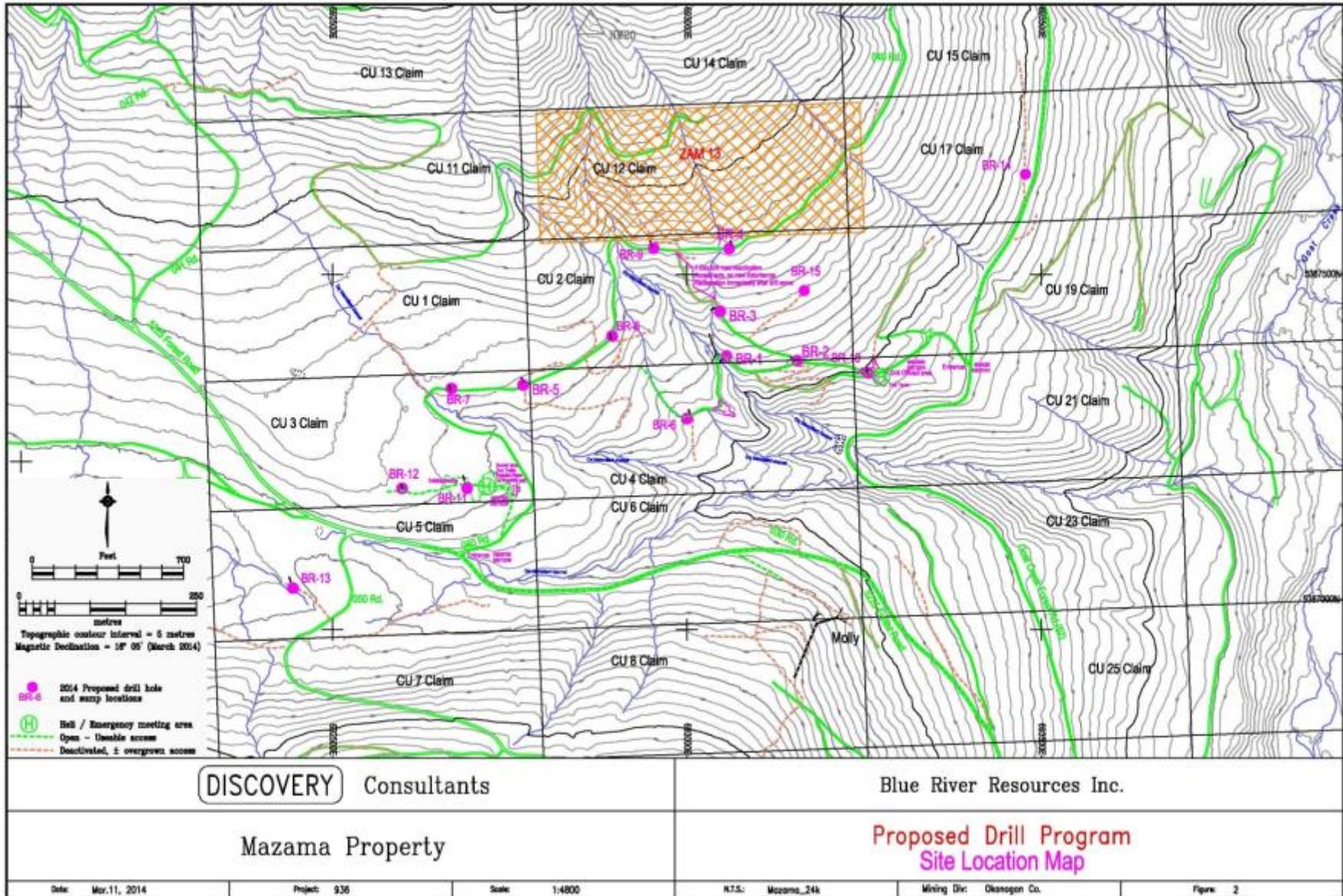


0 .50 Mile  
0 .50 Kilometre

Contour interval 200 feet

Source: Lasmanis (1995)

# Map of Proposed Drill Sites



A copper mining company proposes to do exploratory drilling for copper ore in the Mazama area this summer and fall.

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**what do you think?**

Blue River Resources Ltd, based in Vancouver, BC, is proposing to drill 15 bore holes just north of Flagg Mountain, less than two miles from Mazama. Their plan is to drill 24 HOURS PER DAY, 7 DAYS PER WEEK, starting August 1 and throughout the summer and fall, in their search for copper ore. The bore holes will be approximately 2000 feet deep. If they are able to "punch up" a claim of commercially viable copper ore, they could turn Mazama into the first open pit copper mine in the State of Washington. It does not take a photo to understand what this could mean to Mazama and the entire Methow Valley.

take action and join us to **Protect Flagg Mountain**

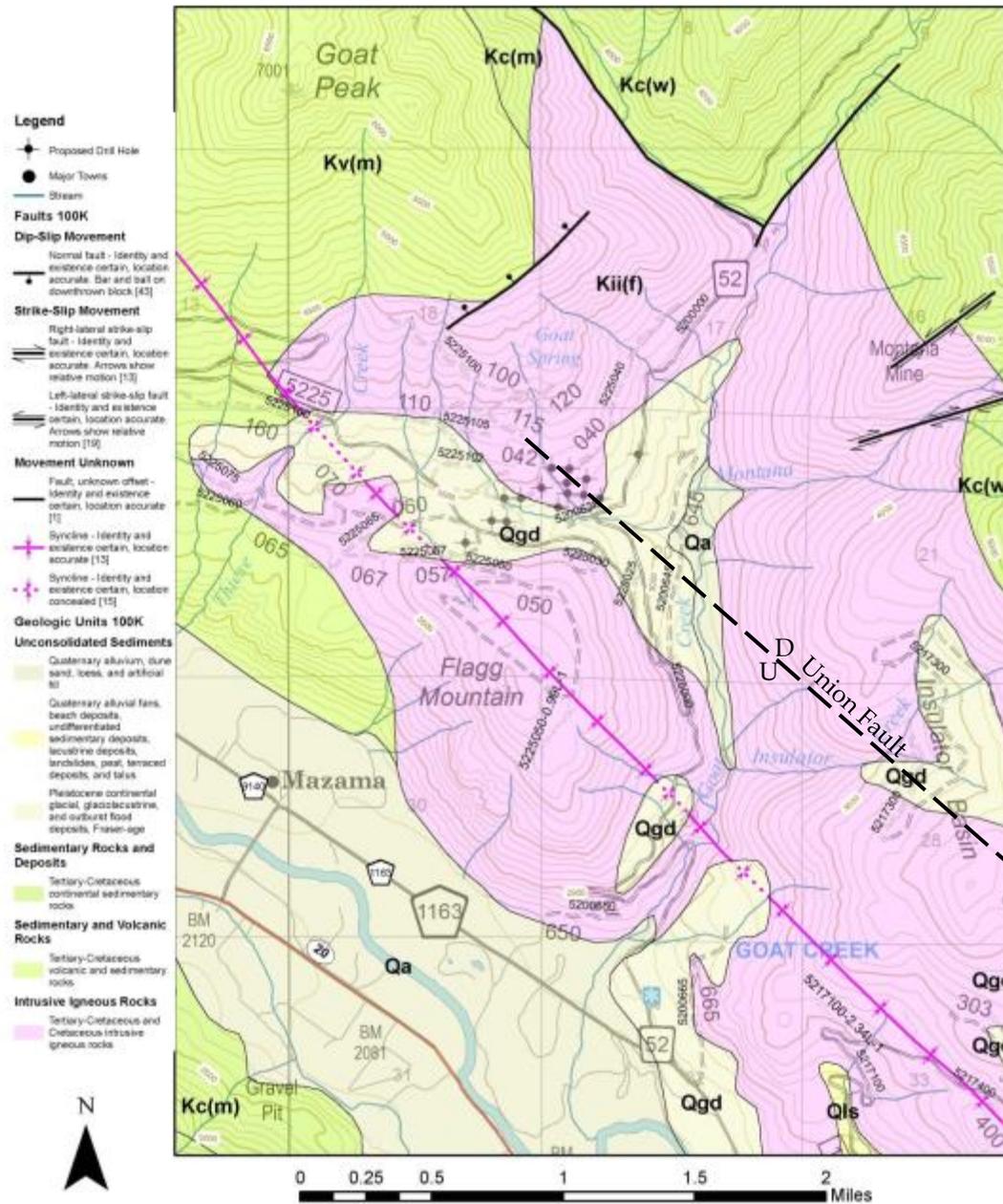
**Protect Flagg Mountain**

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# Baseline / Affected Environment

- ▣ Hydrogeologic Conceptual Model
  - Geologic setting
  - Aquifer types and properties
  - Depth to groundwater from boreholes, piezometers, or wells
  - Occurrence of seeps/springs, wetlands, ponds, lakes
  - Surface streams (gaining or losing reaches)
  - Groundwater recharge/discharge areas
  - Abandoned mines
  - Groundwater flow system
  - Groundwater quality
    - ▣ USGS geoenvironmental mineral deposit models
    - ▣ Available project area data
    - ▣ Baseline data collection

Figure 2. Geologic Map of the Project Area



Source: Washington Department of Natural Resources, Division of Geology and Earth Resources (2010) and Lasmanis (1995).







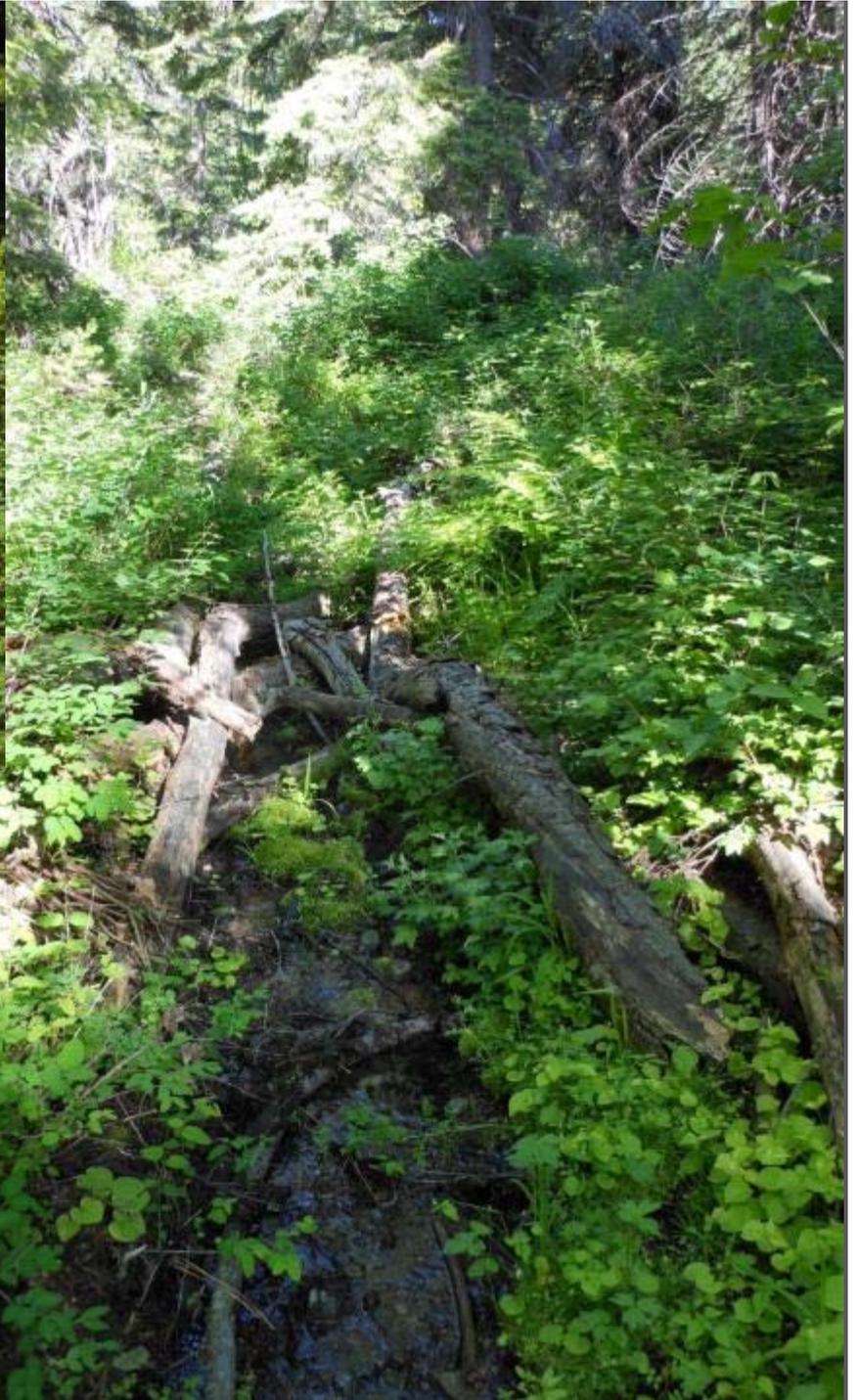
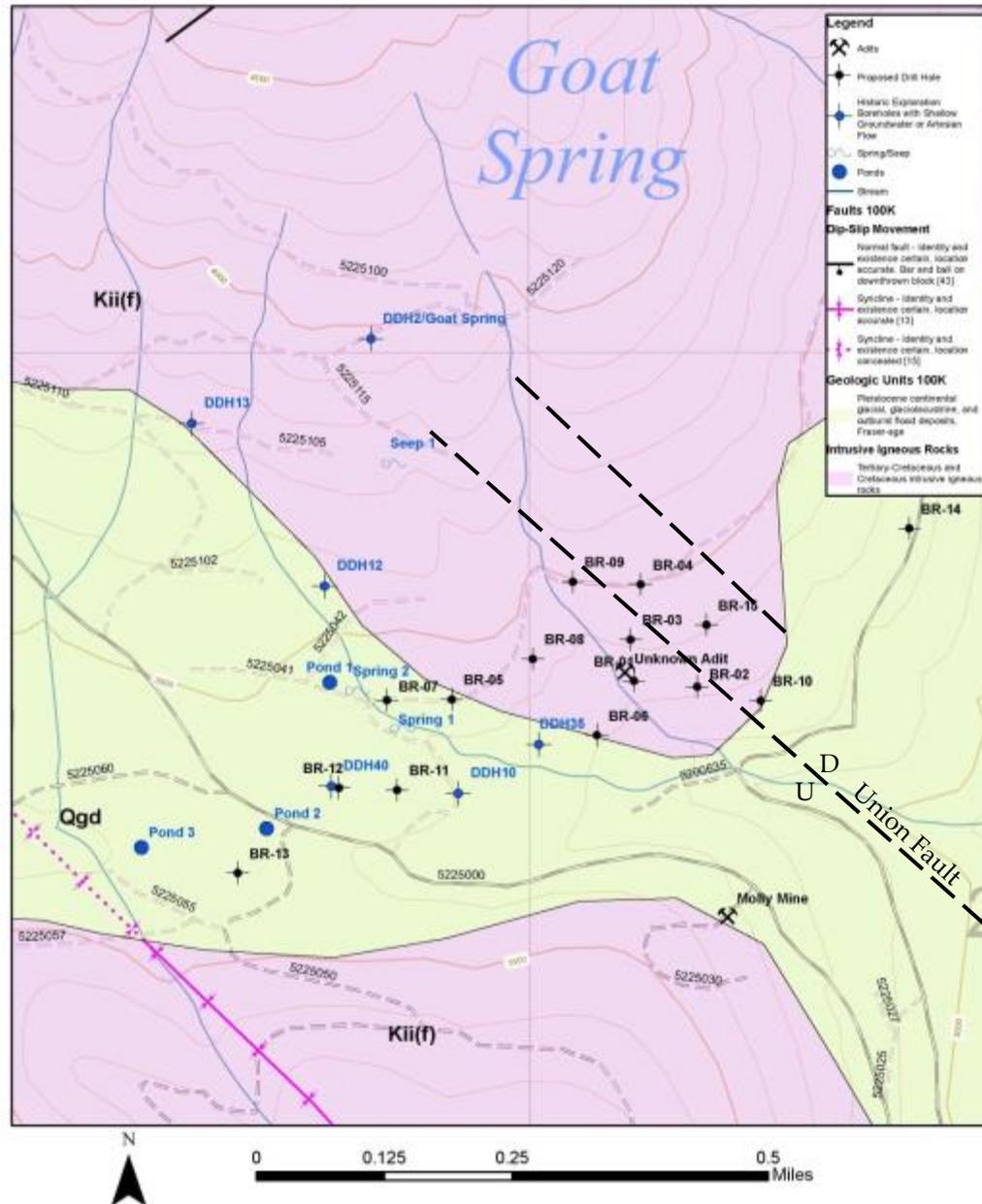




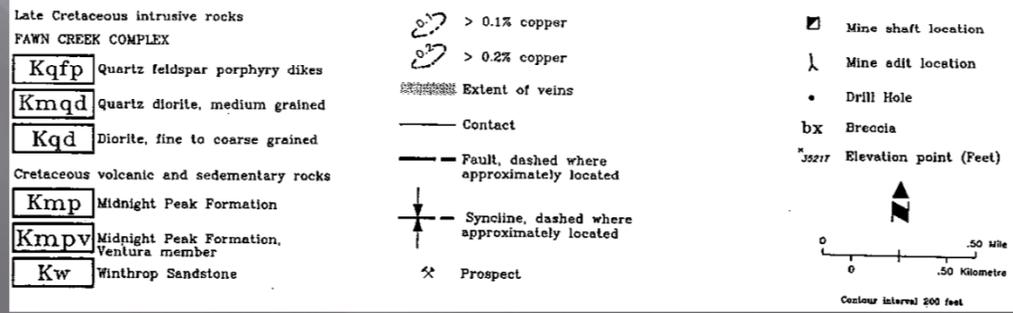
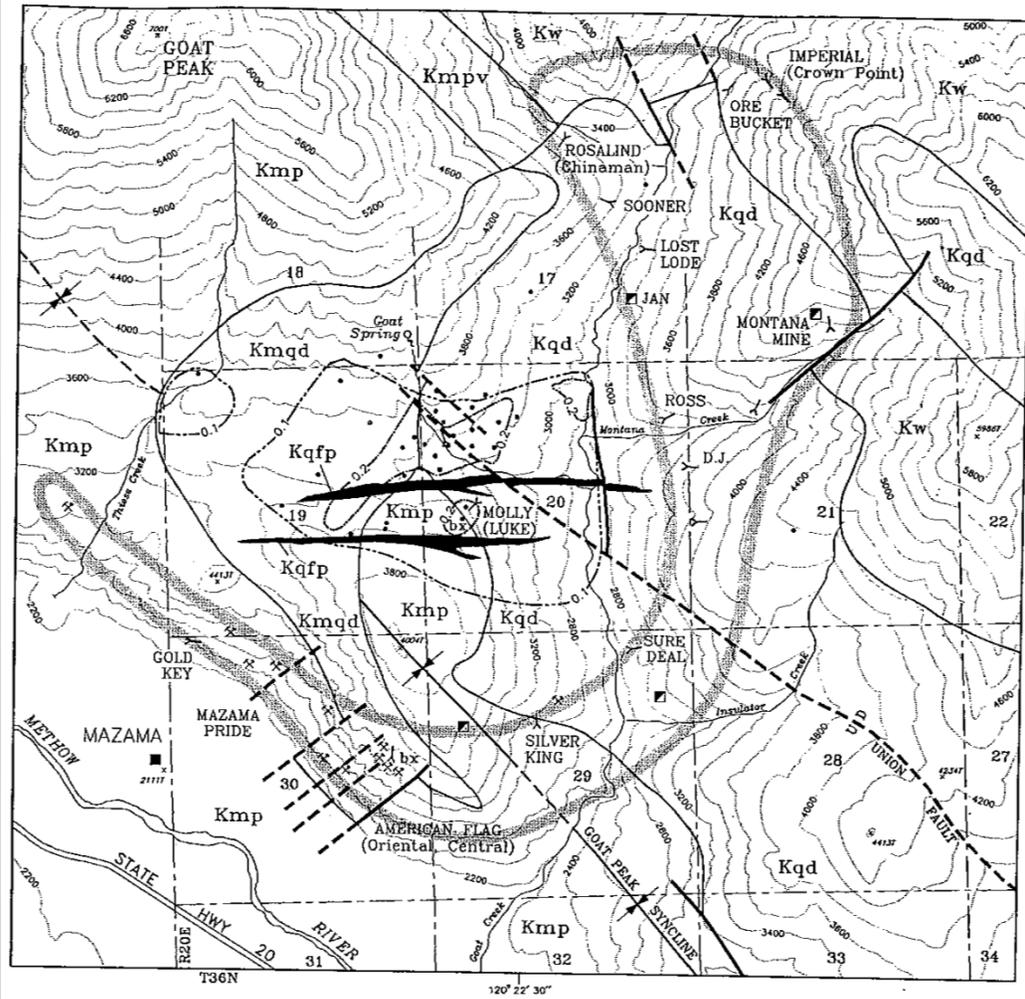




Figure 5. Proposed Drill Sites, Area Seeps and Springs, and Historic Boreholes with Evidence of Shallow Groundwater or Artesian Flow



Source: Washington Department of Natural Resources, Division of Geology and Earth Resources (2010) and Lasmanis (1995).



Source: Lasmanis (1995)

# Effects Analysis

- ▣ Petroleum or hazardous materials transportation, storage, and spills
- ▣ Drill make-up water source/quality/use
- ▣ Drill pad siting/grading considerations
- ▣ Drilling mud, additives, and material properties
  - Purpose, function, MSDS, and certifications
- ▣ Drilling fluids management
- ▣ Drill cuttings characterization, management, and disposal
- ▣ Assessment of any solids removal systems for water re-use
- ▣ Management of downhole water gains and drilling fluid loss
- ▣ Artesian flow potential/management and control
- ▣ Aquifer cross flow along boreholes
- ▣ Borehole abandonment procedures appropriate for hydrogeologic setting and timing

# Effects Analysis (cont.)

- ▣ Assessment of potential impacts to groundwater quality and quantity
  - Hydrogeologic conceptual model for flow and contaminant/constituent migration pathways
  - Location of area receptors
    - ▣ Aquifers, water wells, municipal watersheds, source water protection areas
    - ▣ Seeps, springs, wetlands
    - ▣ Surface waterbodies/streams
    - ▣ T&E habitat
- ▣ Cumulative effects
- ▣ Consideration of appropriate BMPs and mitigation measures to minimize impacts to surface resources and monitoring during project implementation

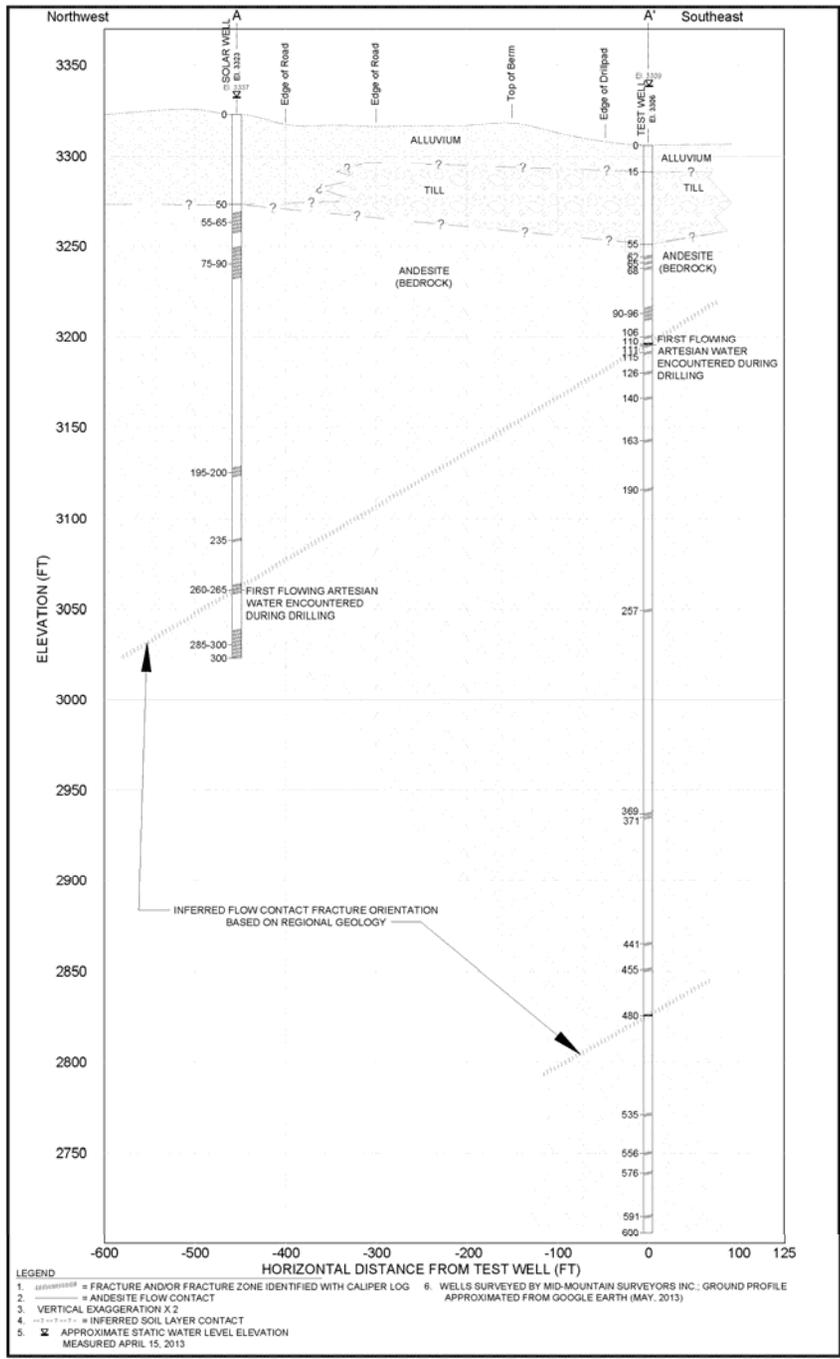




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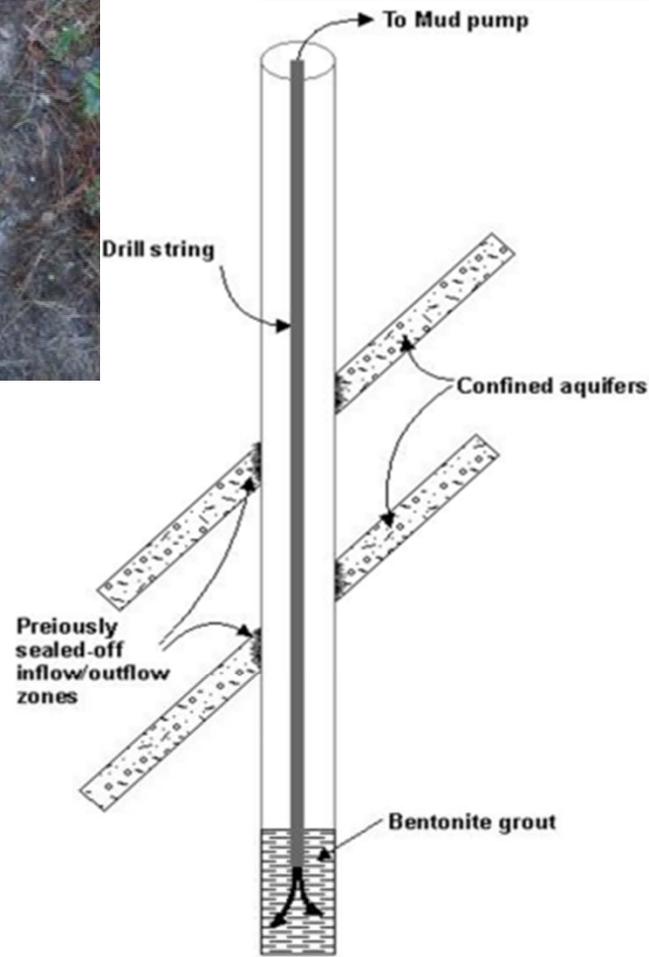


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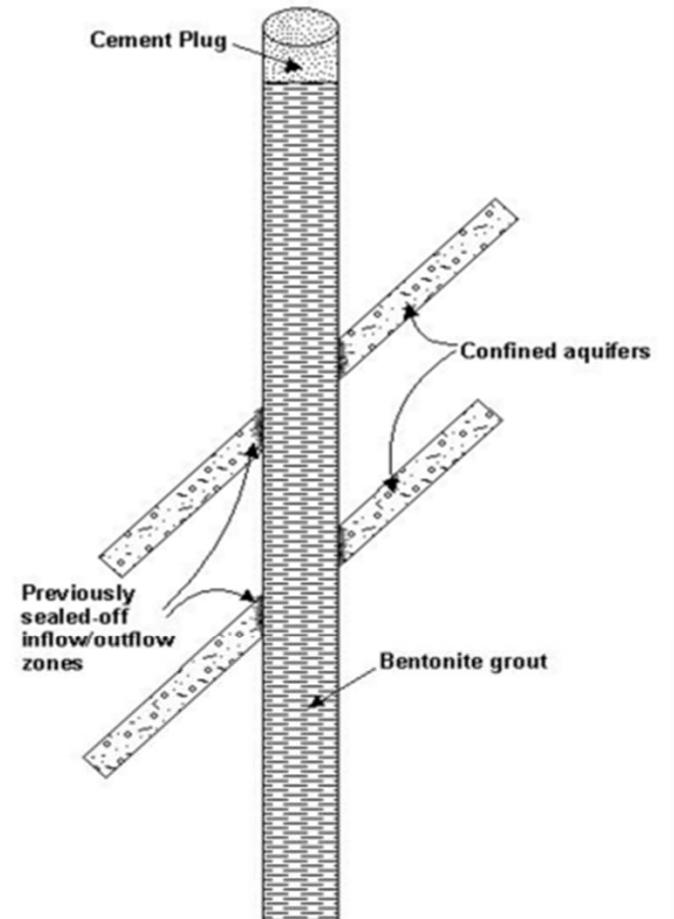


LEGEND

- 1. = FRACTURE AND/OR FRACTURE ZONE IDENTIFIED WITH CALIPER LOG
- 2. = ANDESITE FLOW CONTACT
- 3. VERTICAL EXAGGERATION X 2
- 4. = INFERRED SOIL LAYER CONTACT
- 5. = APPROXIMATE STATIC WATER LEVEL ELEVATION MEASURED APRIL 15, 2013
- 6. WELLS SURVEYED BY MID-MOUNTAIN SURVEYORS INC.; GROUND PROFILE APPROXIMATED FROM GOOGLE EARTH (MAY, 2013)

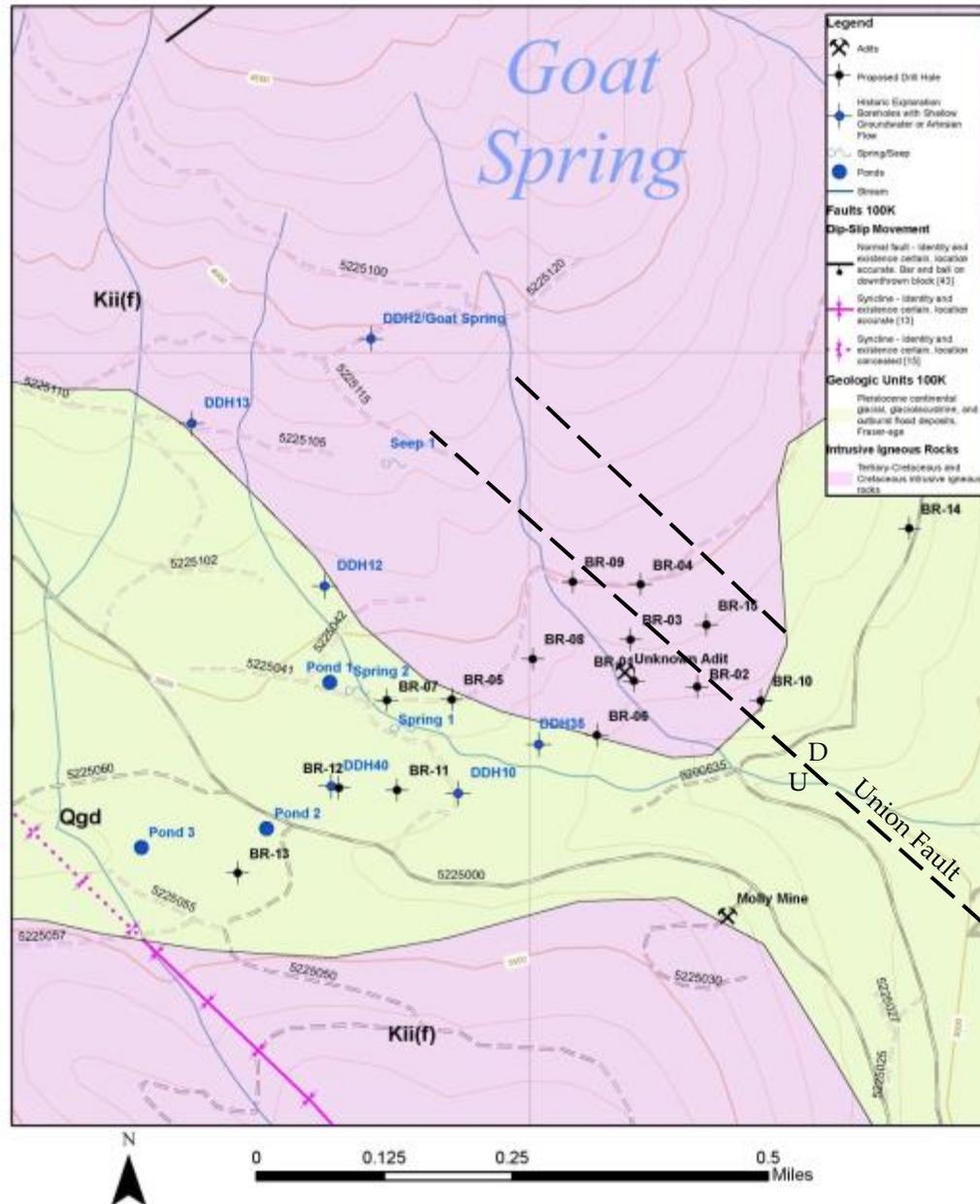


a) Start sealing from bottom



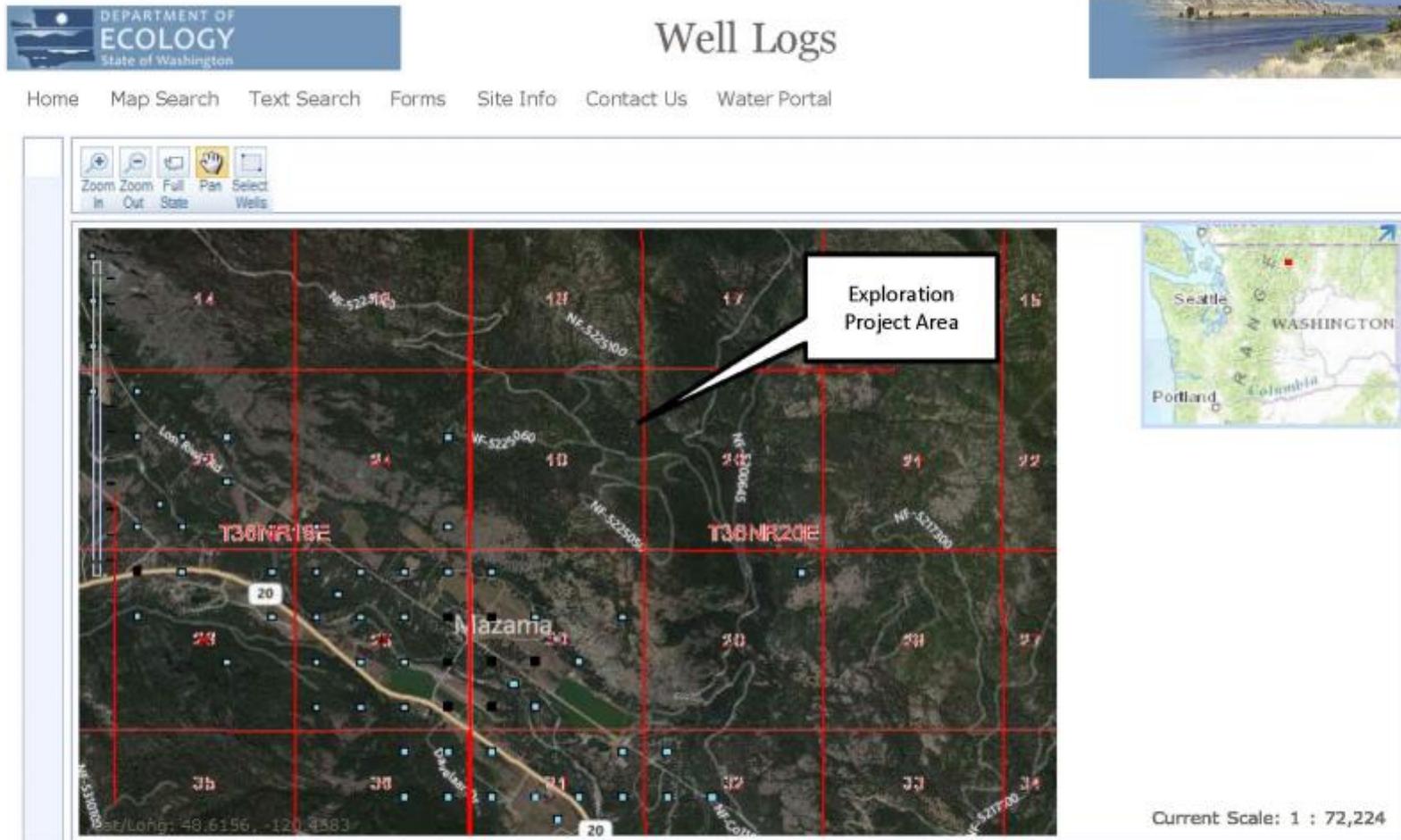
b) Completed abandonment

Figure 5. Proposed Drill Sites, Area Seeps and Springs, and Historic Boreholes with Evidence of Shallow Groundwater or Artesian Flow



Source: Washington Department of Natural Resources, Division of Geology and Earth Resources (2010) and Lasmanis (1995).

Figure 7. Area Water Well Locations from the Washington Department of Ecology



- Water Wells
- Resource Protection Wells
- Decommissioned Wells
- Multiple Well Types

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# Mitigation and Monitoring

- ▣ Determination of appropriate BMPs/mitigation measures and assessment of their effectiveness
- ▣ Groundwater quality/quantity monitoring during project implementation, commensurate with project scope, to validate NEPA analysis
  - Groundwater levels and/or water quality
    - ▣ Historic boreholes or wells
    - ▣ Groundwater surrogates-springs/seeps/gaining stream reach
  - Operational reporting
    - ▣ Hydrogeologic data obtained during drilling
    - ▣ Make-up water use during drilling to demonstrate downhole circulation is being maintained to the extent practicable
    - ▣ Borehole abandonment materials/procedures
  - For advanced exploration projects, conversion of an exploration bore(s) to an appropriately developed monitoring well(s) or monitoring well installation at appropriate location(s) based on site specific conditions may be appropriate

# Recommendations for Project Proponents

- ❑ Know your public and consider appropriate public relations opportunities
- ❑ Document baseline conditions as part of your exploration field work and consider potential environmental factors when siting drill pads
- ❑ Conduct informal scoping with District staff prior to formal Plan of Operations submission
  - ❑ Educate yourself on Forest Plan standards and guidelines for the management areas you are working in order to evaluate how and if they may impact your project
- ❑ Consider groundwater quality baseline data collection opportunities to support NEPA analysis
- ❑ Share pertinent and available groundwater data in corporate project records to contribute to the baseline dataset
- ❑ Be responsive to Agency requests for information/feasibility input



HQ TOP

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PROJECT KS HOLE NO. HC-13-02  
FROM 164 TO 173 BOX NO. 11

PROJECT KS HOLE NO. HC-13-02  
FROM 155.5 TO 164 BOX NO. 10

PROJECT KS HOLE NO. HC-13-02  
FROM 173 TO 182.5 BOX NO. 12