

Generating and Advancing Blind Targets Using Hydrogeochemistry: An Integrated and Multi-Scale Approach

**AME
ROUNDUP.**

James Buskard, Nevada Exploration Inc.
January 21, 2020



 Nevada Exploration Inc

Disclaimer

This Presentation contains certain "forward-looking statements" including, without limitation, expectations, beliefs, plans and objectives regarding the timing and nature of estimated future exploration, success of exploration activities, and potential transactions and ventures discussed. Among the important factors that could cause actual results to differ materially from those indicated by such forward-looking statements are the risks inherent in mineral exploration, the need to obtain additional financing, environmental permits, the availability of needed personnel and equipment for exploration and development, fluctuations in the price of minerals, and general economic conditions.

Wade A. Hodges, CEO of Nevada Exploration Inc., is the Qualified Person, as defined in National Instrument 43-101, and has prepared the technical and scientific information contained in this Presentation.

Why: huge amount of information / \$

Frequently Asked Questions

When: Regional → District → Target

CASE STUDY



Why:



Exploration undercover

Exploration is a business (must create value)

Exploration Value Drivers

SIZE OF THE PRIZE \times CHANCE OF SUCCESS $>$ COST TO TEST

PERFORMANCE 2009 – 2018*

\$0.55 discovered per exploration \$1
Spent \$198B to find \$109B

* SOURCE: Schodde (2019)

Detection vs. prediction

Predict



Detect



Detection vs. prediction

Predict



STILL IMPORTANT: but...

Detect

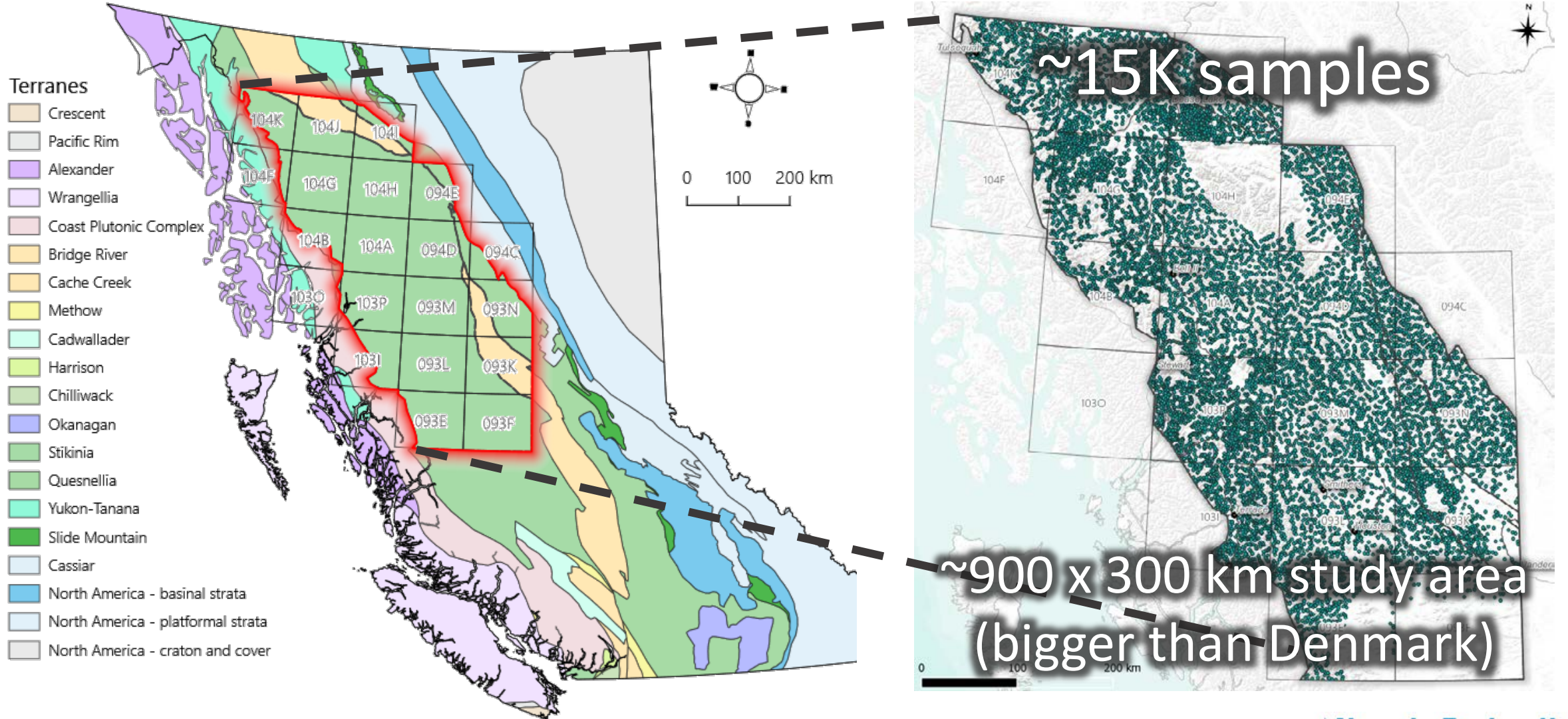


GEOCHEMISTRY
STILL REQUIRED!

?

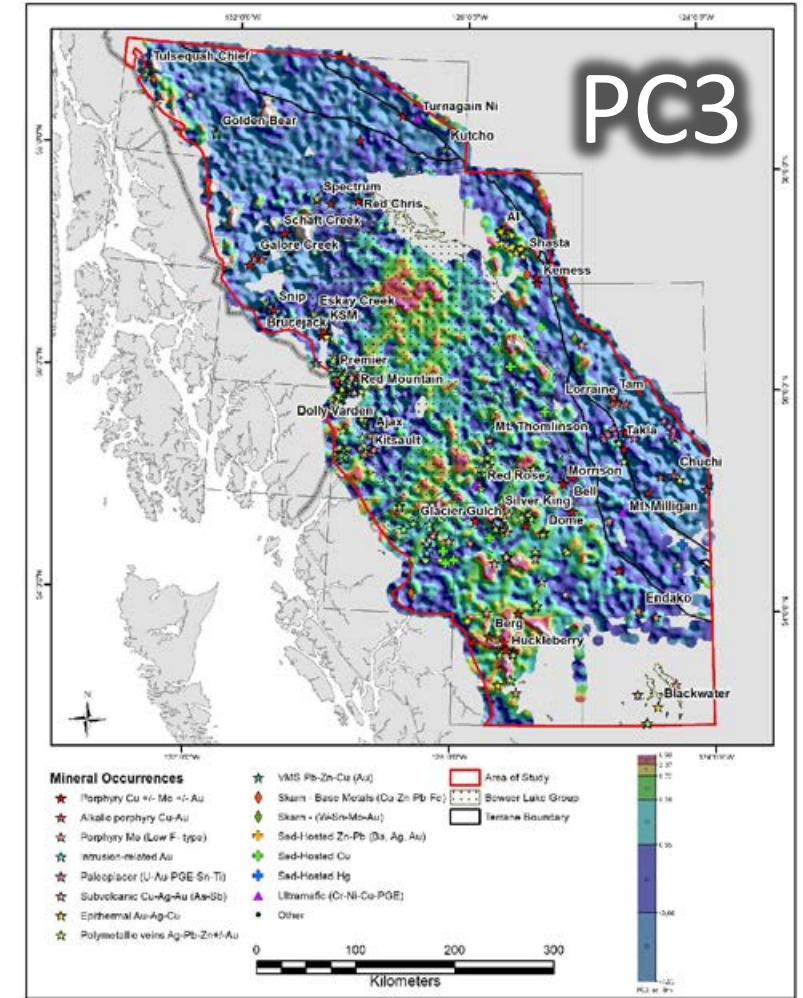
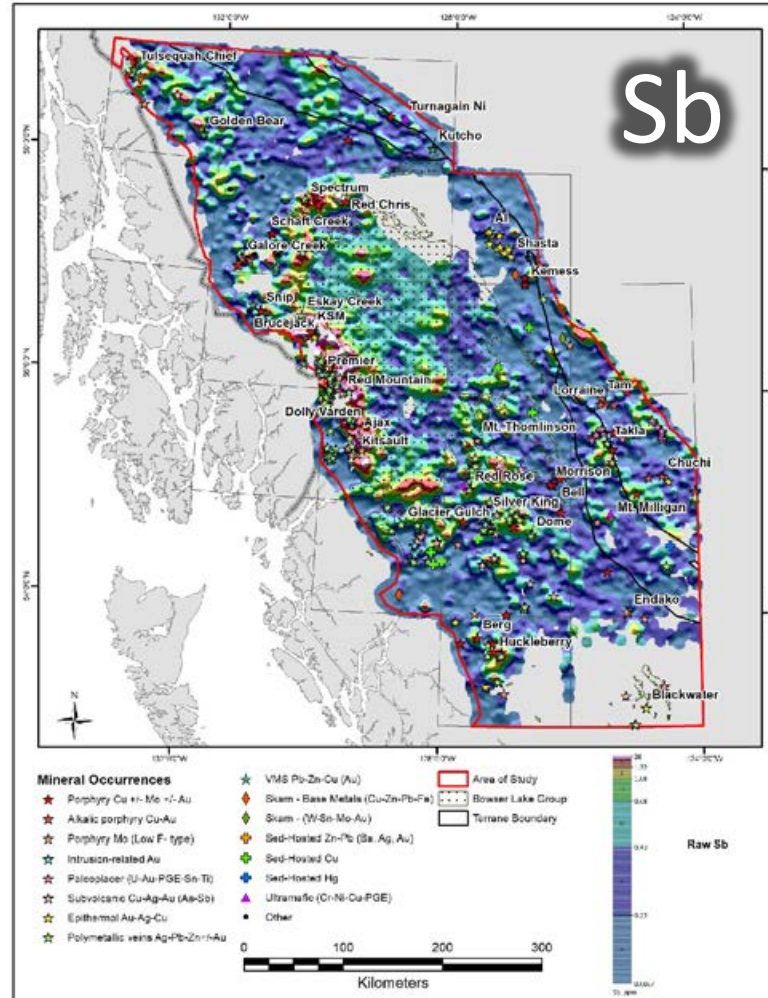
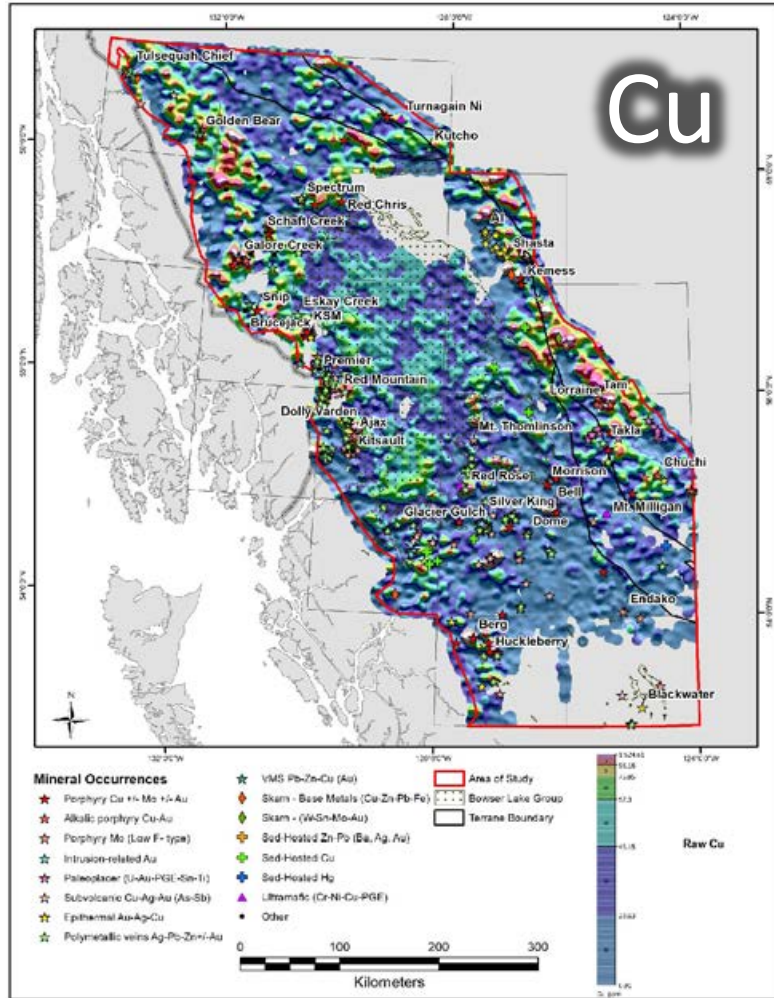
Regional-scale geochemistry programs

Stream sediment sampling in NW BC



Regional-scale geochemistry programs

Stream sediment sampling in NW BC



The Holy Grail

Reproduce past successes

See through cover

Confirm presence of a mineral

Cost-effective to use over vast areas

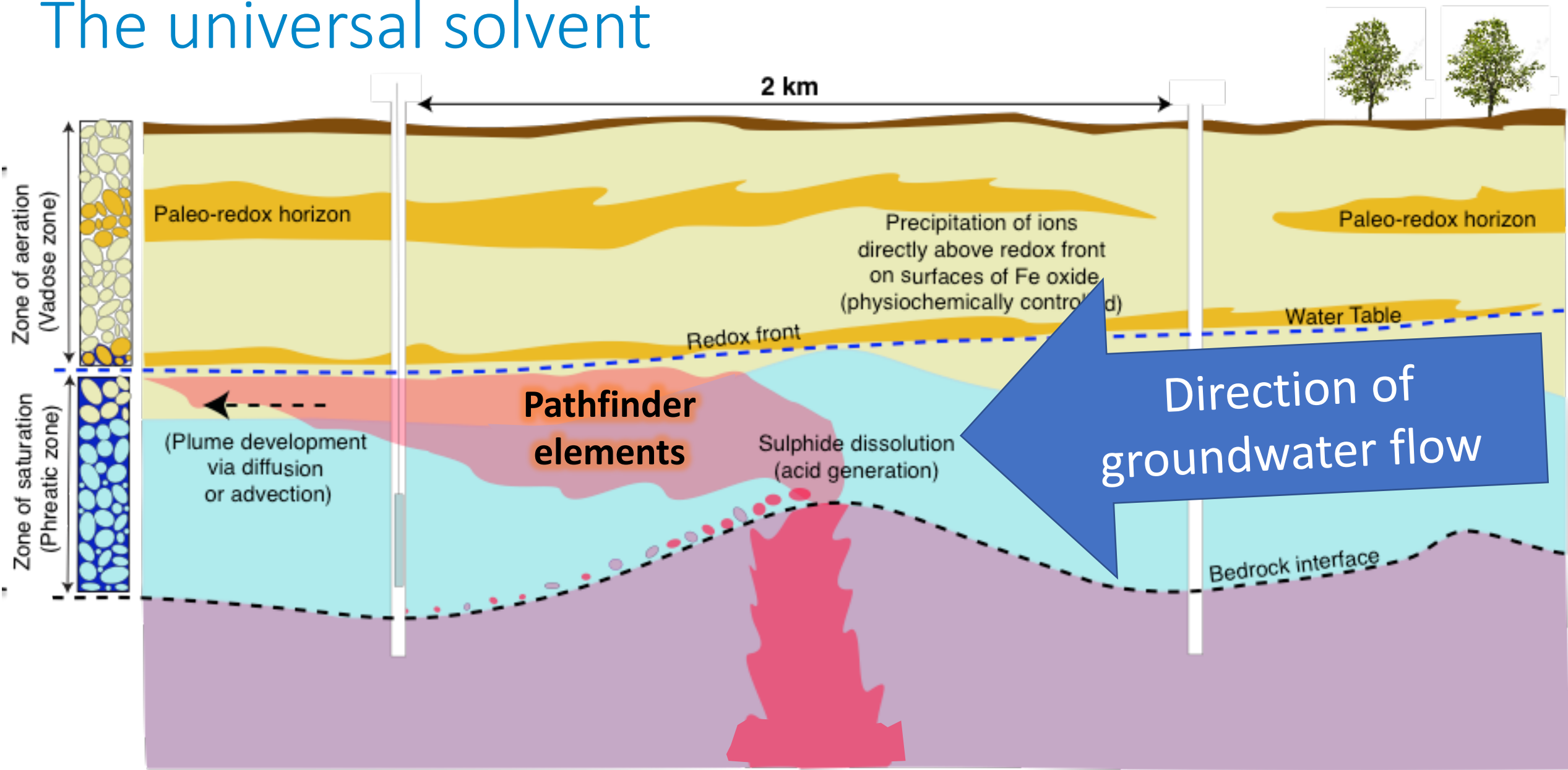
Orders of magnitude drop in detection limits



New sampling media



The universal solvent



Why is clear

Direct indication of minerals + pathfinders

Groundwater moves

Bigger footprints = fewer samples

Creates vectors and gradients

Can recharge from depth

Often along structures

Detect deeper mineralization

Open up new covered search spaces

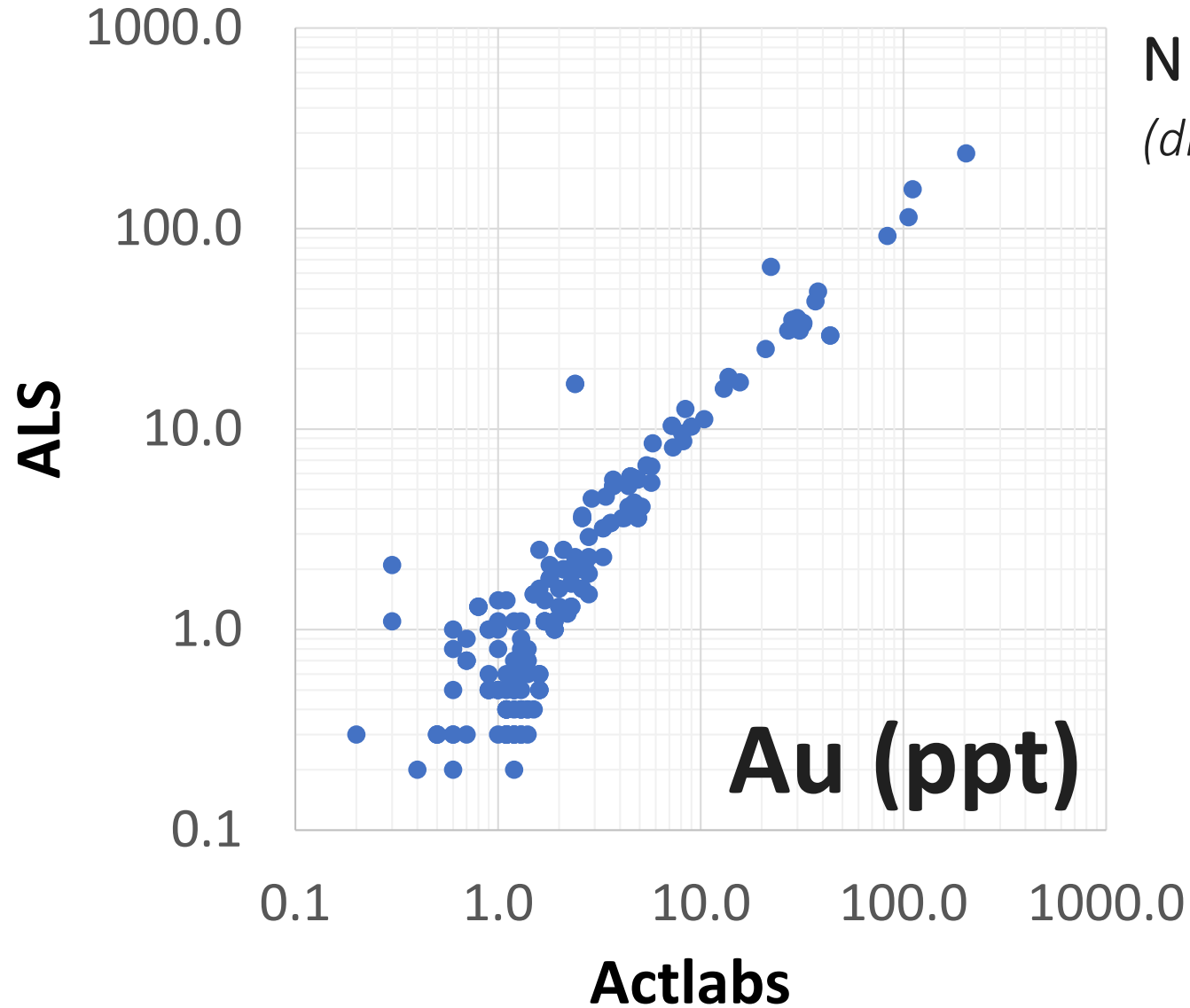
Lowers exploration costs

Focus use of more expensive tools



PPT!?

South Grass Valley Project 2019 Field Duplicates



N = 198

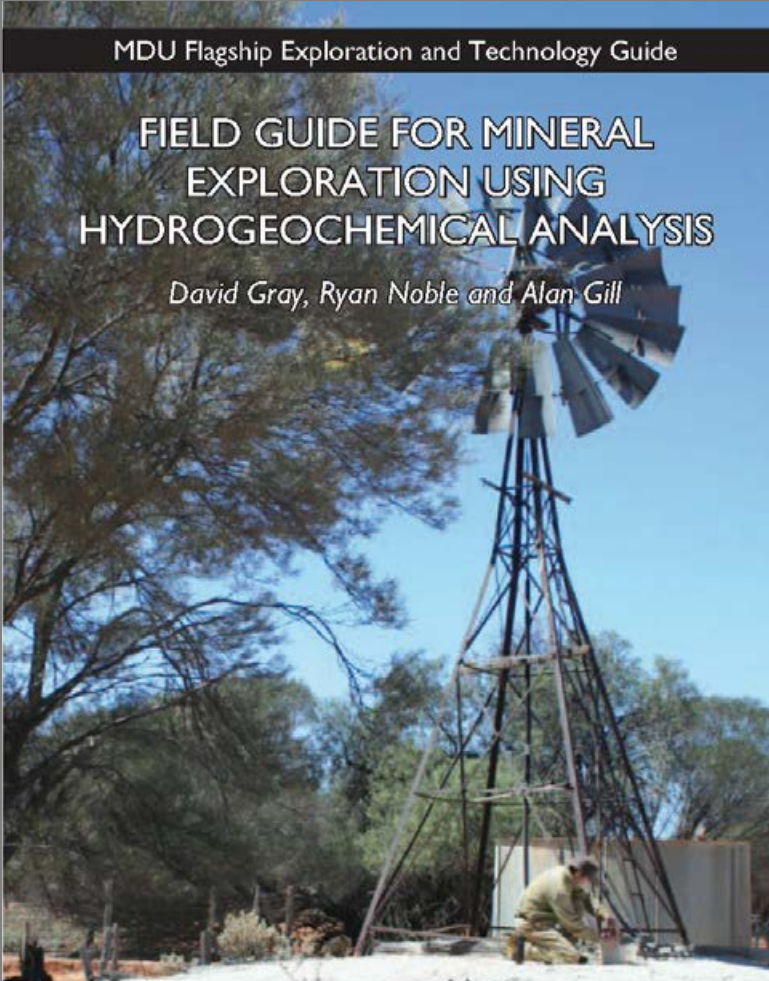
(different labs & instruments)



How do you collect/prepare/analyze samples?

MDU Flagship Exploration and Technology Guide

FIELD GUIDE FOR MINERAL EXPLORATION USING HYDROGEOCHEMICAL ANALYSIS

David Gray, Ryan Noble and Alan Gill



National Research **FLAGSHIPS** Minerals Down Under  

President's Message

At the beginning of my tenure as AAG's president, I look forward to continuing the involvement of the ongoing president, David Collins, and also the opportunity to thank him for his commitment to AAG during the time of his presidency. I would like to welcome AAG's incoming committee, Mark Atwood, Bob Barrett, Bruce Leaman, Roger Hume, and David Waterford, who bring a variety of experience to Council. Although their committees have worked hard this year, they will be stepping into the shoes of David Collins, David Latta, Pat Latta, and Dave Trinder, so I encourage you to see their reports associated with AAG's business, as they contribute to various AAG committees.

The continued success of AAG relies on the efforts of a small group of members who serve on AAG's Council, as well as a number of other committees who help give effect to their advice to Council and serve the various committees. These efforts, combined with committee members who serve on the inside track committees of EXPLORE, and if you recognize some of these names, it's probably because they have not only made contributions to AAG in various capacities over the years, but also because they are well known for their valuable contributions to applied geochemistry.

The most visible presence of AAG for most members are its publications, and these reports are largely paid for by the commitment of Council (Mark Atwood is Chair of CBEA) and Bob McChunglin is Chair of EXPLORE. The AAG website (www.aagexploration.org) contains a variety of information about reports and those interested in the organization, and it has been regularly updated since the last meeting of the AAG's Executive Committee. Although most of you will not know that Eric Christian has been leading the site information project for the reports, he could well have taught a lesson here to those who use the CBEA. Overseeing the day-to-day running of AAG has been the job of Barry Dorman, whose efforts have been instrumental in the success of the reports. Barry has been instrumental in the success of the reports, and it has been a pleasure to work with him. Barry's efforts have been instrumental in the success of the reports, and it has been a pleasure to work with him.

Let me, the outgoing president of applied geochemistry, say to those at the 2010 AAG in Parkersburg, New Hampshire. Of the 2010 meeting, I attended this meeting, and I am sure that the organization will continue to grow and prosper. I think that the high caliber reports and the success in applied geochemistry can be continued with a higher percentage of student speakers at AAG, which at the moment stands at only 4% of the 200-word abstracts. I hope that these increasing reports and the success of the organization.

EXPLORE

Increasing the number of student speakers will also help address the aging demographic of AAG. In most of member nations, AAG members who hold academic positions are particularly important, as they are well placed to both bring applied geochemistry, and encourage members to join AAG.

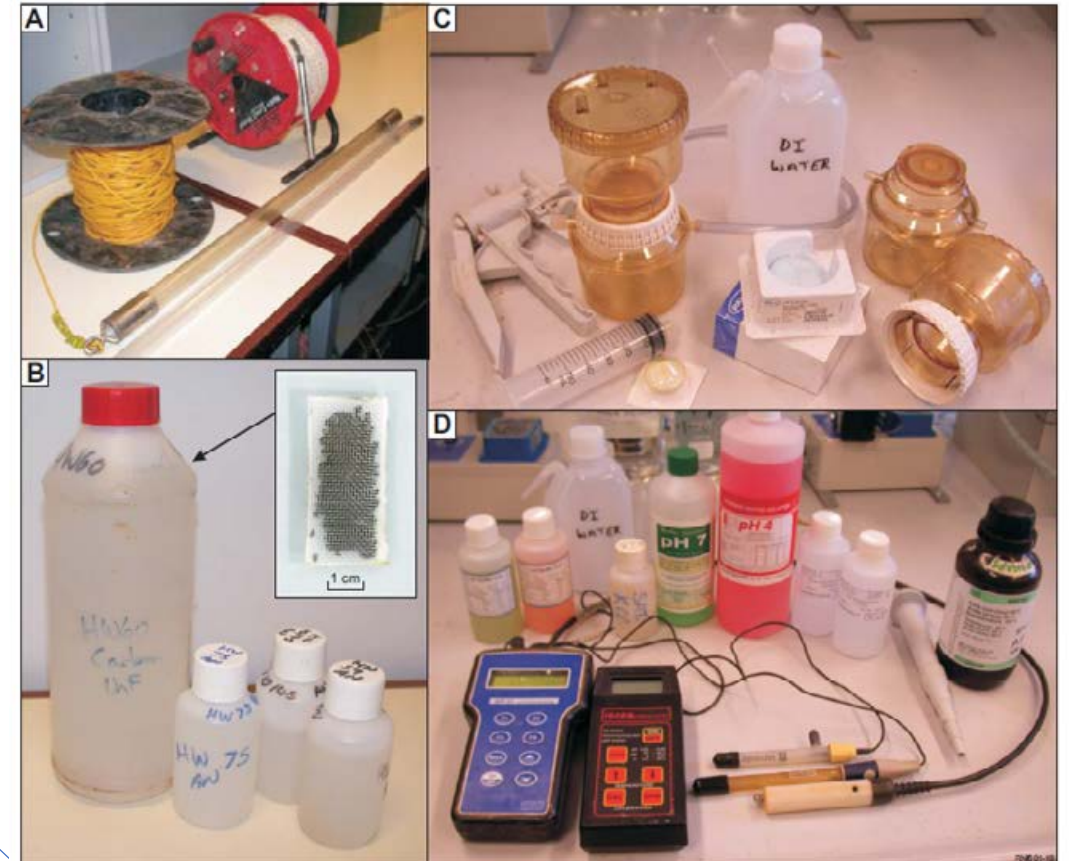
The issue of membership numbers is not unique to our association. Recently, the Geological Society of Australia and the Australian Institute of Geoscientists have both experienced a decline in membership through a lengthy consolidation process with members who had the possibility of an acquisition (which did not materialize). AIGS took membership numbers in a long number from 100,000 to 10,000. However, the loss of student speakers did cause difficulties, and organizations like the AAG have expressed their reluctance in being a member of a large, well-known association with an aging climate, as perhaps we should consider associating with other groups with other professional organizations, but remain AAG in its present form.

With the beginning of the new year, it's time for me to step down from the AAG presidency, which will be passed to Barry Dorman. Although August 2011 seems a little distant, I hope you to continue enjoying the meeting and particularly thank the various committees. The AAG's success will be the result of the efforts of the AAG's members, so please to see you there, and the meeting in Parkersburg will be a great chance to meet and hear from the various committees. As with the day to day running of the AAG, the success of the AAG's reports relies on the commitment of AAG members who volunteer their time to ensure the reports are well prepared and run, and I think the AAG's best reports committees for their efforts. A little further out in the 2010 International Geological Congress (IGC), which will be held in Brisbane in August 2012 (over 2000 days ago), AAG has been invited to have the honor of the organization of the meeting, and its organization (David Collins) is working on the organization to hold AAG's annual meetings and technical sessions at the meeting. I had fun in helping with the AAG's annual sessions over the last few years, and hope to see many of you in Parkersburg in 2011.

Paul Morris
AAG President

EXPLORE NEWSLETTER
Volume 10 Number 1
December 2010

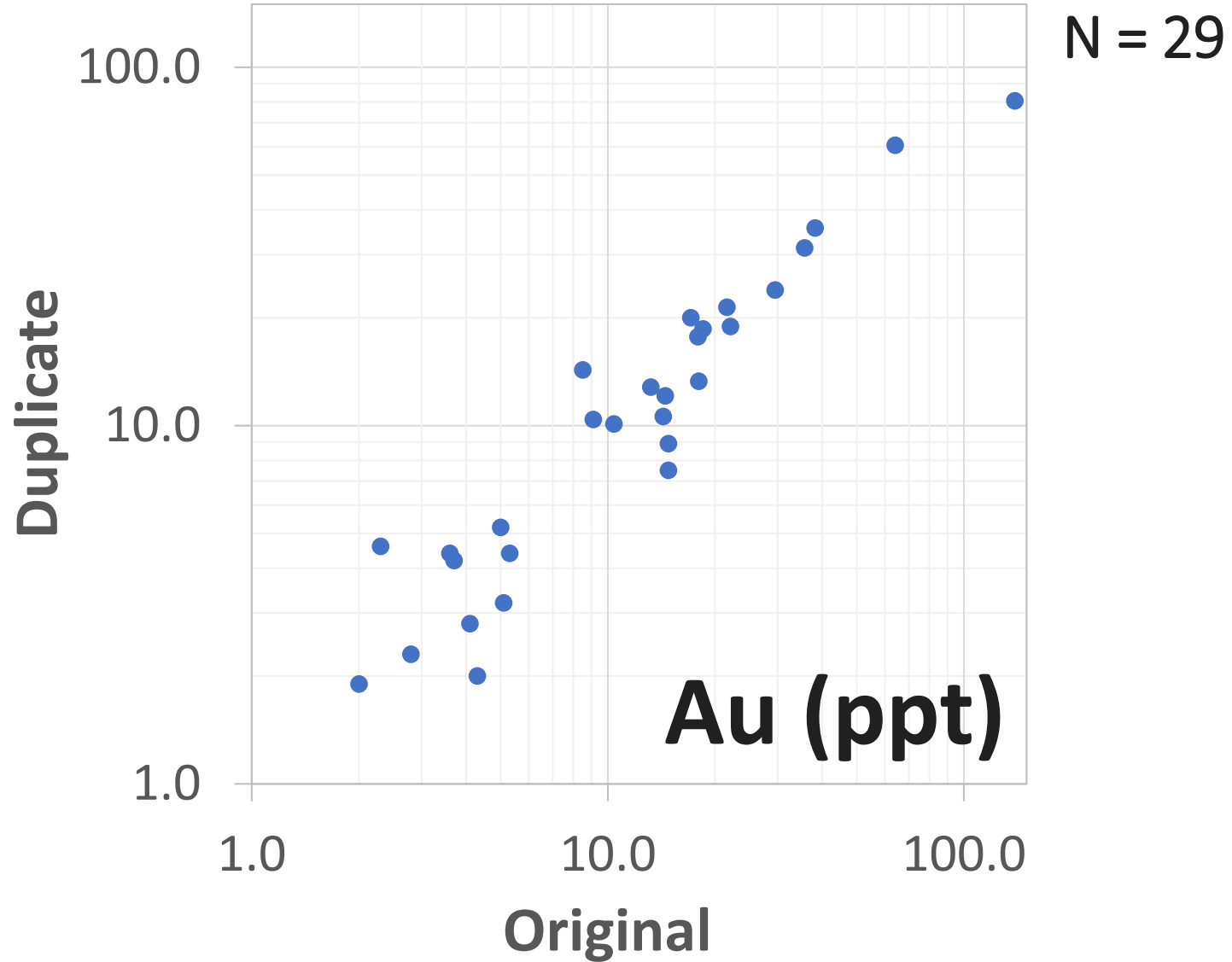




Noble & Gray (2010)
AAG Explore March 2010

Repeatable?

Kelly Creek Project 2016-17 RC Water Duplicates



What's anomalous?

Explorers need to know:

Background concentrations

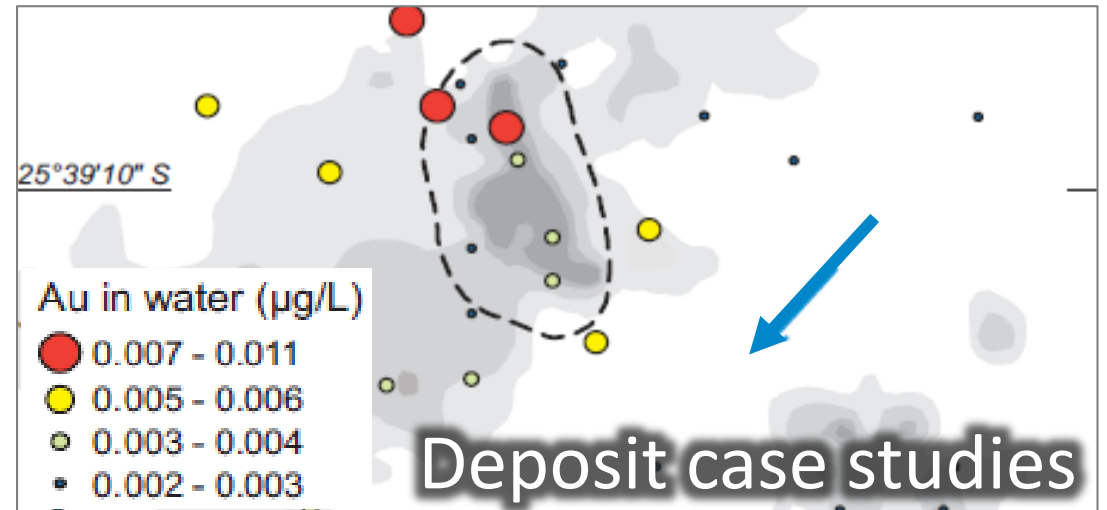
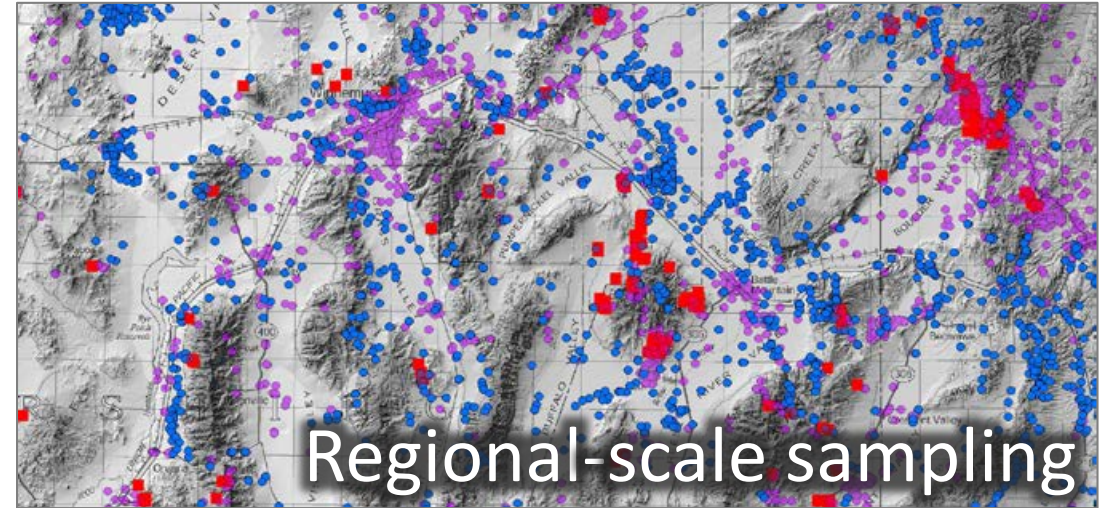
Concentrations at known deposits

Appropriate sample spacing

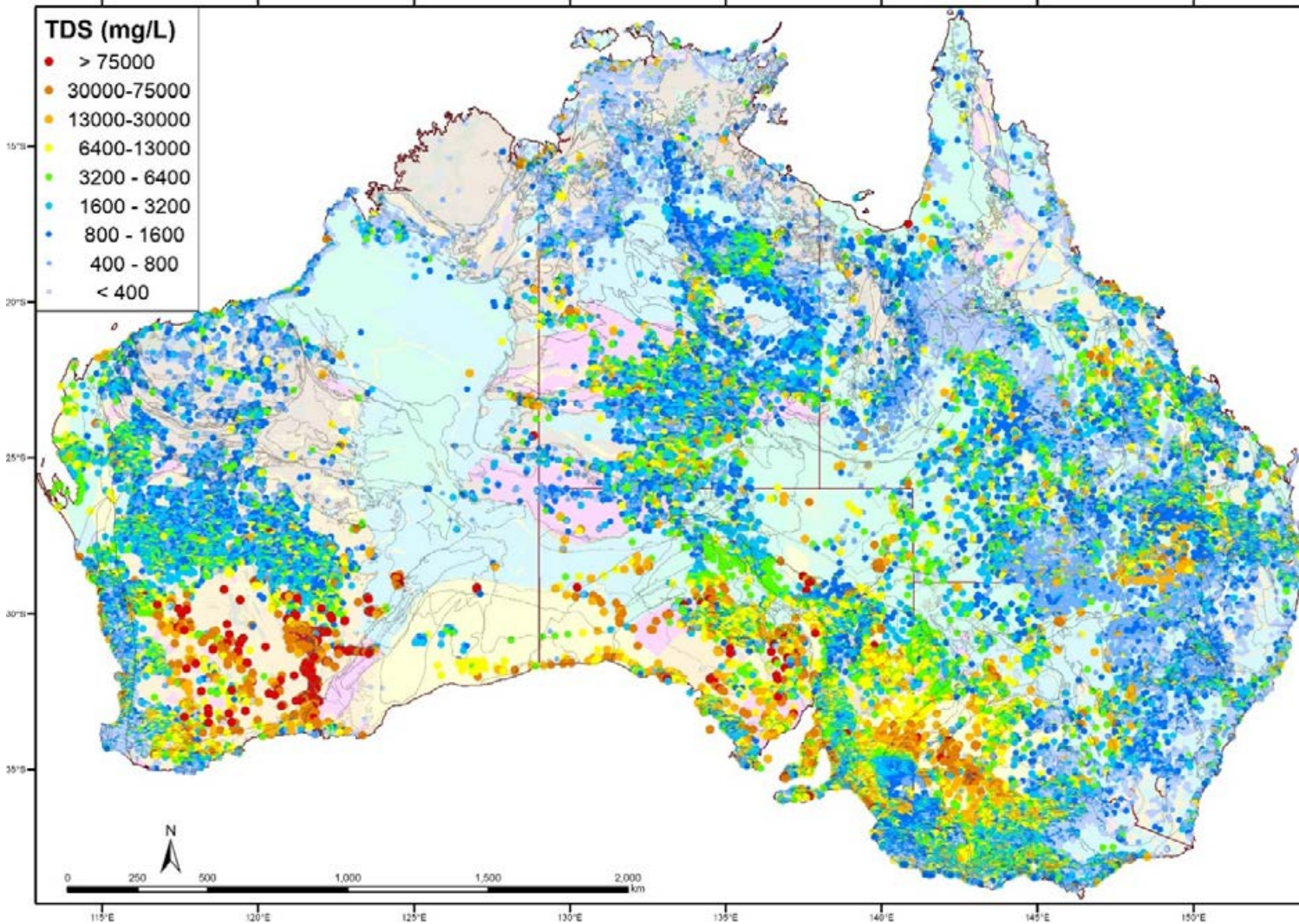
Requires

Regional context (large datasets)

Deposit case studies



Continental-scale hydrogeochemistry atlas

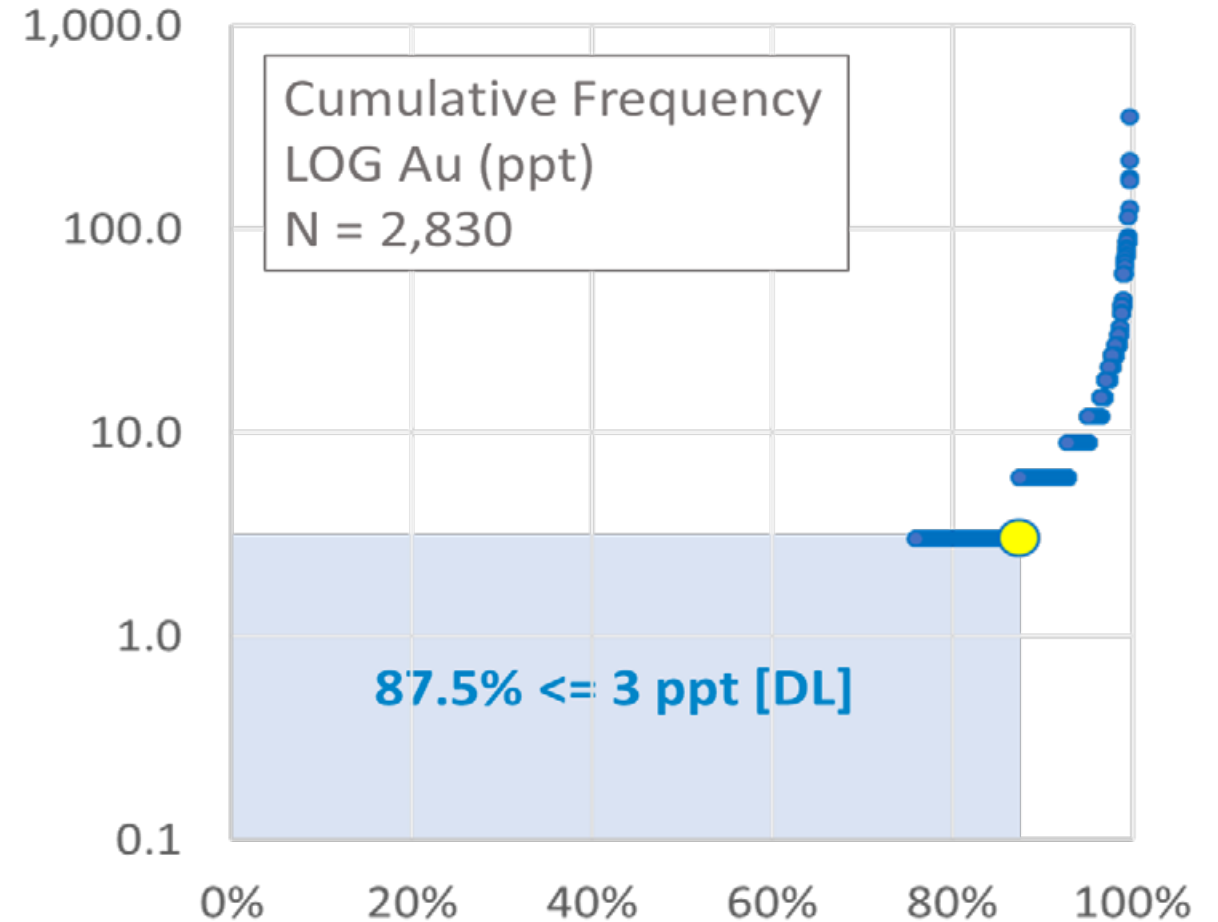
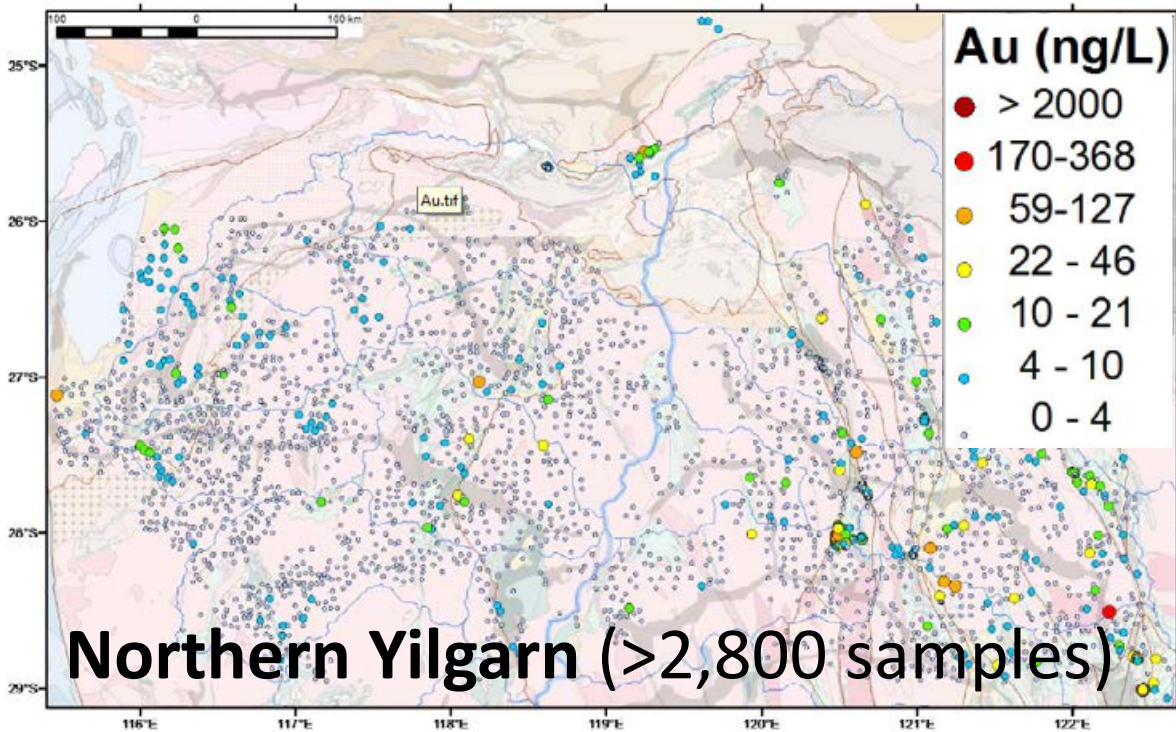


Aggregated existing data:

>380,000 samples

>30,000 Au analyses

Regional-scale sampling program



Low background concentrations

Multi-order-of-magnitude anomalies

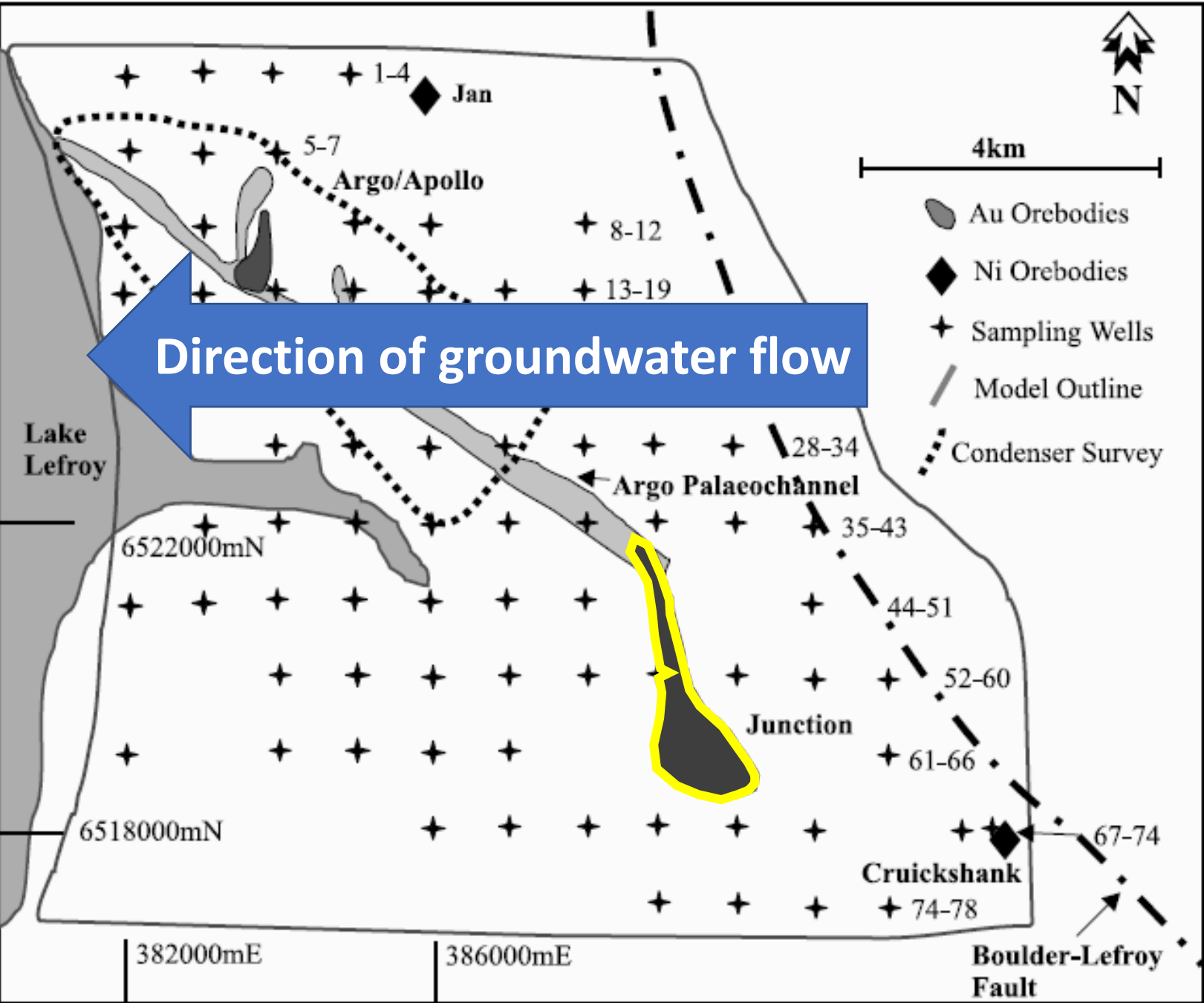
Reliably identified 15 of 18 larger-scale Au camps

Appropriate sample spacing?

St. Ives Area,
Western Australia

Junction (2.3 Moz Au)

1 km x 1 km grid
(purpose-drilled holes)



Appropriate sample spacing?

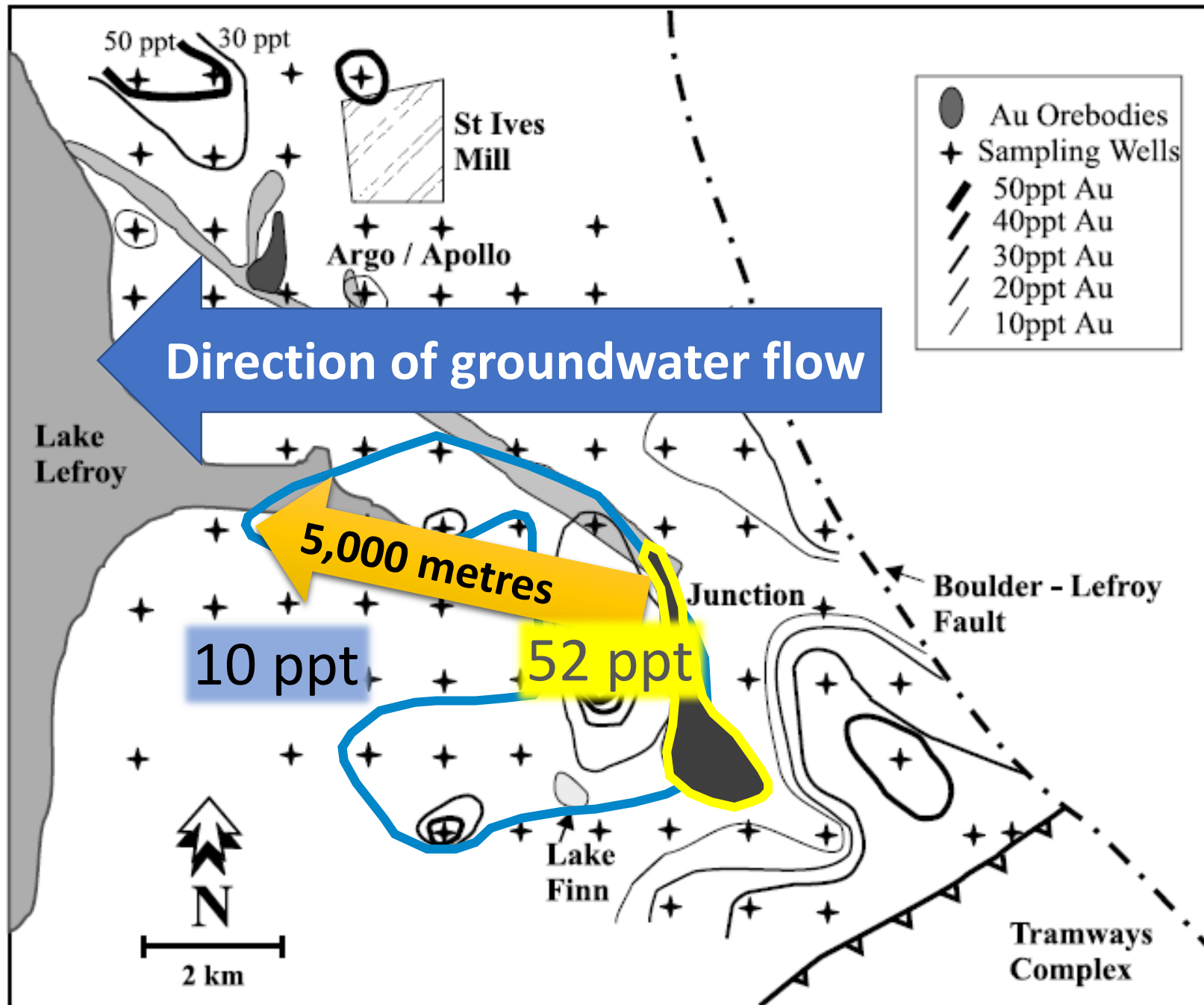
St. Ives Area,
Western Australia

Results

High sample (99th)

Footprint > Deposit
(10 ppt @ 5,000 m)

**Easily seen with 1 km
sample spacing**



Where's it being used?



Australia

CSIRO

Independence Group



**Photos:
David Gray**

Where's it being used?



Chile

First Quantum
Anglo American Chile &
Phelps Dodge

Photos:
Peter Winterburn

Where's it being used?



**Botswana and
Zambia
First Quantum**

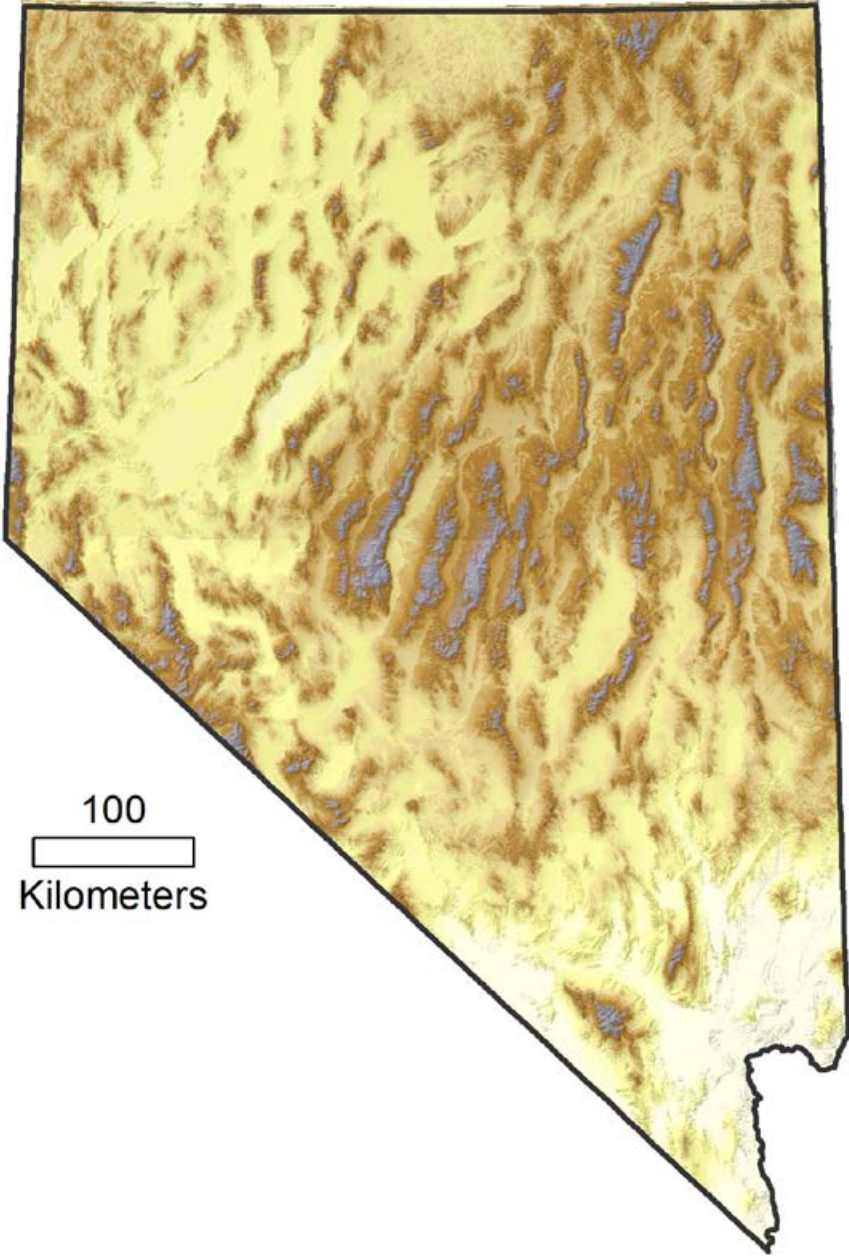
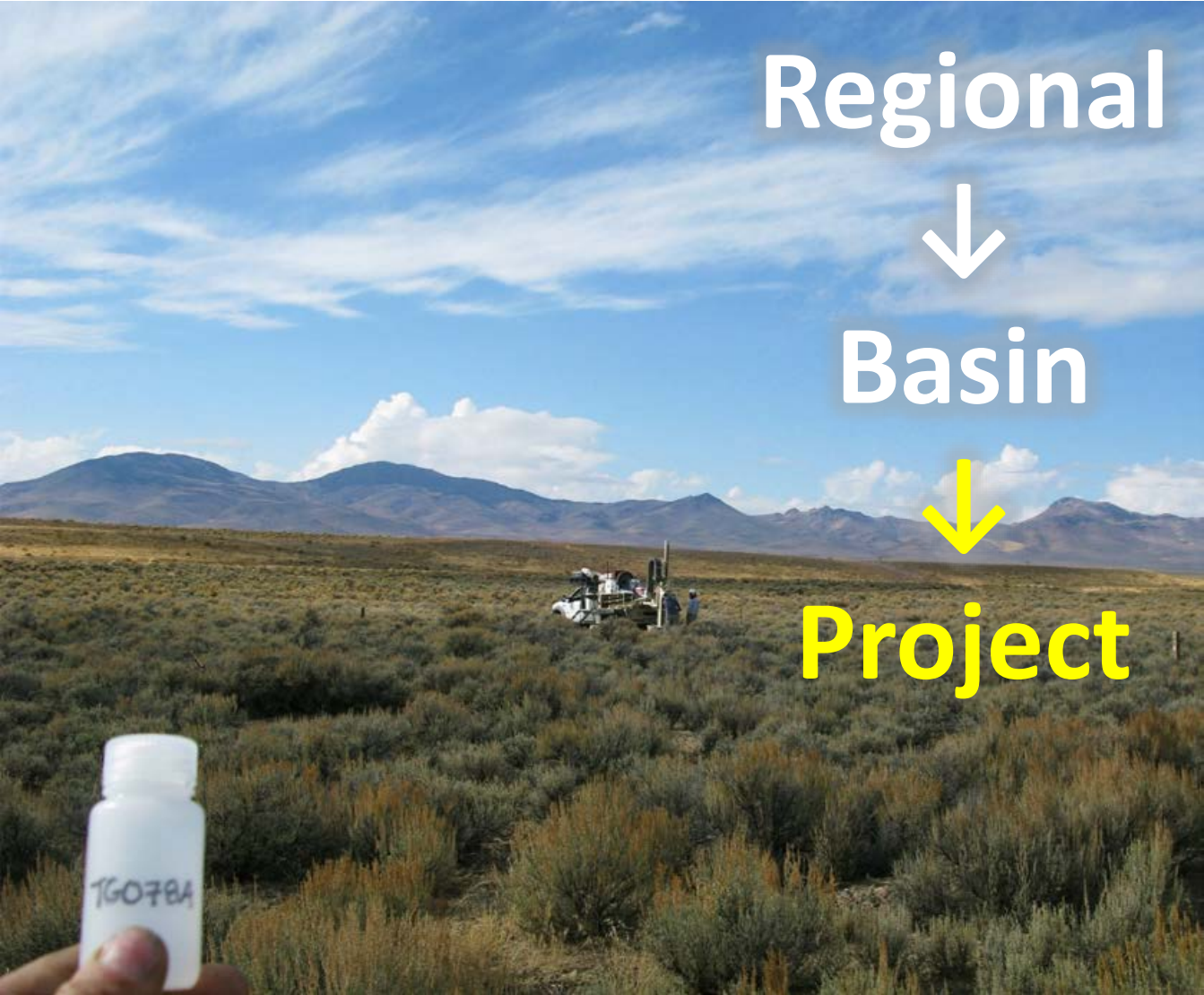
**Photos:
James Kidder**

Where's it being used?



Nevada
Nevada Exploration

Case study



Starts with regional area selection

100,000 mapped prospects

600 gold mines

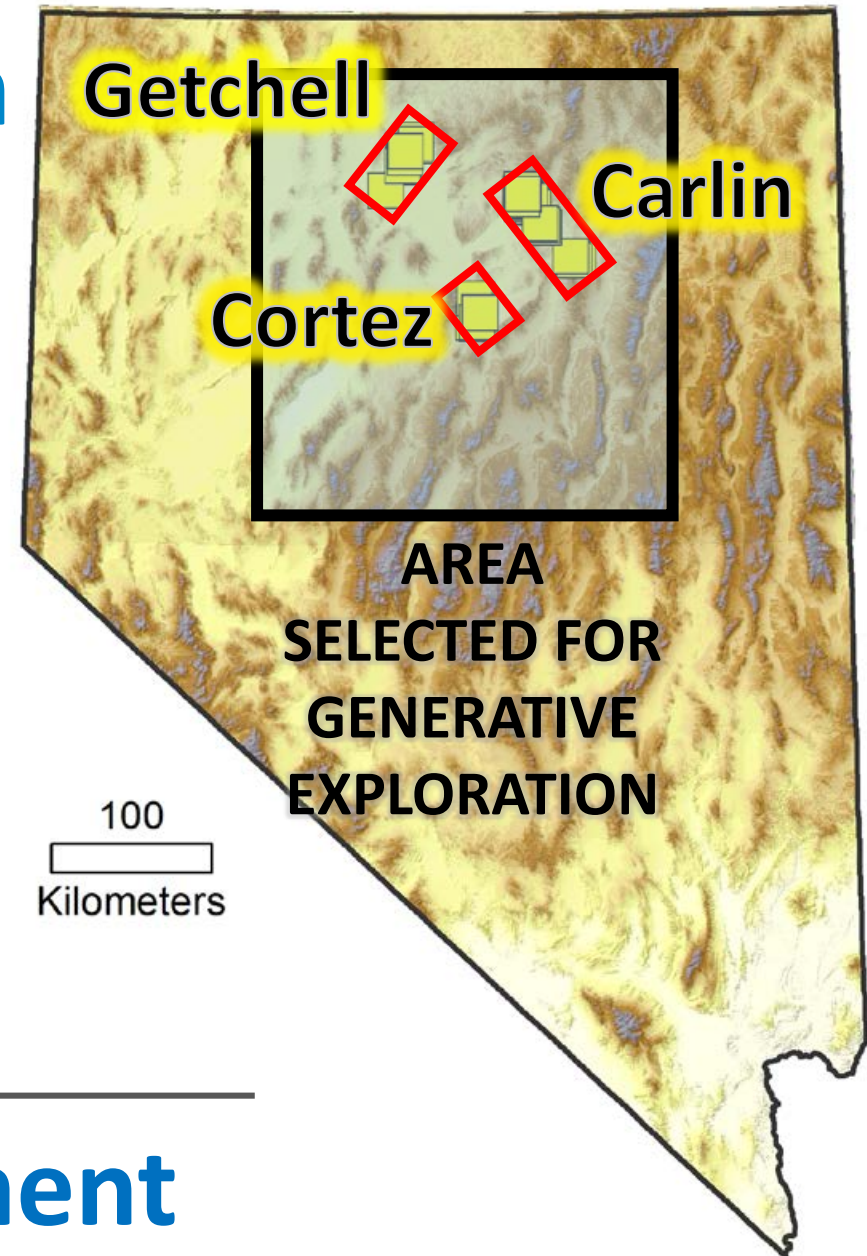
5.6 Moz Au per year (↓40%)

250 Moz Carlin Au endowment

80 % of Carlin Au from 3 camps

55 % under cover

>200 Moz Au residual endowment



Biggest challenge: lack of existing bore holes



Required: purpose-drilled bore holes



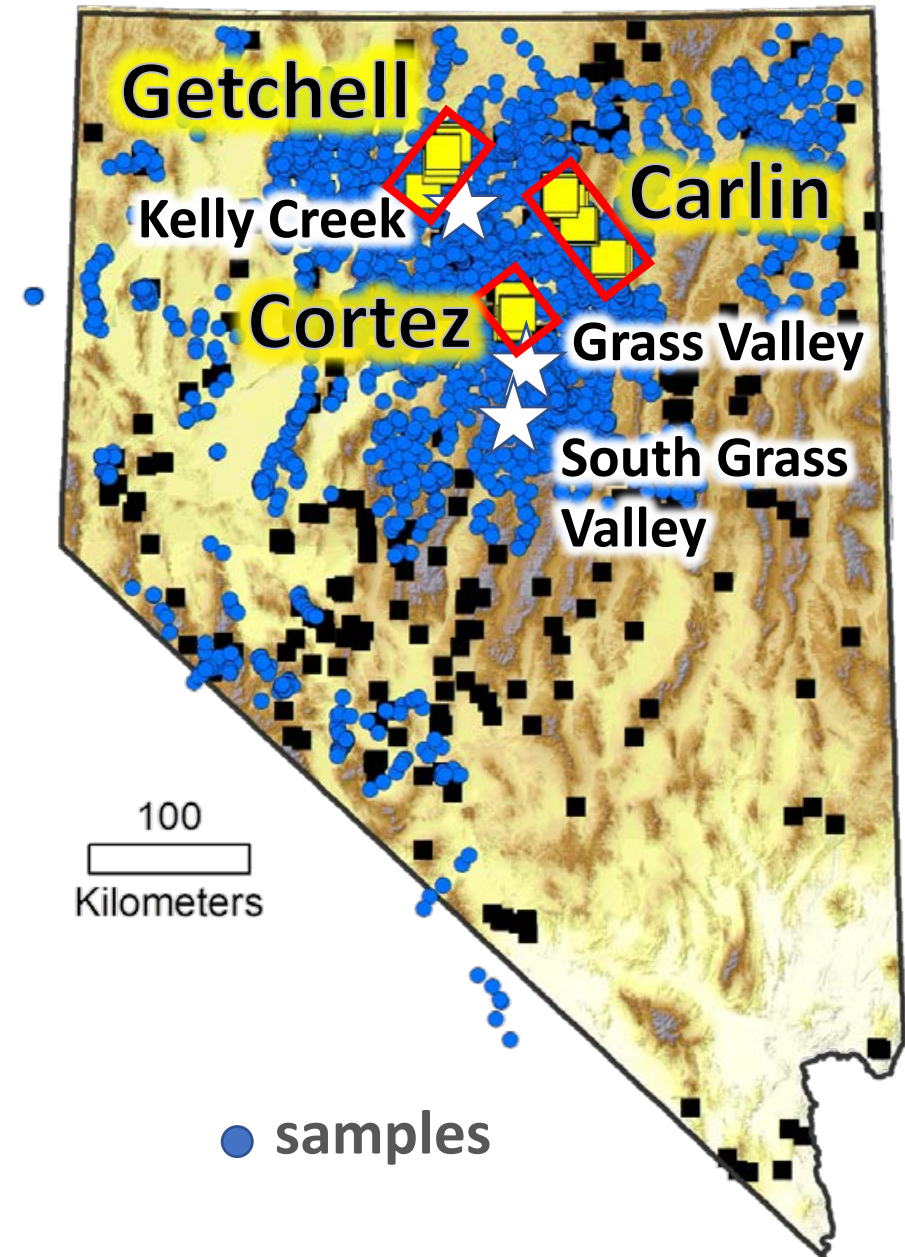
Regional-scale sampling

>6,000 groundwater samples mostly from purpose-drilled sampling bores

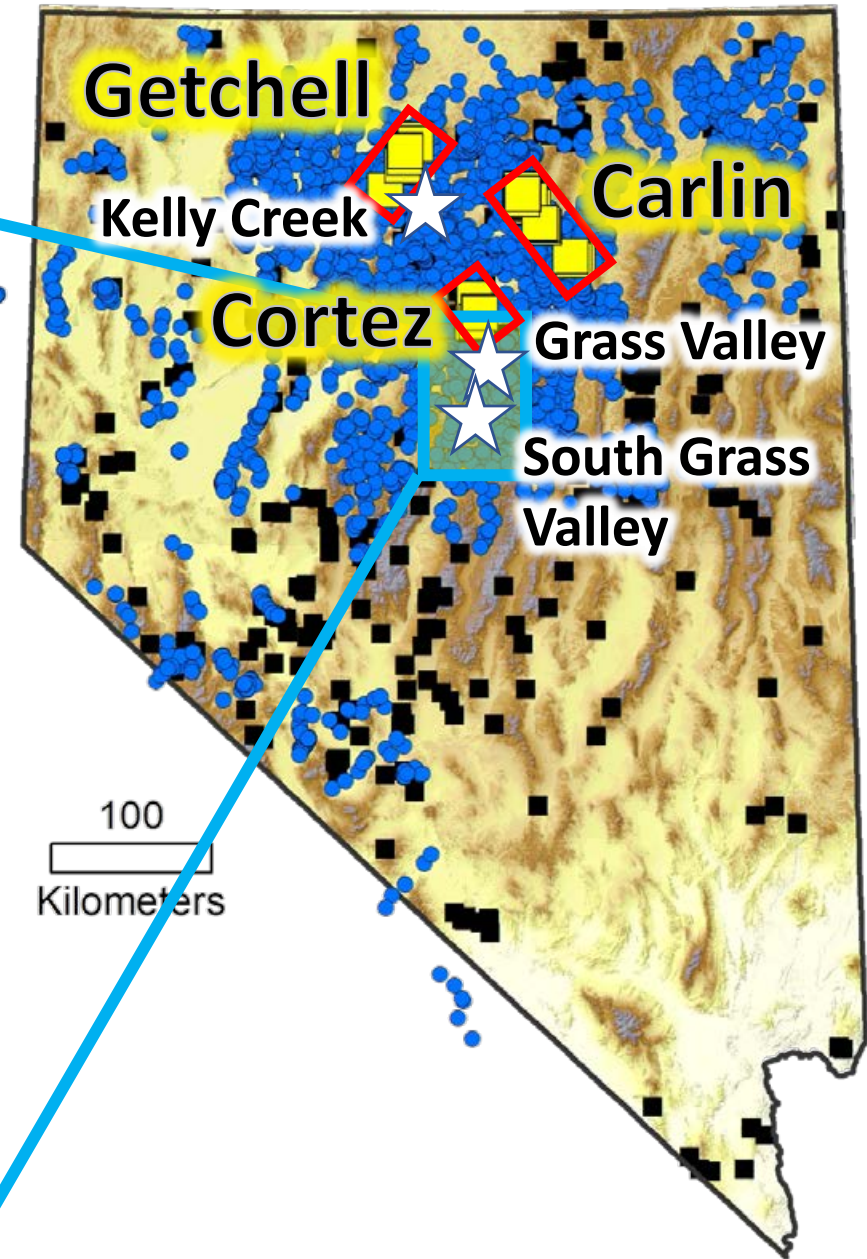
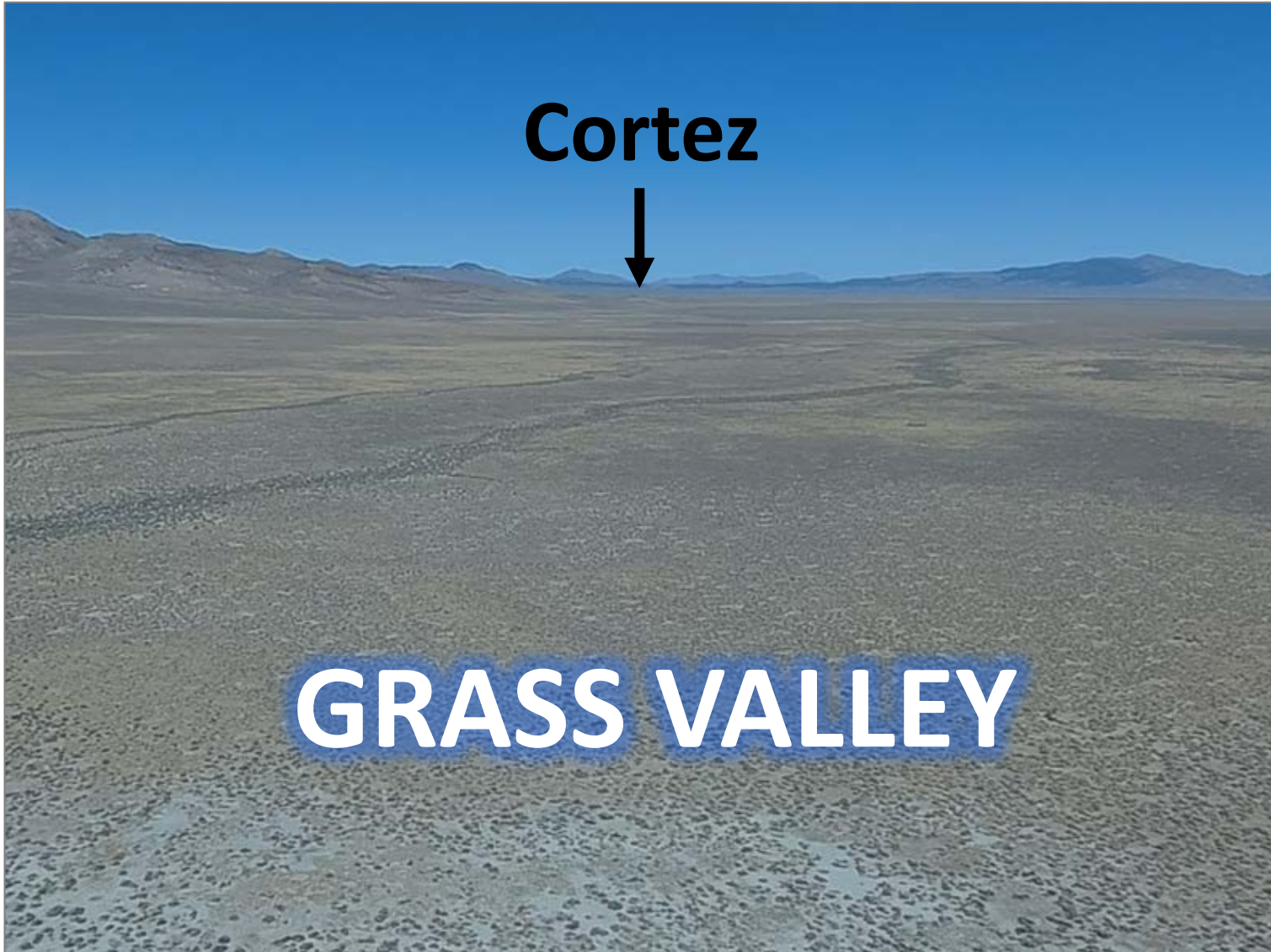
Tested around >30 known gold mines

Database defining element distributions and exploration thresholds

Selected three projects to advance



On the ground



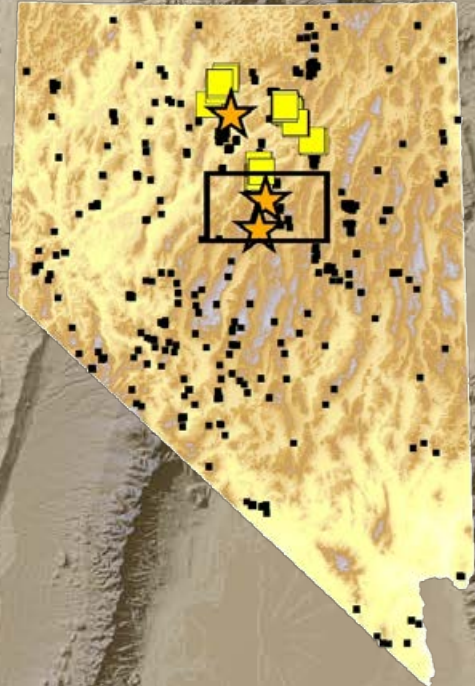
Pipeline

Cortez Hills

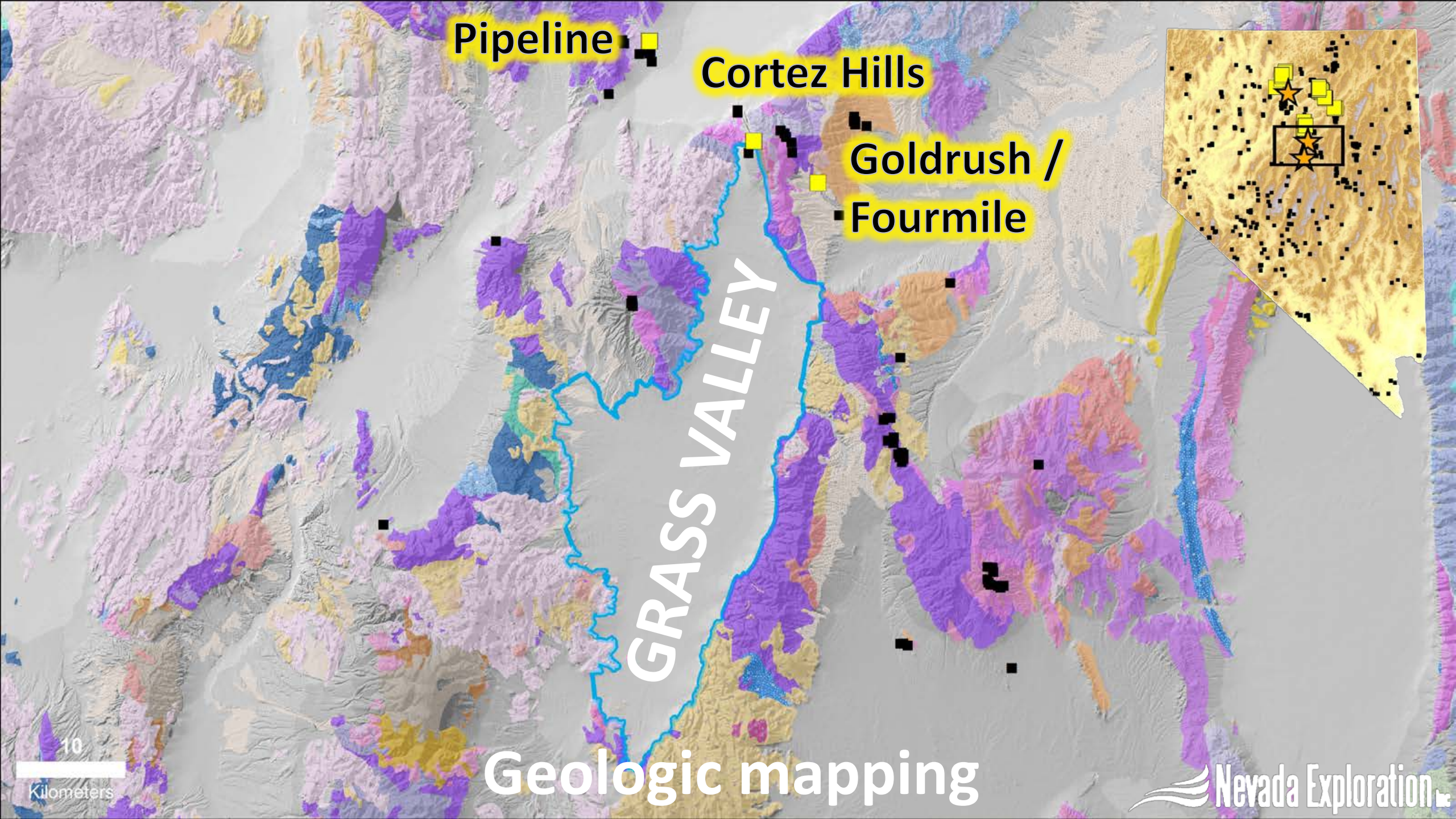
Goldrush /
Fourmile

GRASS VALLEY

500 km²
Search Space



10
Kilometers



Pipeline

Cortez Hills

Goldrush /

Fourmile

GRASS VALLEY

10
Kilometers

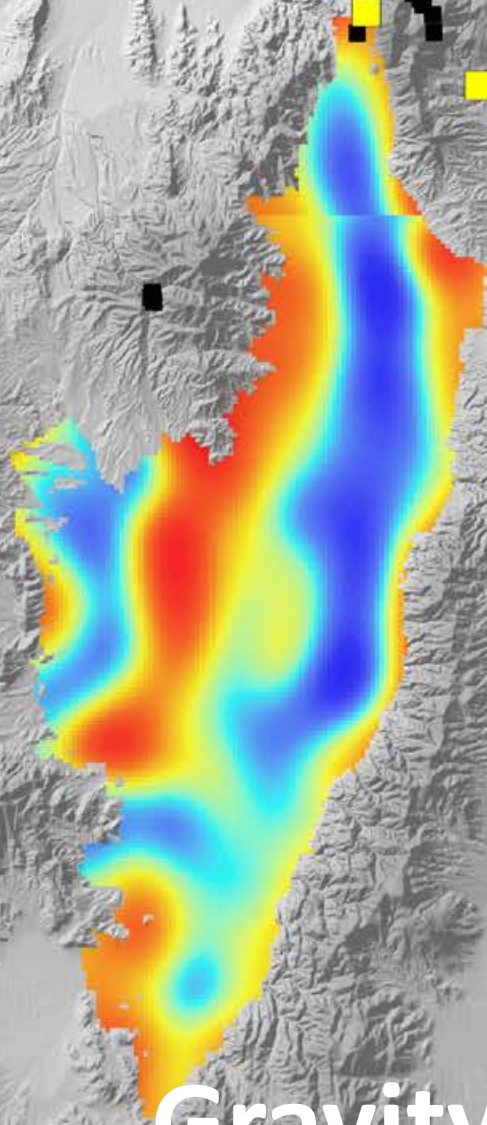
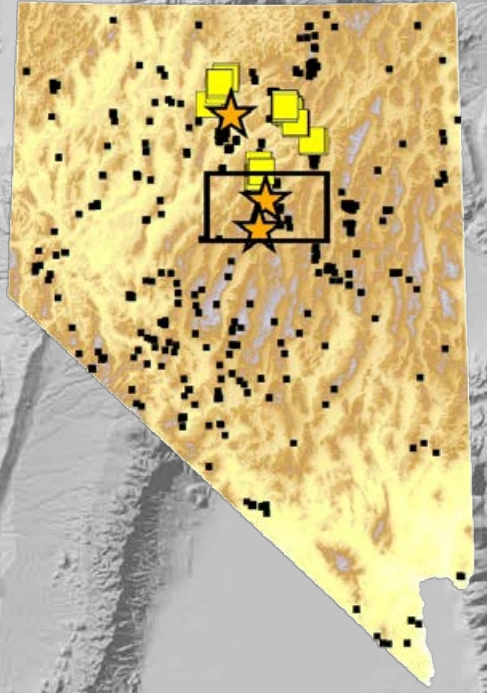
Geologic mapping

Nevada Exploration

Pipeline

Cortez Hills

Goldrush /
Fourmile



Gravity

10
Kilometers

Road to Goldrush / Fourmile

Cortez Hills

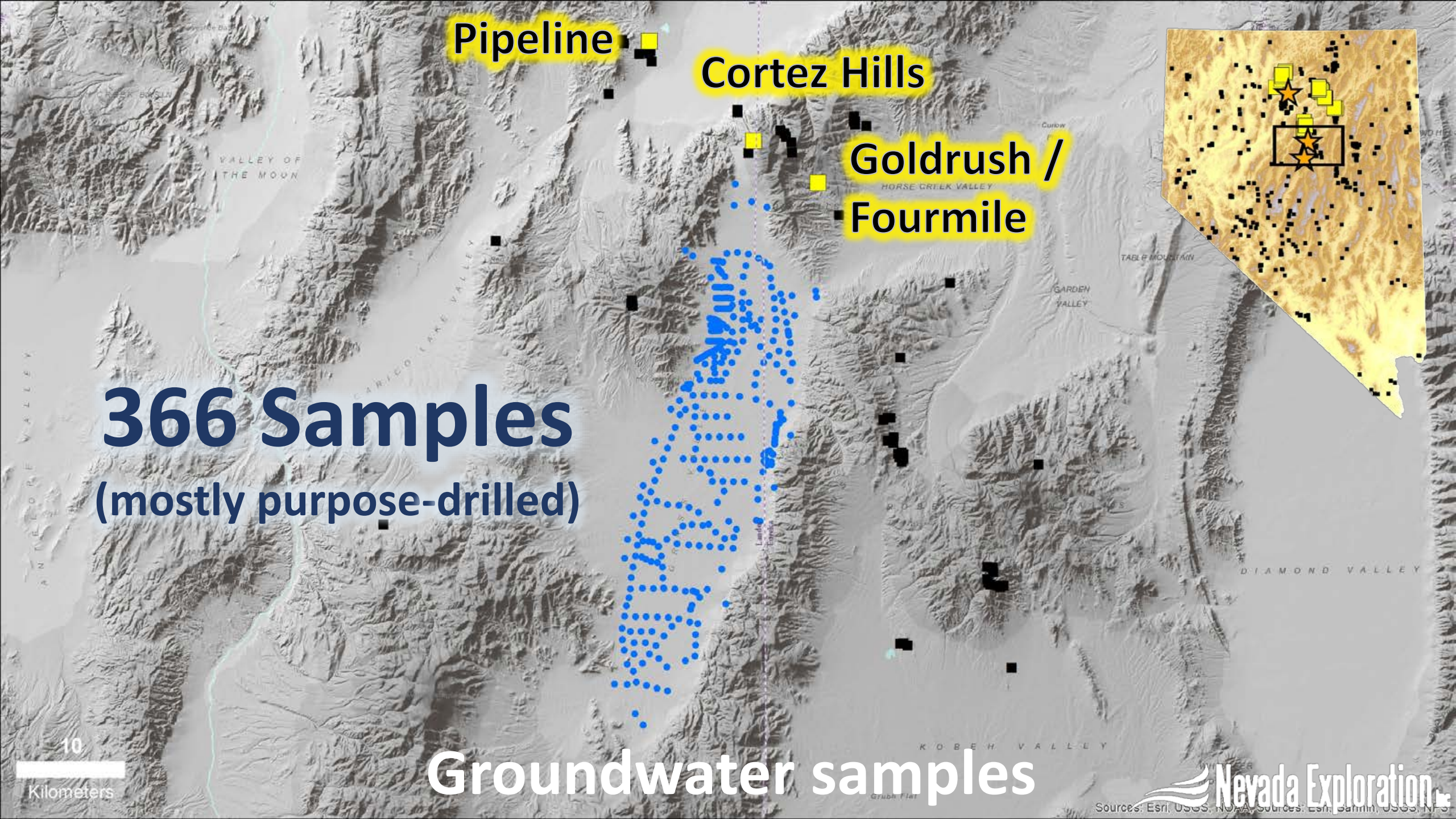








HSP 149A



Pipeline

Cortez Hills

Goldrush /
Fourmile

366 Samples
(mostly purpose-drilled)

10
Kilometers

Groundwater samples

Pipeline

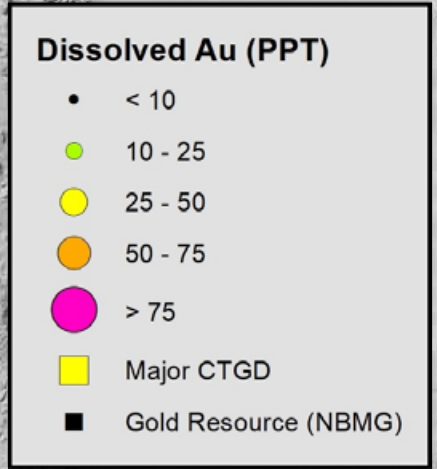
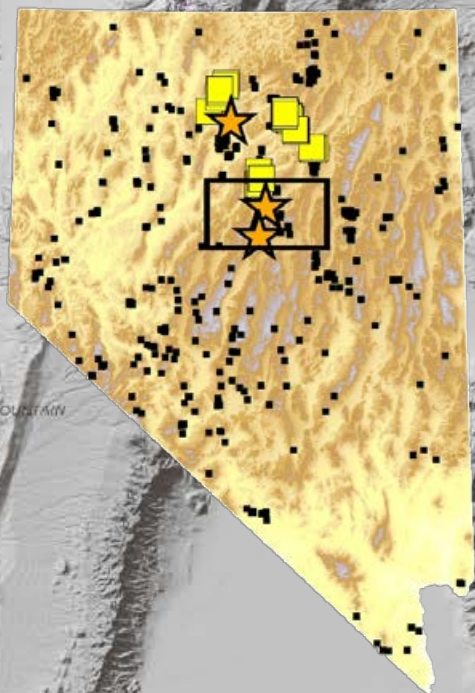
Cortez Hills

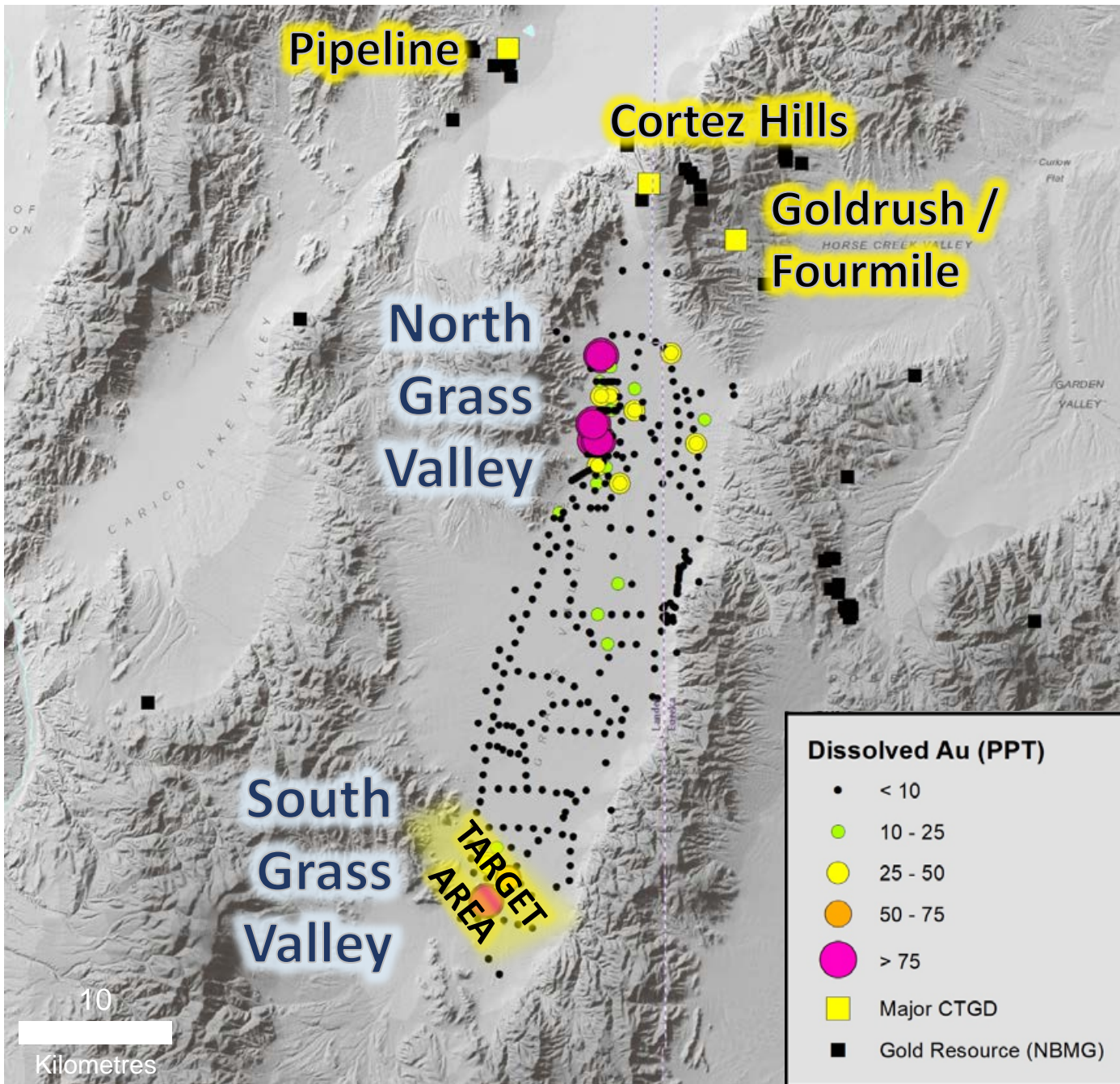
Goldrush /
Fourmile

North Grass Valley

366 Samples
(mostly purpose-drilled)

South Grass Valley





Basin-scale program

500 km² search space

\$500,000 US program

\$1,000/km²

RESULTS

Low background

High-contrast anomalies

What comes next?



Pipeline
Cortez Hills
Goldrush / Fourmile

GRASS VALLEY

TARGET AREA

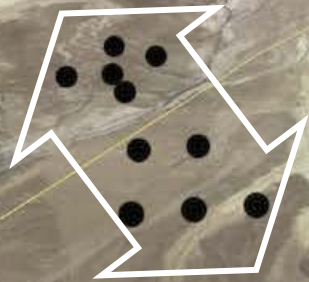
- Gravity survey (2018)
- Air magnetic survey (2018)
- Infill groundwater (2018-19)
- Soil geochemistry (2018-19)
- Detailed mapping (2019)

South Grass Valley Project



Pipeline
Cortez Hills
Goldrush / Fourmile

GRASS VALLEY



10 orientation core holes
3.7 km NNW-SSE

- Gravity survey (2018)
- Air magnetic survey (2018)
- Infill groundwater (2018-19)
- Soil geochemistry (2018-19)
- Detailed mapping (2019)
- Strat. orientation drilling (2018-19)

South Grass Valley Project

TEST: Camp-scale CTGD mineral system



10 orientation core holes

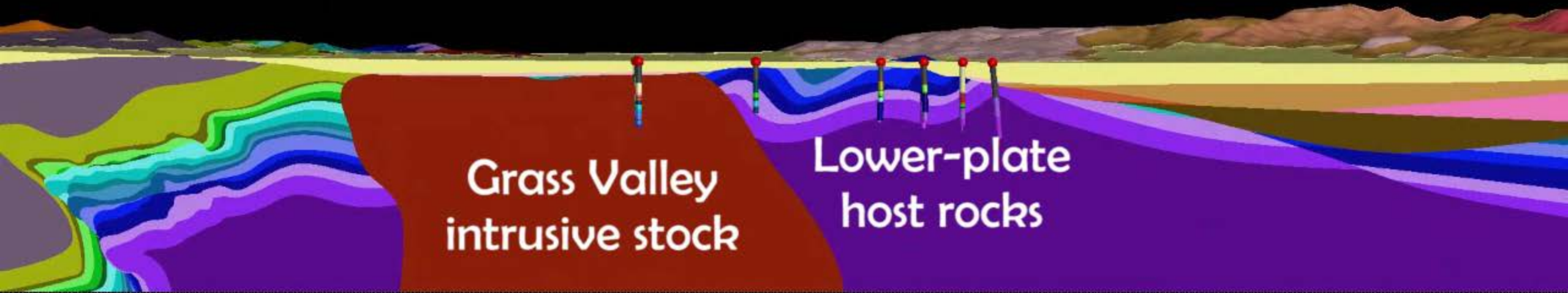
3.7 km NNW-SSE



1km

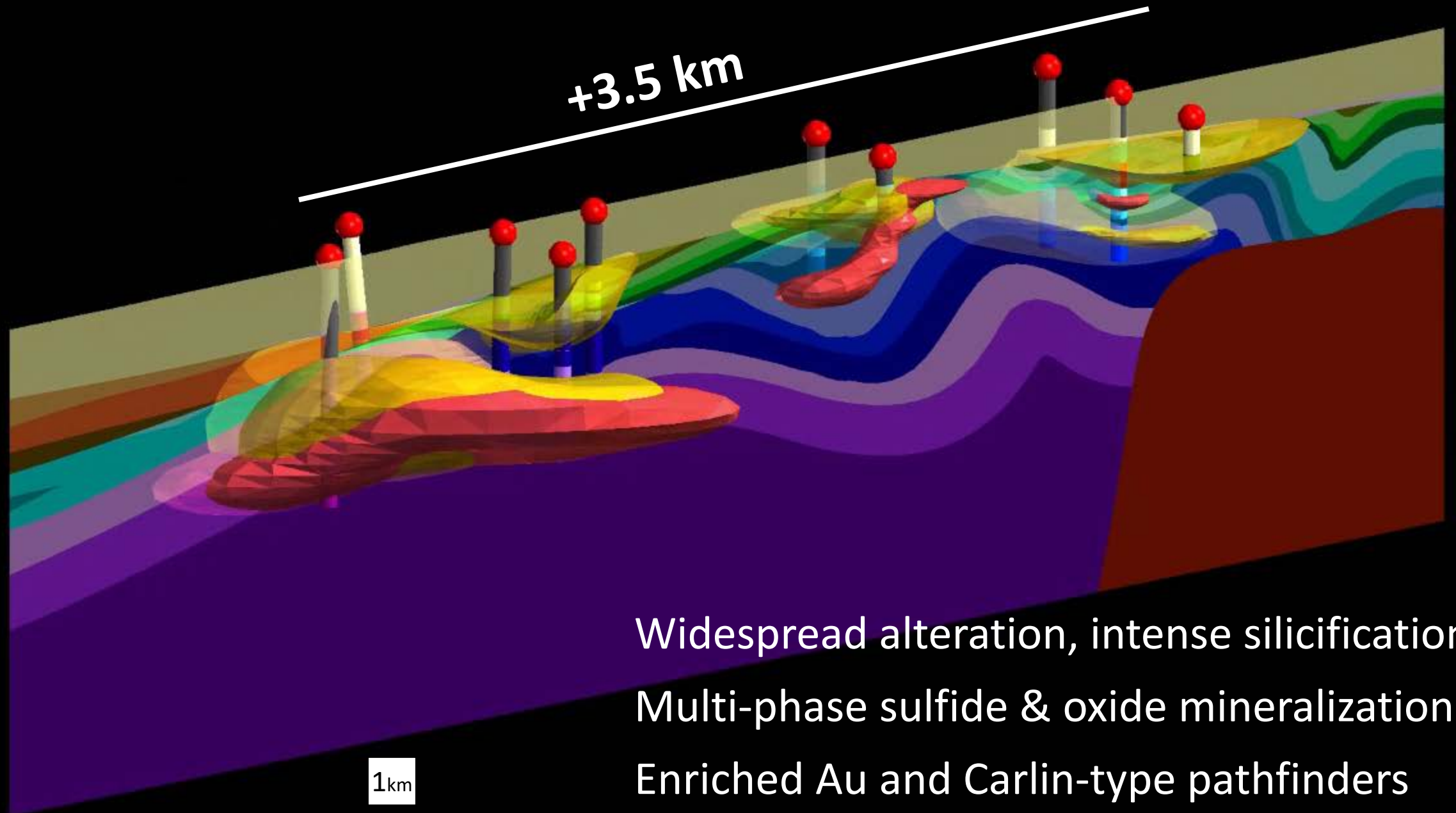
Classic geologic architecture of a Carlin-type mineral system:

- Complex, regional-scale structural fabric with multiple structural trap sites
- Thick package of reactive lower-plate exhibiting significant brecciation
- Along the margin of a major intrusive



Geologic model

Large Carlin-type mineral system

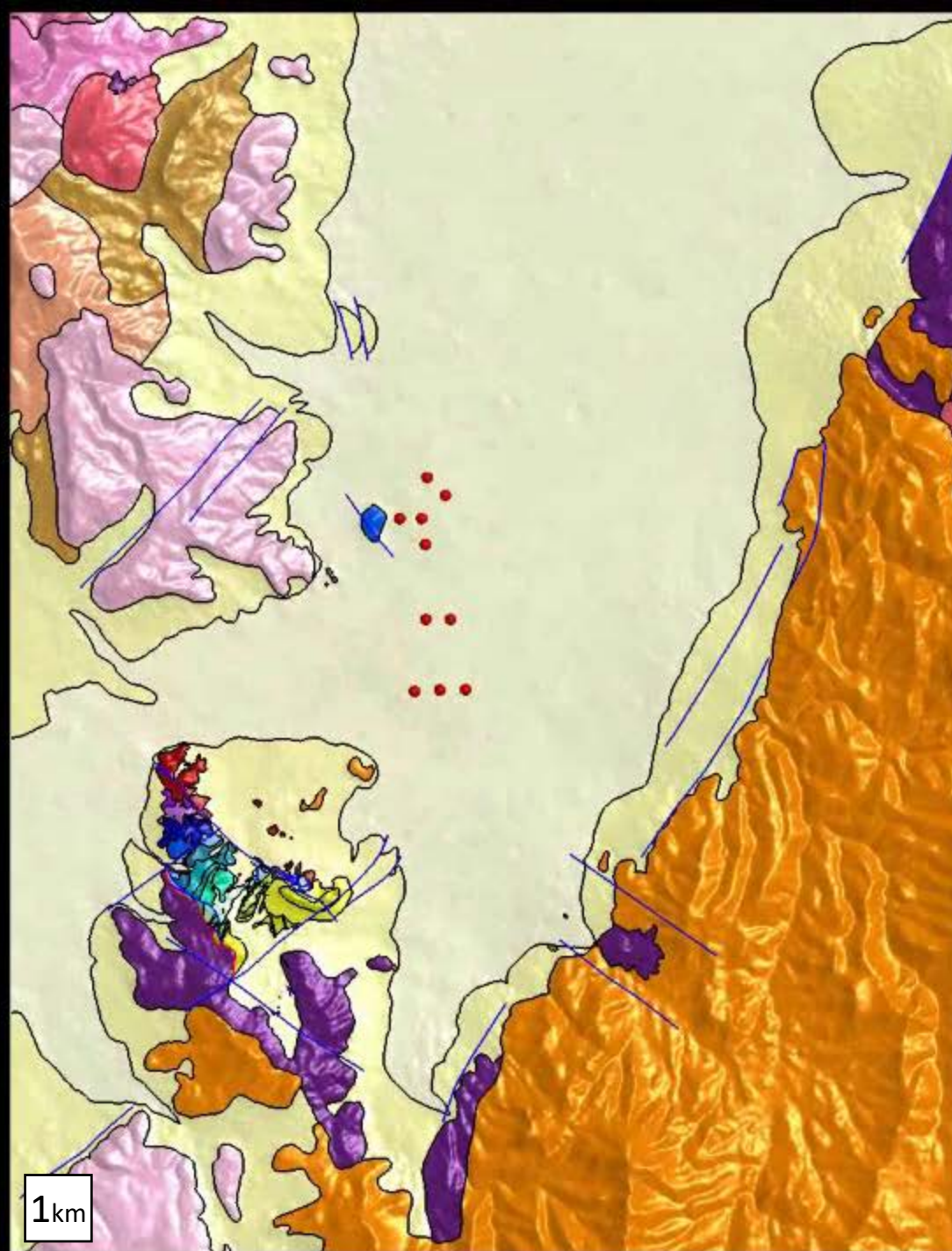


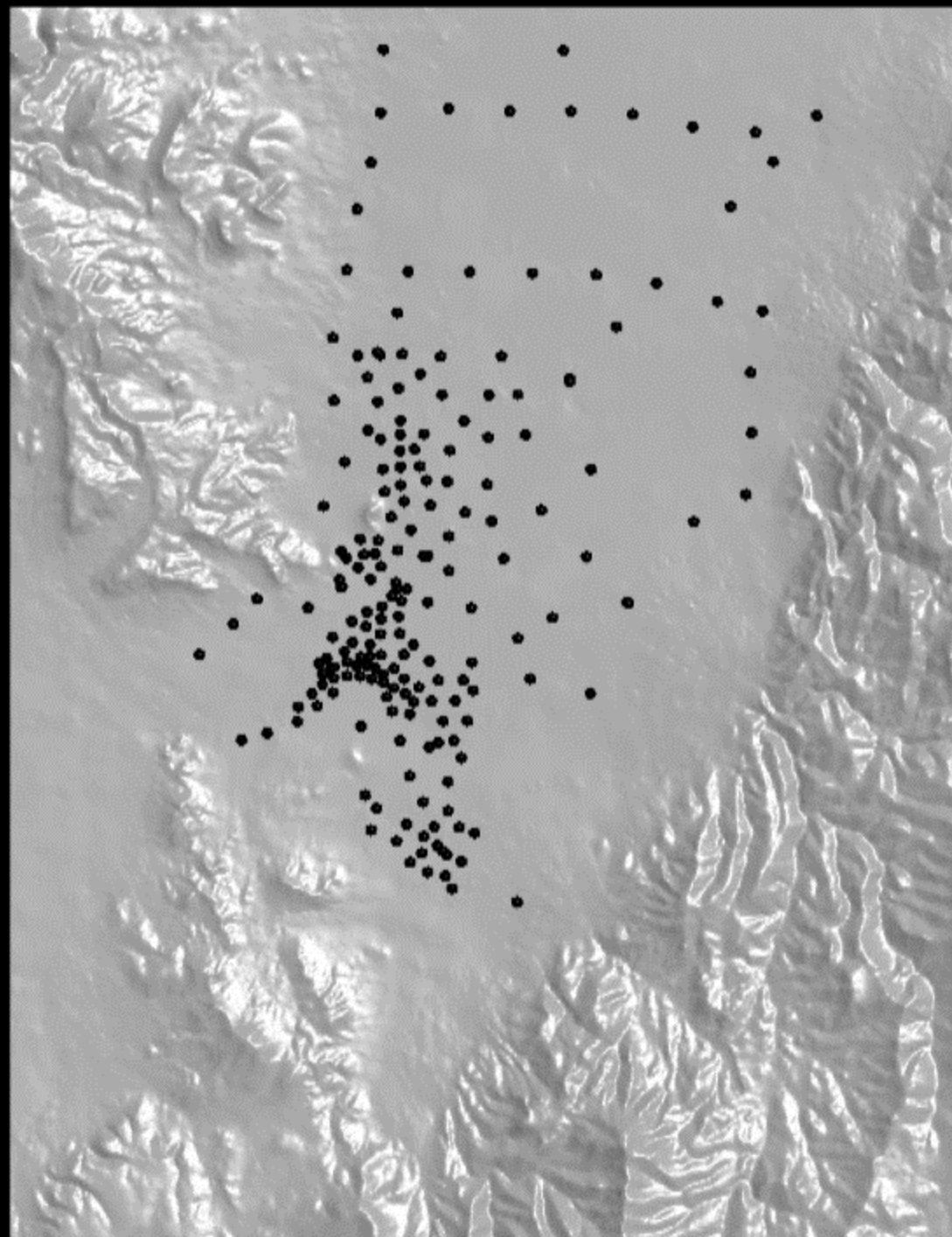
+3.5 km

Widespread alteration, intense silicification
Multi-phase sulfide & oxide mineralization
Enriched Au and Carlin-type pathfinders

1km

Camp-scale hydrogeochemistry





**Camp-scale
hydrogeochemistry**

219 boreholes

194 SWL

*(static water level
measurements)*

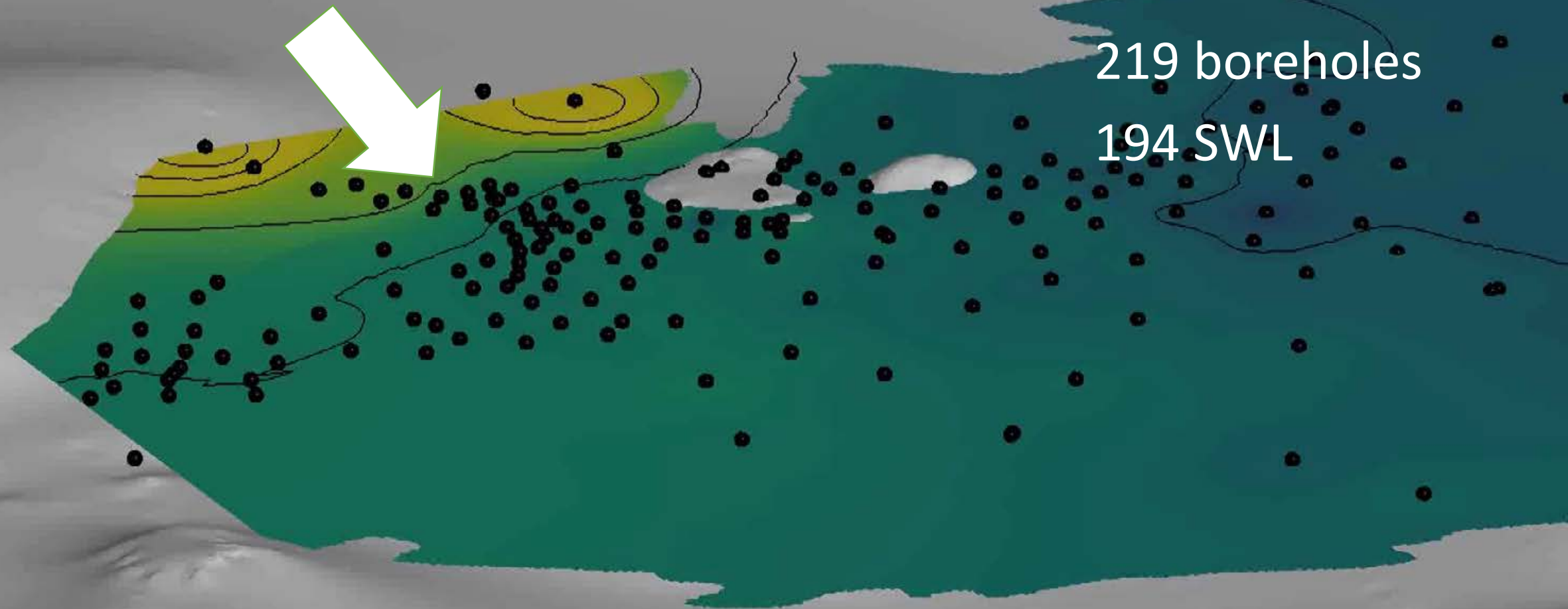
Groundwater flow direction



**Camp-scale
hydrogeochemistry**

219 boreholes

194 SWL

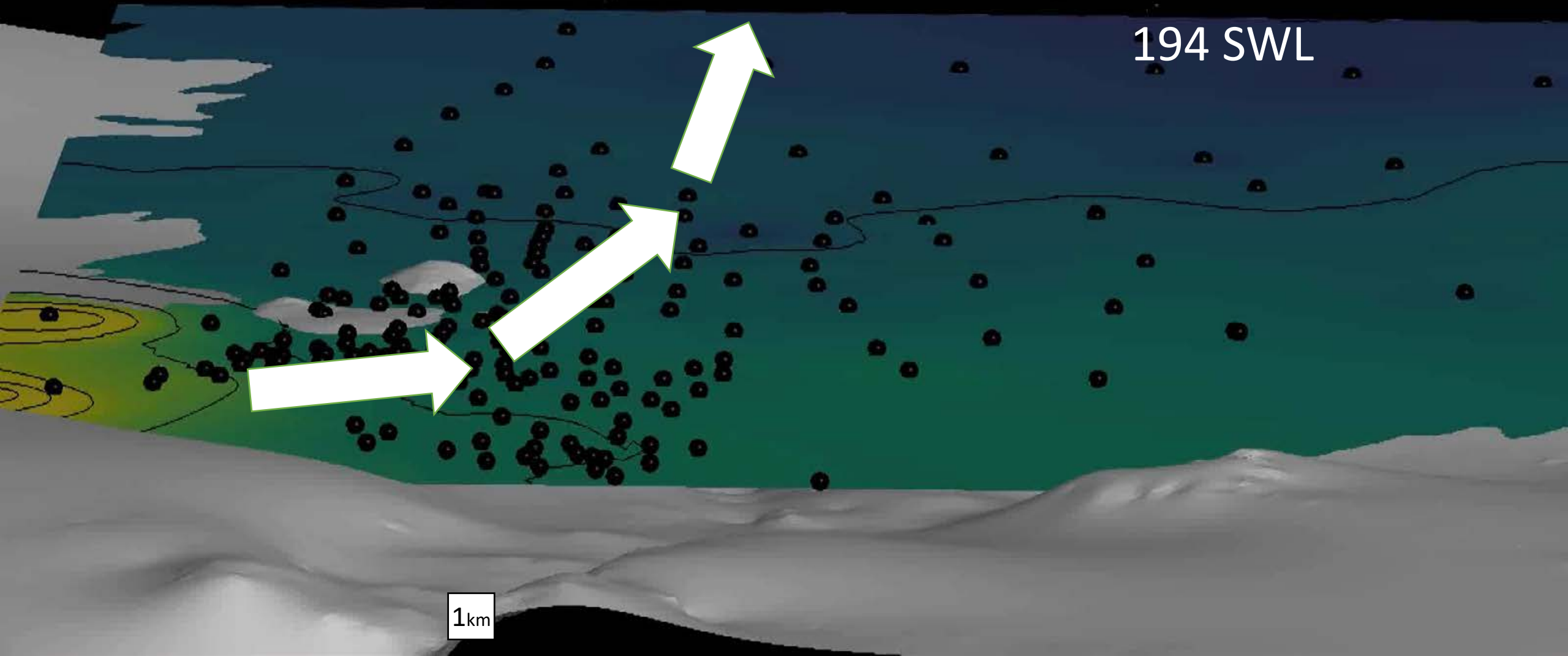


**Camp-scale
hydrogeochemistry**

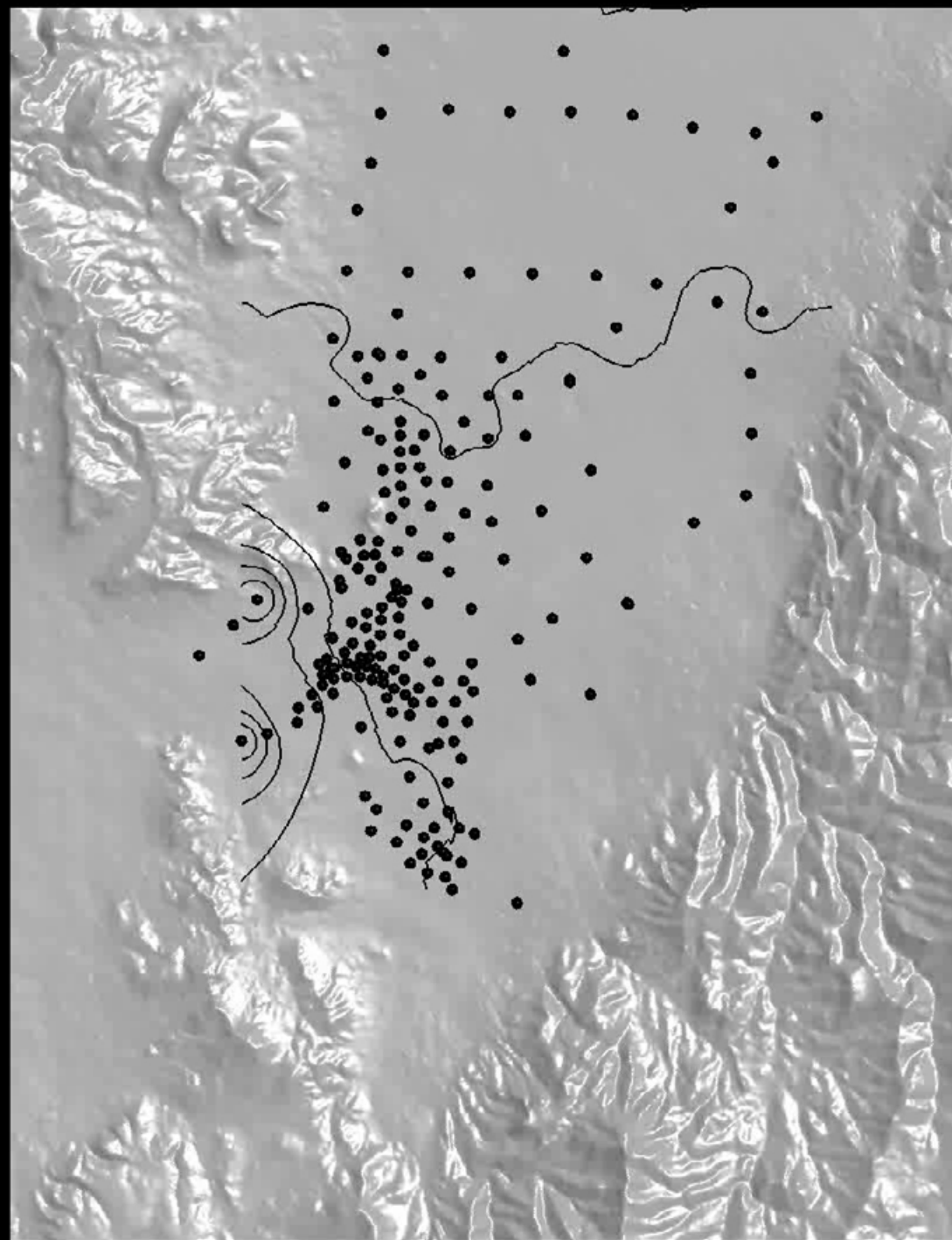
219 boreholes

194 SWL

Groundwater flow direction



1km



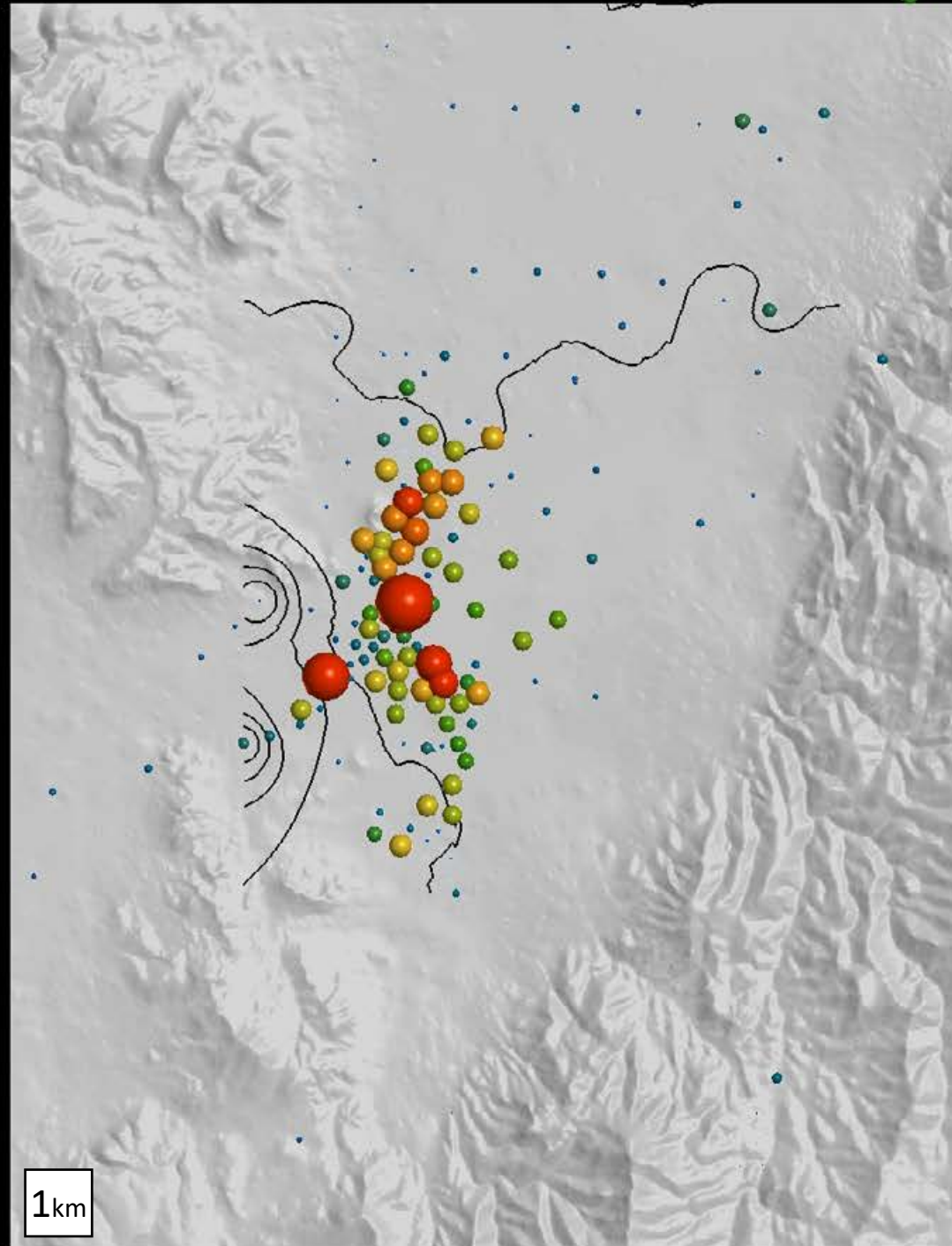
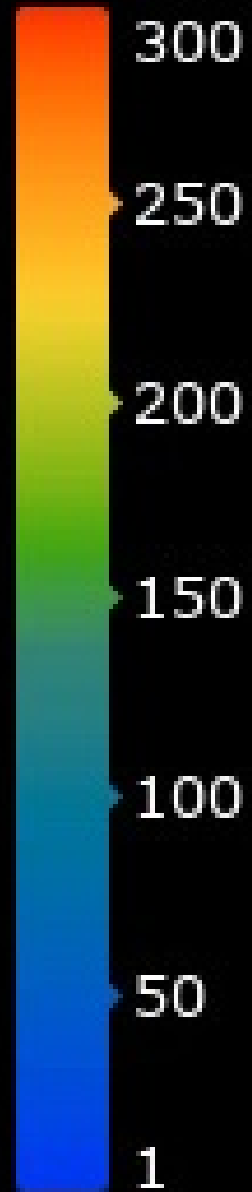
Camp-scale hydrogeochemistry

219 boreholes

194 SWL

425 groundwater
samples

SO4_ppm



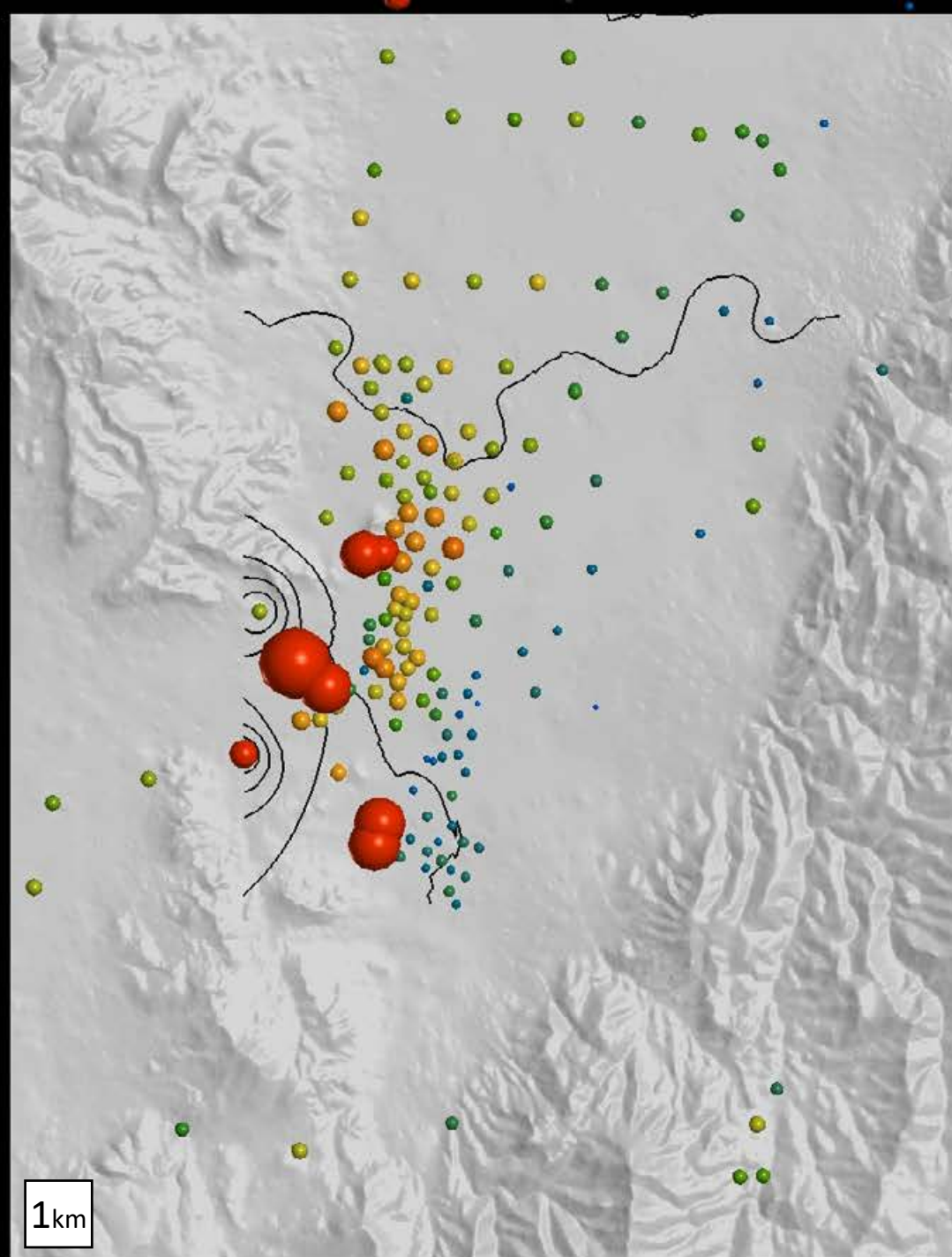
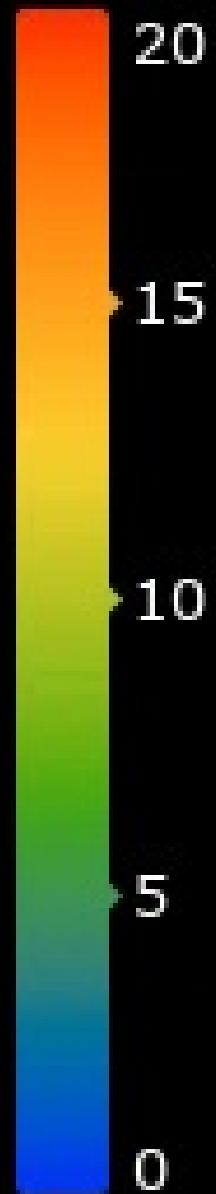
Camp-scale hydrogeochemistry

219 boreholes

194 SWL

425 samples

As_ppb



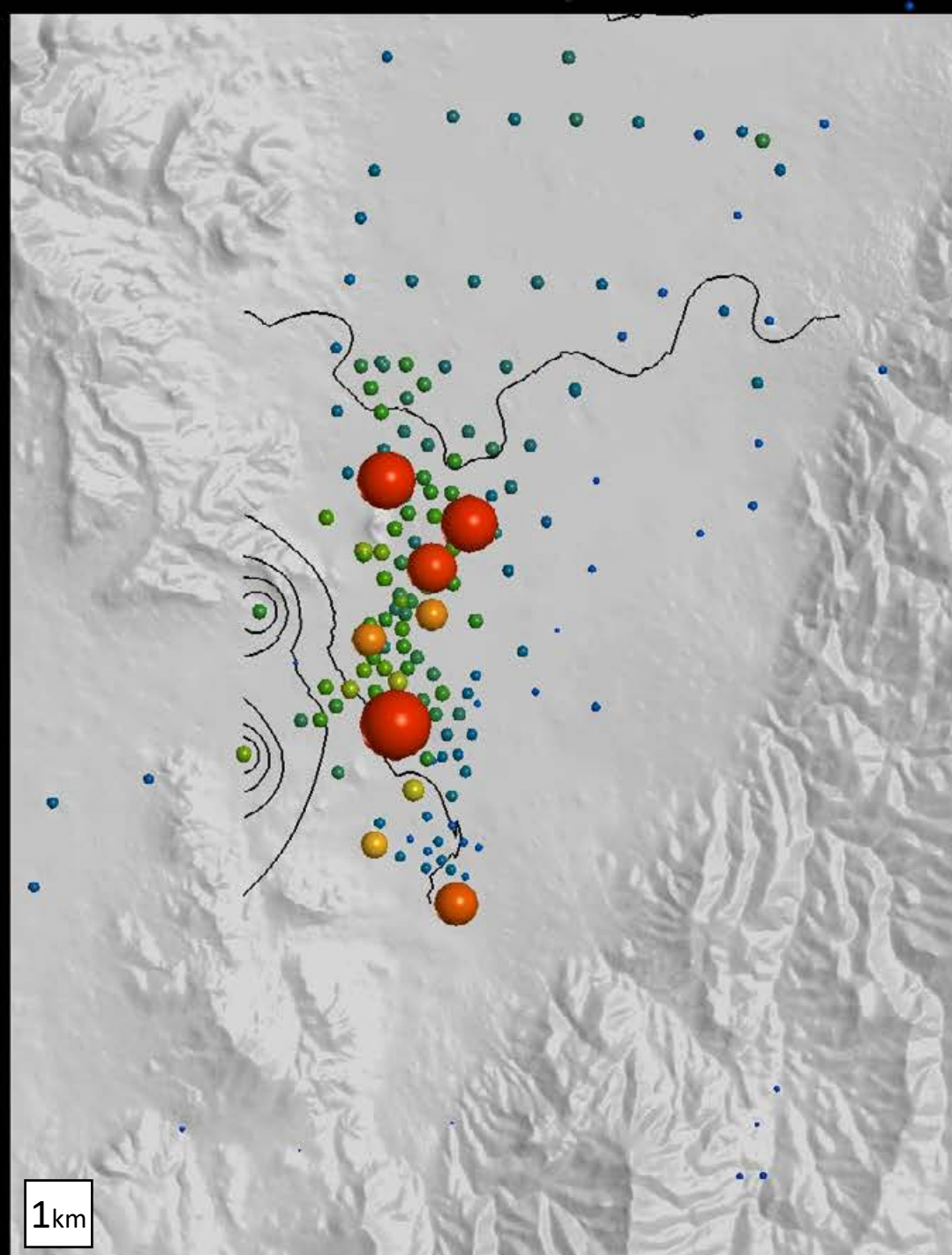
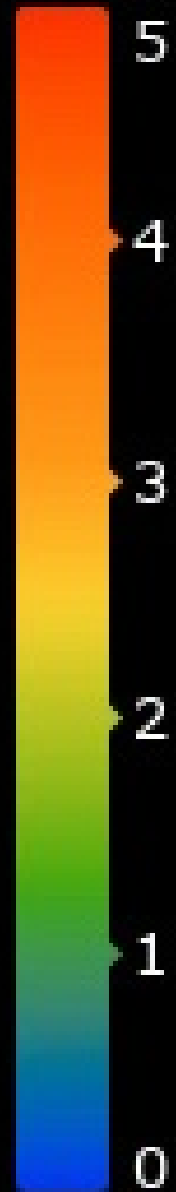
Camp-scale hydrogeochemistry

219 boreholes

194 SWL

425 samples

Sb_ppb



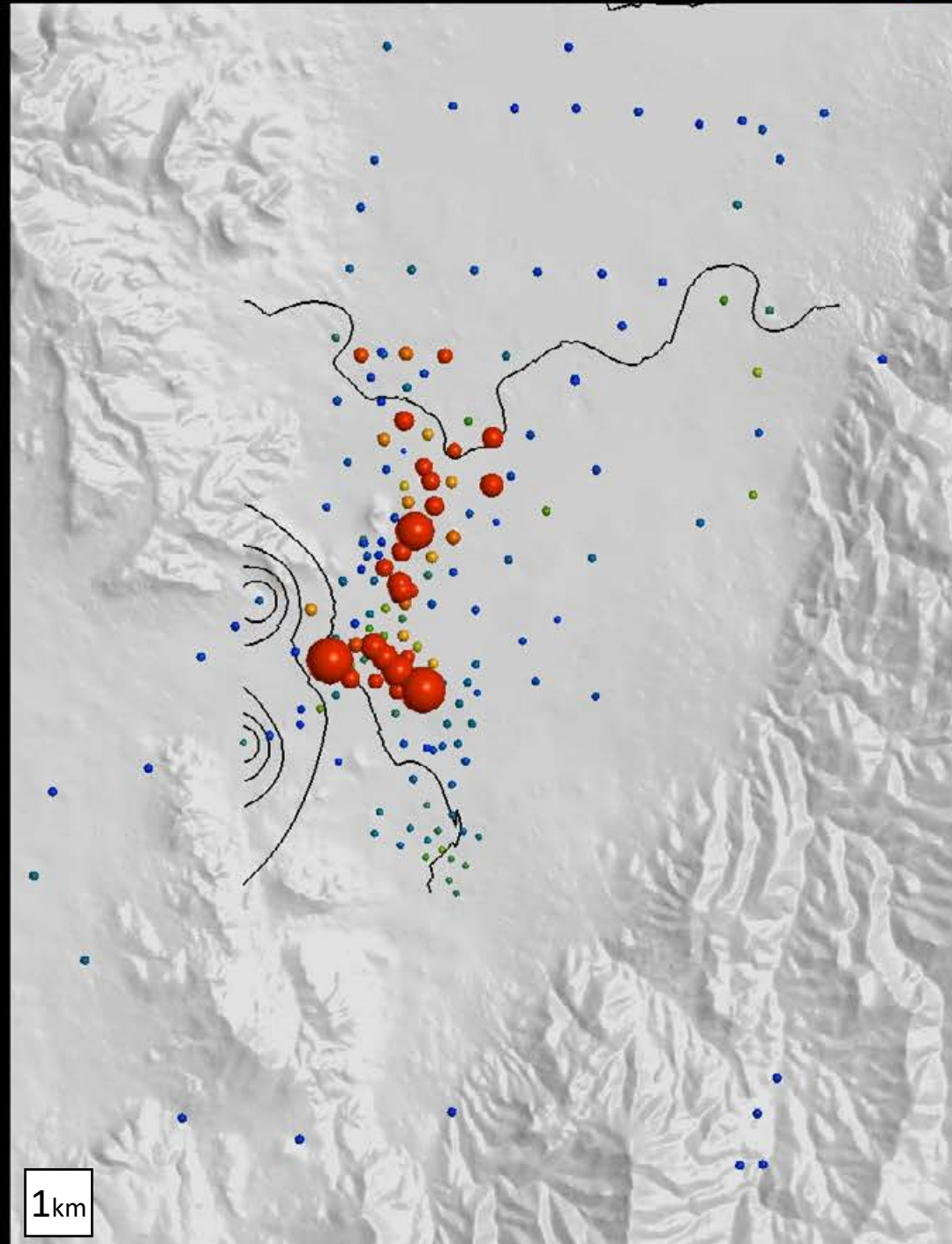
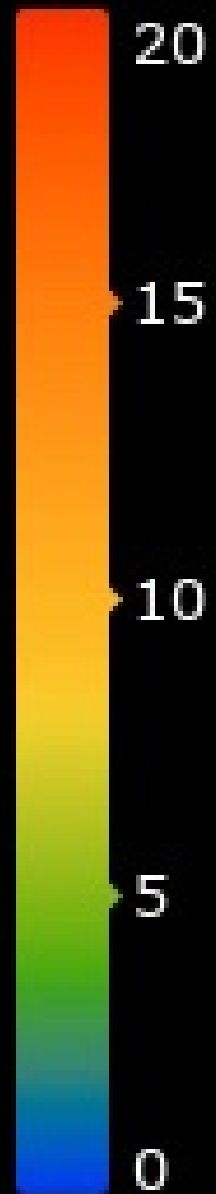
Camp-scale hydrogeochemistry

219 boreholes

194 SWL

425 samples

Au_ppt

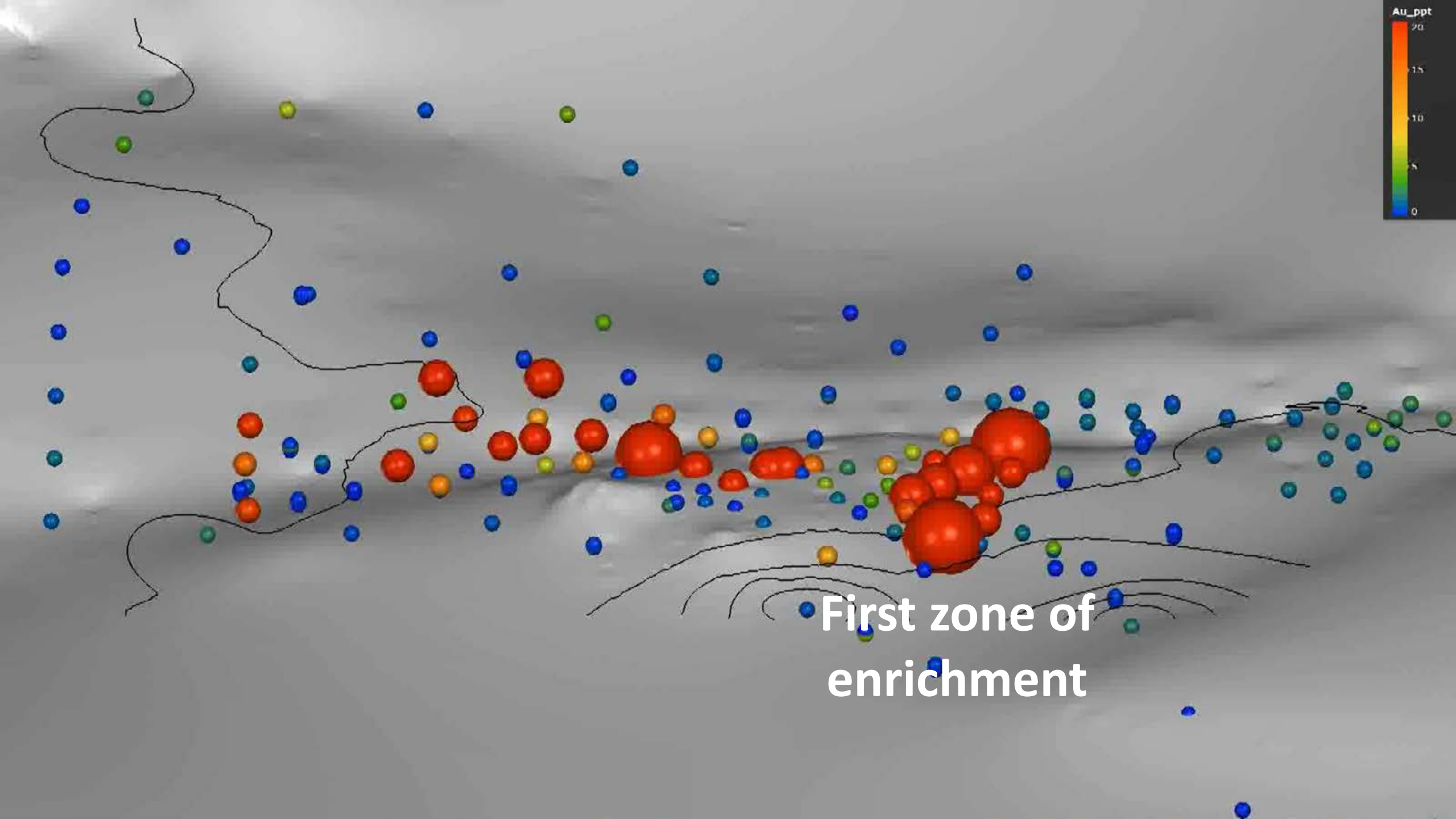


Camp-scale hydrogeochemistry

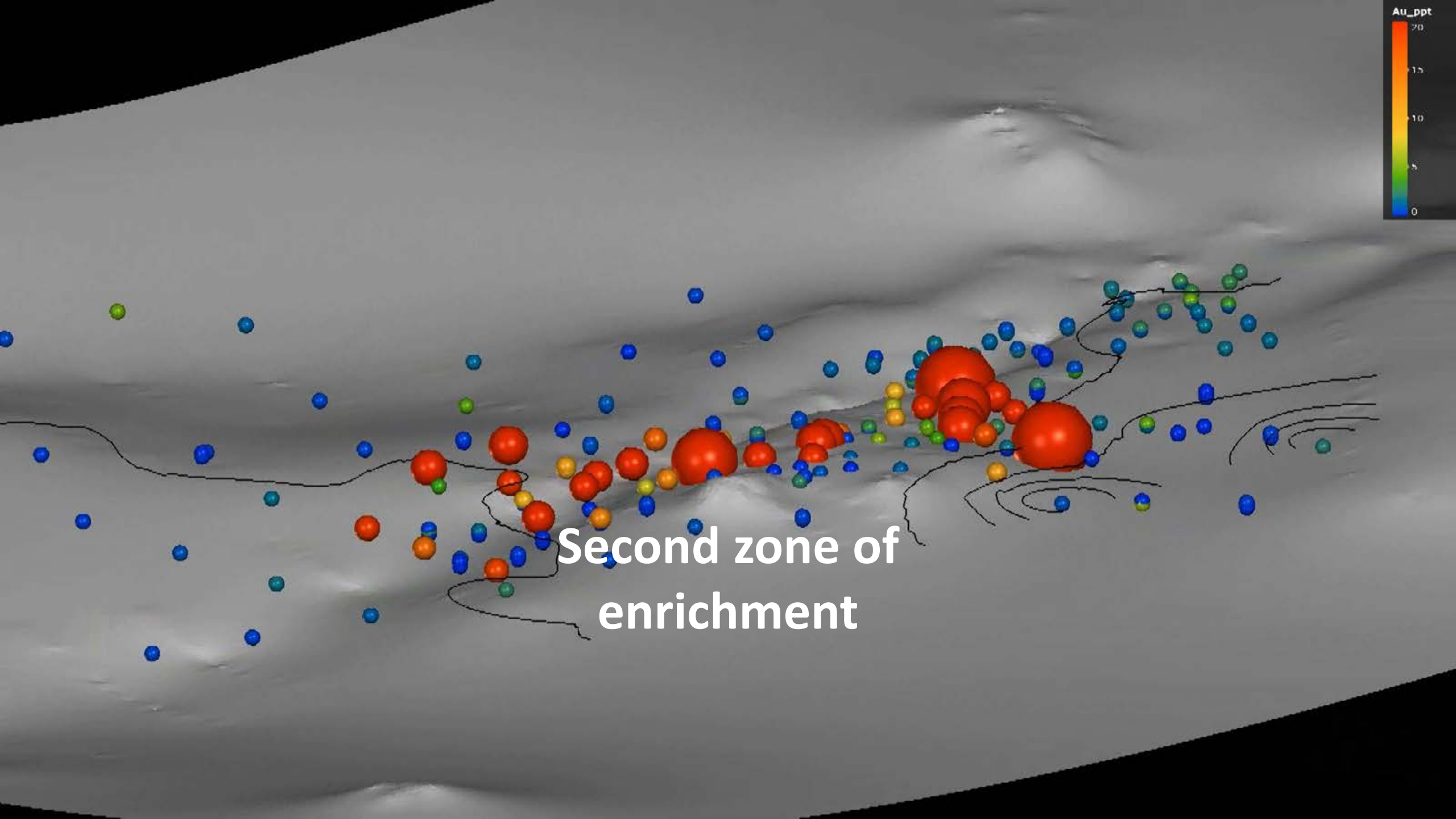
219 boreholes

194 SWL

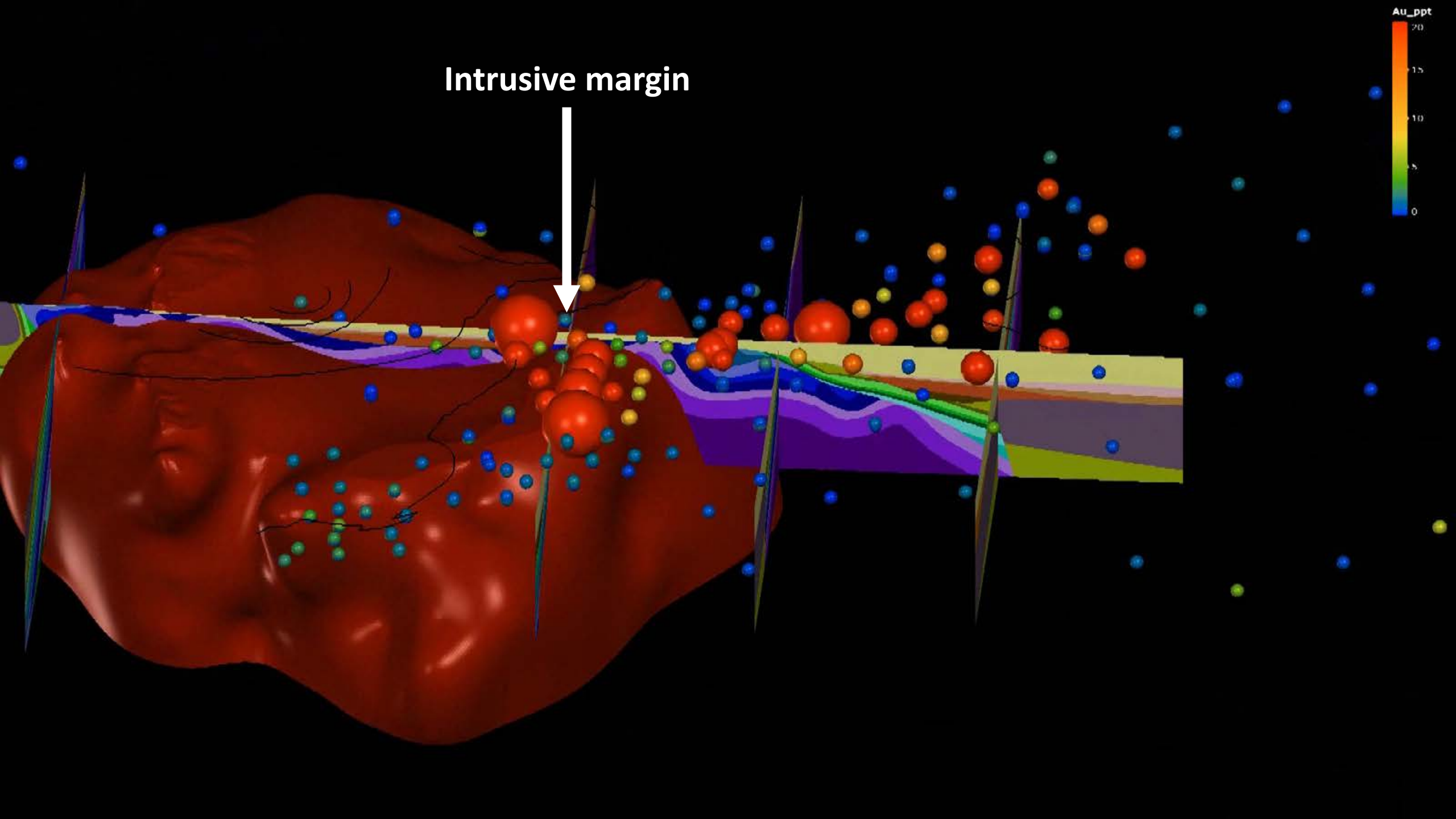
425 samples



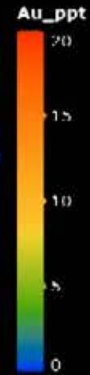
First zone of
enrichment

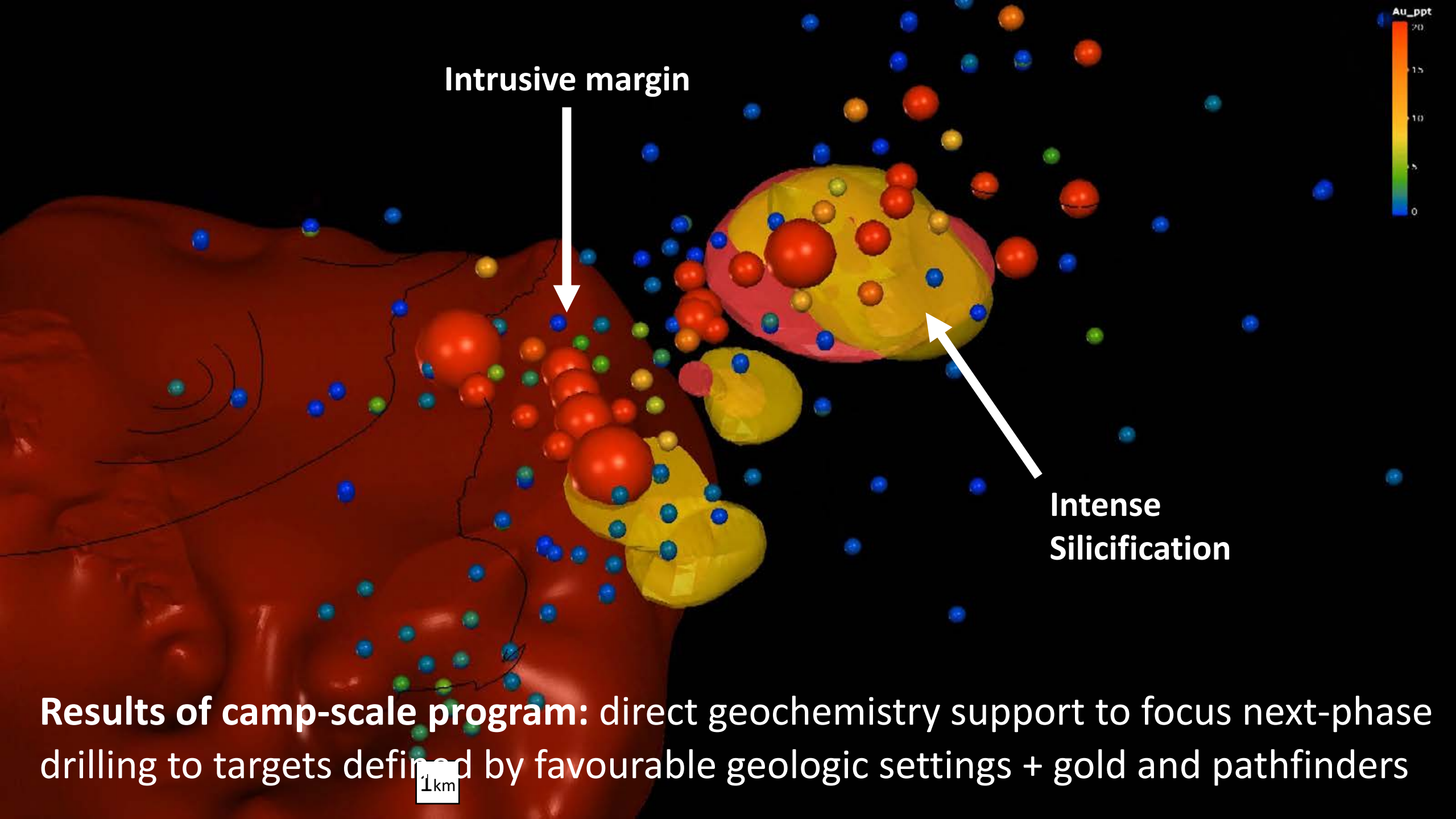


Second zone of
enrichment



Intrusive margin





Intrusive margin

Intense
Silicification

Results of camp-scale program: direct geochemistry support to focus next-phase drilling to targets defined by favourable geologic settings + gold and pathfinders

1km

Blind Search Space



WHY HYDROGEOCHEMISTRY



WHY HYDROGEOCHEMISTRY

Exploration is a business
We're here to create value

Provides opportunities to:
Improve chance of success
(direct detection)

Lower cost to test
(fewer + cheaper samples)

Find better deposits
(**new search spaces**)

WHEN

Adds value at multiple scales of application!

Regional to district scale

Target scale to focus the use of our most expensive tool: drilling

CREATING VALUE

SIZE OF
THE PRIZE

X

CHANCE OF
SUCCESS

>

COST TO
TEST

Thank you!

AME ROUNDUP.



 Nevada Exploration Inc