Pat Walters

From: Andrew Sharpley
Sent: Friday, October 09, 2015 10:24 AM
To: Kresse, Timothy
Subject: RE: Stage only site

Thanks, Tim,

I am pretty sure that we can rustle up the necessary $6000 for this site. It's a sorry state of affairs if we can't!!

I will get back to you next week, so we can proceed post haste.

Andrew

From: Kresse, Timothy [mailto:tkresse@usgs.gov]
Sent: Friday, October 09, 2015 8:18 AM
To: Andrew N. Sharpley <sharpley@uark.edu>
Subject: Re: Stage only site

Ok, that sounds good. My feelings are that all of us have limited funds and want to spend our money wisely. I'm always trying to think of ways to get information at the best bang for the buck. My first thought, as you know, was a simple subtraction, but we don't have perfect delineations of the watershed, Van shows different directions of groundwater flow (bringing into question changes in baseflow between measuring points), and other considerations. Similar to comparisons of continuous nitrate to lab analysis of nitrate samples, I do think one year of stage compared to variation in flow between the 2 sites will yield some good information. I would pay for it out of my account, if I hadn't been told (rather strongly) that I'm already overextended. Let me know if you can scrape it together, and we'll get things moving on this end. All the best,

Tim

On Wed, Oct 7, 2015 at 5:24 PM, Andrew N. Sharpley <sharpley@uark.edu> wrote:

Tim

Given the visibility of our program and scrutiny our finding attract, I think I should try to find the $6,000 to enable you (USGS) to monitor stage at Left Fork for one year at least. As you note this would afford us a more reliable relationship to determine flow than by subtraction.

I'll let you know what I can find out as soon as possible.

Thank you,

Karl VanDevender

From: Andrew N. Sharpley <sharpley@uark.edu>
Sent: Wednesday, October 14, 2015 10:28 AM
To: Mike Daniels; Karl VanDevender; Phillip Hays; 'Kresse, Timothy'
Subject: FW: 2015_Fields-Halihan_MTJ Presentation for 60thMGWC_Bentonville, AR
Attachments: 2015_Fields-Halihan_MTJ Presentation for 60thMGWC_Bentonville, AR.ppt

Just for you information, attached is Jon's presentation at the upcoming Groundwater meeting at Crystal Bridges tomorrow.

I didn't see any "major difficulties." But am not privy to the dialogue that will go with it.

Andrew

From: Halihan, Todd [mailto:todd.halihan@okstate.edu]
Sent: Tuesday, October 13, 2015 9:05 PM
To: Andrew N. Sharpley <sharpley@uark.edu>
Subject: FW: 2015_Fields-Halihan_MTJ Presentation for 60thMGWC_Bentonville, AR

Andrew,

Let us know if you see any major difficulties with Jon's presentation for Thurs.

Thanks,

Todd

From: Fields, Jon [jonjf@ostatemail.okstate.edu]
Sent: Tuesday, October 13, 2015 7:06 PM
To: Halihan, Todd
Subject: 2015_Fields-Halihan_MTJ Presentation for 60thMGWC_Bentonville, AR

For Andrew....

--
Jon Jay Fields Jr.
Master's Candidate
105 Nobel Research Center
Oklahoma State University
Stillwater, OK 74074

Pat Walters

From: Andrew N. Sharpley <sharpley@uark.edu>
Sent: Friday, October 16, 2015 10:44 AM
To: Kresse, Timothy
Cc: Mike Daniels; Karl VanDevender; Phillip Hays
Subject: RE: FW: 2015_Fields-Halihan_MTJ Presentation for 60thMGWC_Bentonville, AR

Good. I am glad the presentation went well.

From: Kresse, Timothy [mailto:tkresse@usgs.gov]
Sent: Friday, October 16, 2015 9:38 AM
To: Andrew N. Sharpley <sharpley@uark.edu>
Cc: Mike Daniels <mdaniels@uaex.edu>; Karl VanDevender (kvandevender@uaex.edu) <kvandevender@uaex.edu>; Phillip Hays <pdhays@usgs.gov>
Subject: Re: FW: 2015_Fields-Halihan_MTJ Presentation for 60thMGWC_Bentonville, AR

I saw the presentation. There were no difficulties at all and it was a good presentation. I did chat with Todd and Jon some about the pond results, and Phil joined in on the second half of that conversation. We can chat about that sometime. In short, it would be nice to put a well on the west side in the vicinity of where Todd believed he saw a major fracture and movement of waste. This could be critical to resolving the interpretation of the resistivity data. Todd would be willing to assist on getting the drilling done for free. I just don't know the amount of grief or worry this would cause, in lieu of all the activity at the farm, but again I believe it is a critical component. Todd is fairly confident of his interpretation. Thoughts?

On Wed, Oct 14, 2015 at 10:27 AM, Andrew N. Sharpley <sharpley@uark.edu> wrote:

Just for you information, attached is Jon's presentation at the upcoming Groundwater meeting at Crystal Bridges tomorrow.

I didn't see any "major difficulties." But am not privy to the dialogue that will go with it.

Andrew

From: Halihan, Todd [mailto:todd.halihan@okstate.edu]
Sent: Tuesday, October 13, 2015 9:05 PM
To: Andrew N. Sharpley <sharpley@uark.edu>
Subject: FW: 2015_Fields-Halihan_MTJ Presentation for 60thMGWC_Bentonville, AR

Andrew,

Let us know if you see any major difficulties with Jon's presentation for Thurs.

Pat Walters

From: Andrew N. Sharpley <sharpley@uark.edu>
Sent: Friday, October 16, 2015 10:50 AM
To: Karl VanDevender; Kresse, Timothy
Cc: Mike Daniels; Phillip Hays
Subject: RE: FW: 2015_Fields-Halihan_MTJ Presentation for 60thMGWC_Bentonville, AR

Sure, we can have a conference call next week. What time works for most of you? Tuesday and Friday are not good for me. Monday morning at 9:00 am?

Relatedly, though, I know Jason is close to the limit of accommodating new requests for several reasons. And I certainly empathize with him.

Andrew

From: Karl VanDevender [mailto:kvandevender@uaex.edu]
Sent: Friday, October 16, 2015 10:37 AM
To: Kresse, Timothy <tkresse@usgs.gov>
Cc: Andrew N. Sharpley <sharpley@uark.edu>; Mike Daniels <mdaniels@uaex.edu>; Phillip Hays <pdhays@usgs.gov>
Subject: RE: FW: 2015_Fields-Halihan_MTJ Presentation for 60thMGWC_Bentonville, AR

Not sure.

Where and how deep does the well need to be?

All do we need to schedule a phone/web conference to discuss?

From: Kresse, Timothy [mailto:tkresse@usgs.gov]
Sent: Friday, October 16, 2015 9:44 AM
To: Karl VanDevender
Cc: Andrew Sharpley; Mike Daniels; Phillip Hays
Subject: Re: FW: 2015_Fields-Halihan_MTJ Presentation for 60thMGWC_Bentonville, AR

Not really. I would imagine (or hope) that the zone we are concerned with would be cased off from the potable water. Cuttings would have helped some. When was the well installed?

On Fri, Oct 16, 2015 at 9:41 AM, Karl VanDevender <kvandevender@uaex.edu> wrote:

Would the new potable water well serve? I understand that is located west of ponds between barns.

From: Kresse, Timothy [mailto:tkresse@usgs.gov]
Sent: Friday, October 16, 2015 9:38 AM
To: Andrew Sharpley
Cc: Mike Daniels; Karl VanDevender; Phillip Hays
Subject: Re: FW: 2015_Fields-Halihan_MTJ Presentation for 60thMGWC_Bentonville, AR

ph: (501) 228-3616

fax: (501) 228-3601

email: tkresse@usgs.gov

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Timothy M Kresse
Water Quality Specialist
U.S. Geological Survey
Arkansas Water Science Center
401 Hardin Road
Little Rock Arkansas 72211
ph: (501) 228-3616
fax: (501) 228-3601
email: tkresse@usgs.gov

Resistivity Imaging of Swine Waste in Mantled Karst

Jon Fields

Todd Halihan, Ph.D., P.Gp.

Oklahoma State University

Objectives

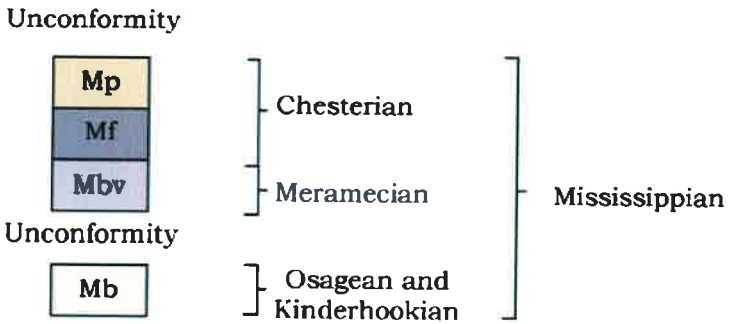
- For this experiment, electrical imaging was conducted to:
  - Evaluate rock properties.
  - Characterize potential groundwater flowpaths in a complex mantled karst.
  - Evaluate potential electrical signals of applied swine waste.

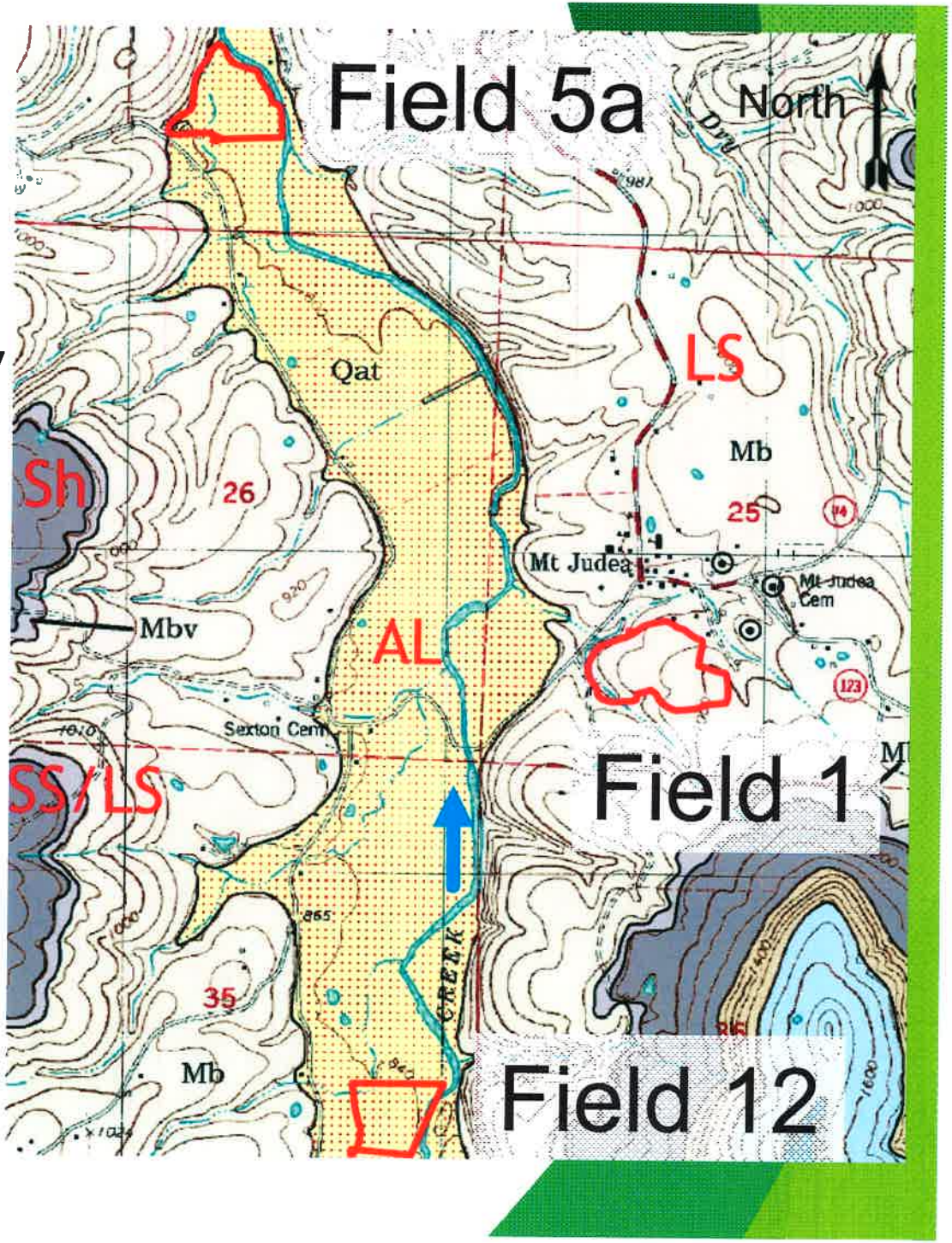
Electrical Resistivity Imaging

- One of the oldest geophysical methods; significant improvements in last 20 years
- 56 electrodes connected to an energy source and an instrument that measure the differences in apparent resistivity and generates a 2D dataset

Geology

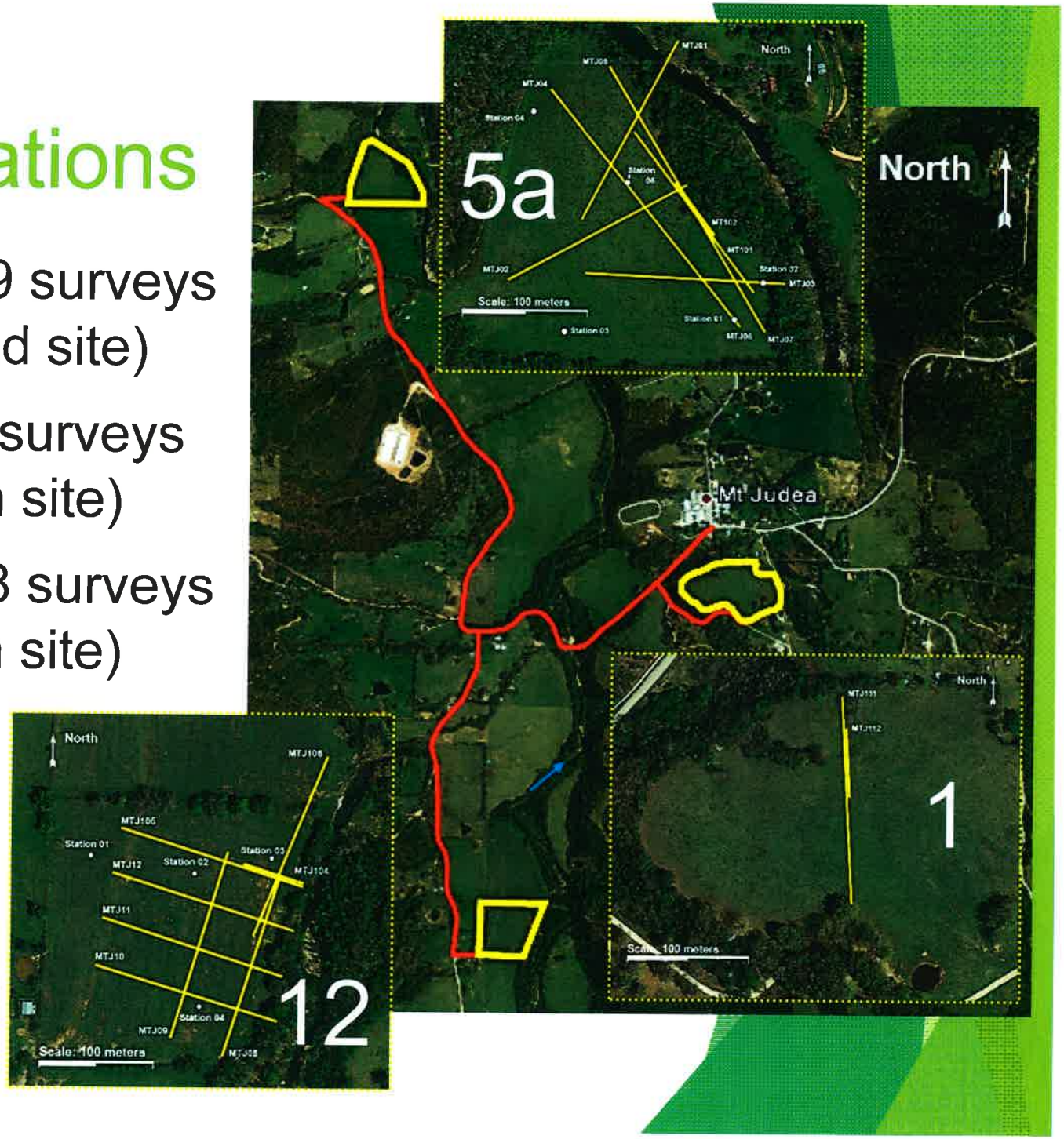
Fayetteville Shale (Sh) – **Mf**
Batesville Formation (SS/LS) – **Mbv**
Hindsville Limestone Member
Boone Formation (LS) – **Mb**





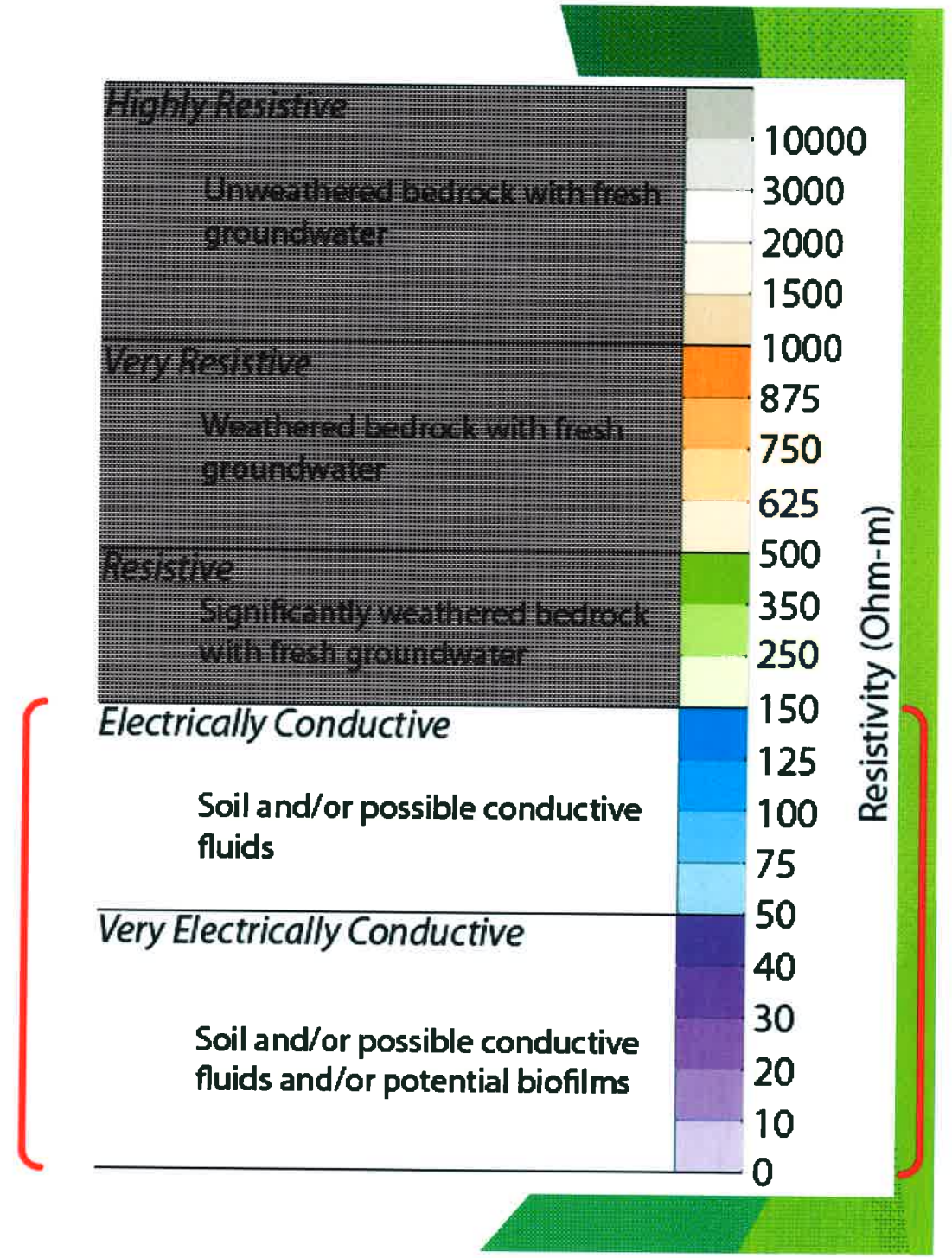
Site Locations

- *Field 5a* – 9 surveys (background site)
- *Field 1* – 2 surveys (application site)
- *Field 12* – 8 surveys (application site)



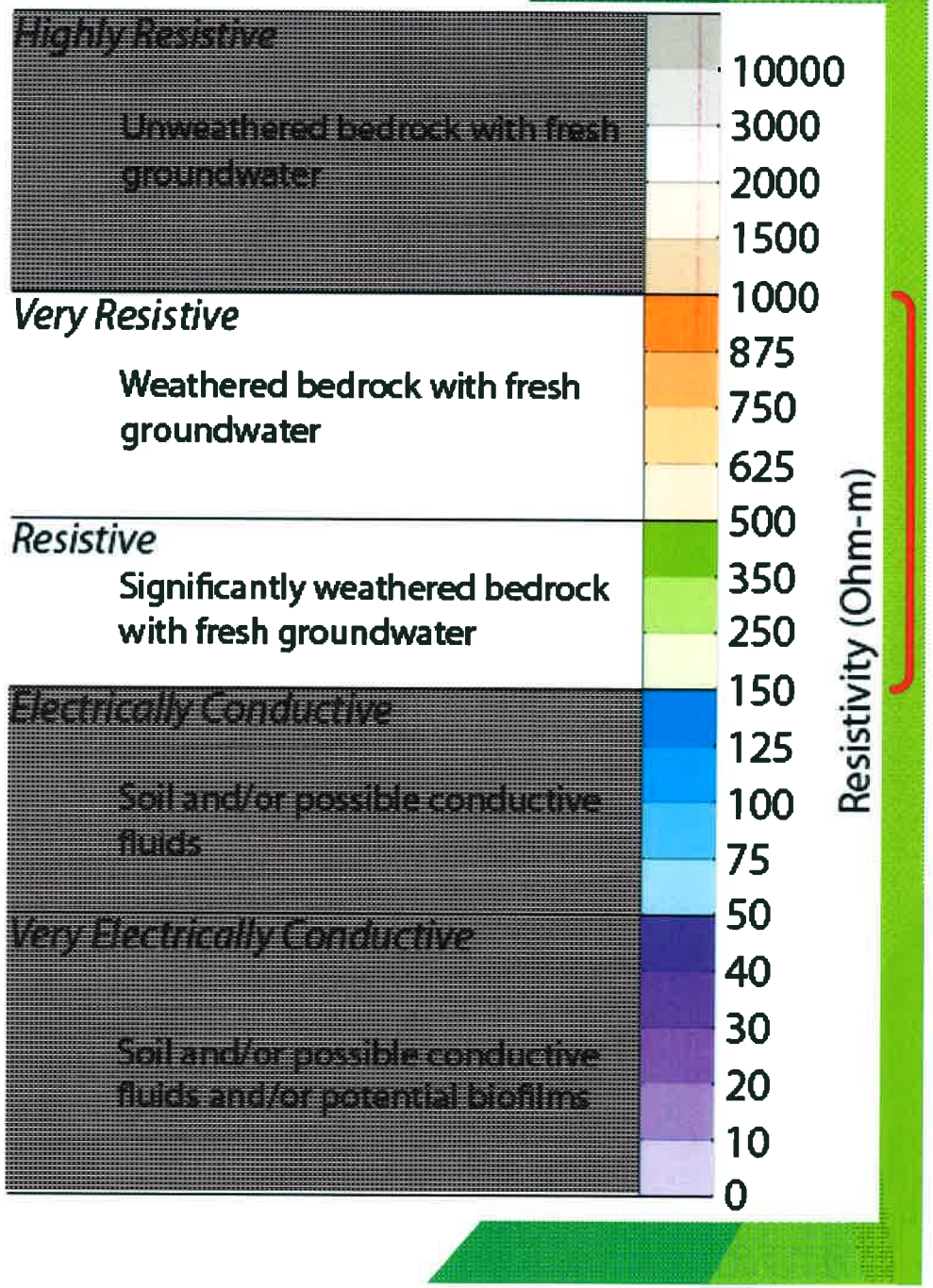
Soil Zone

- The electrically conductive zone between ground surface and the epikarst.
- Determined through hand coring to refusal



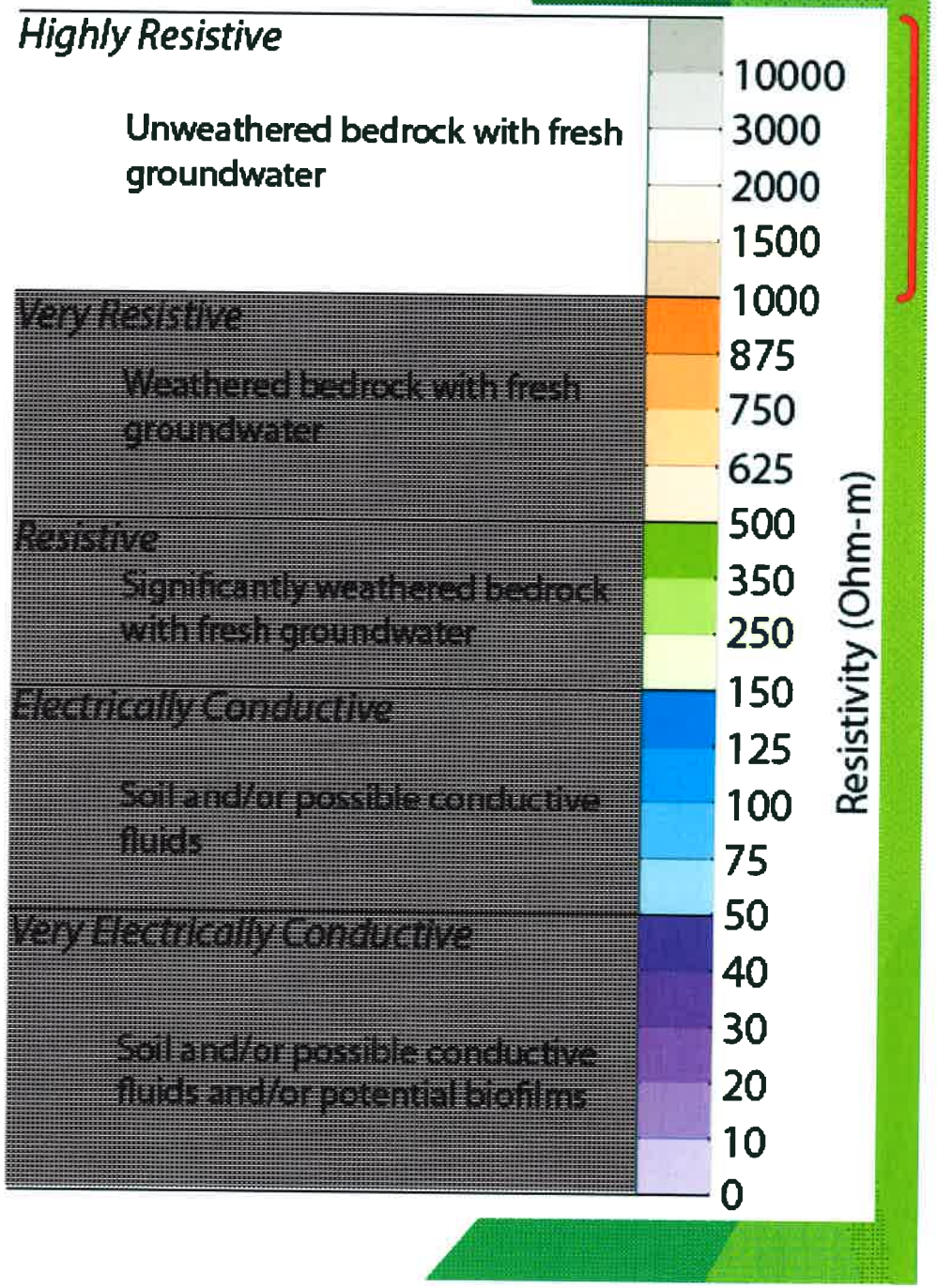
Epikarst Zone

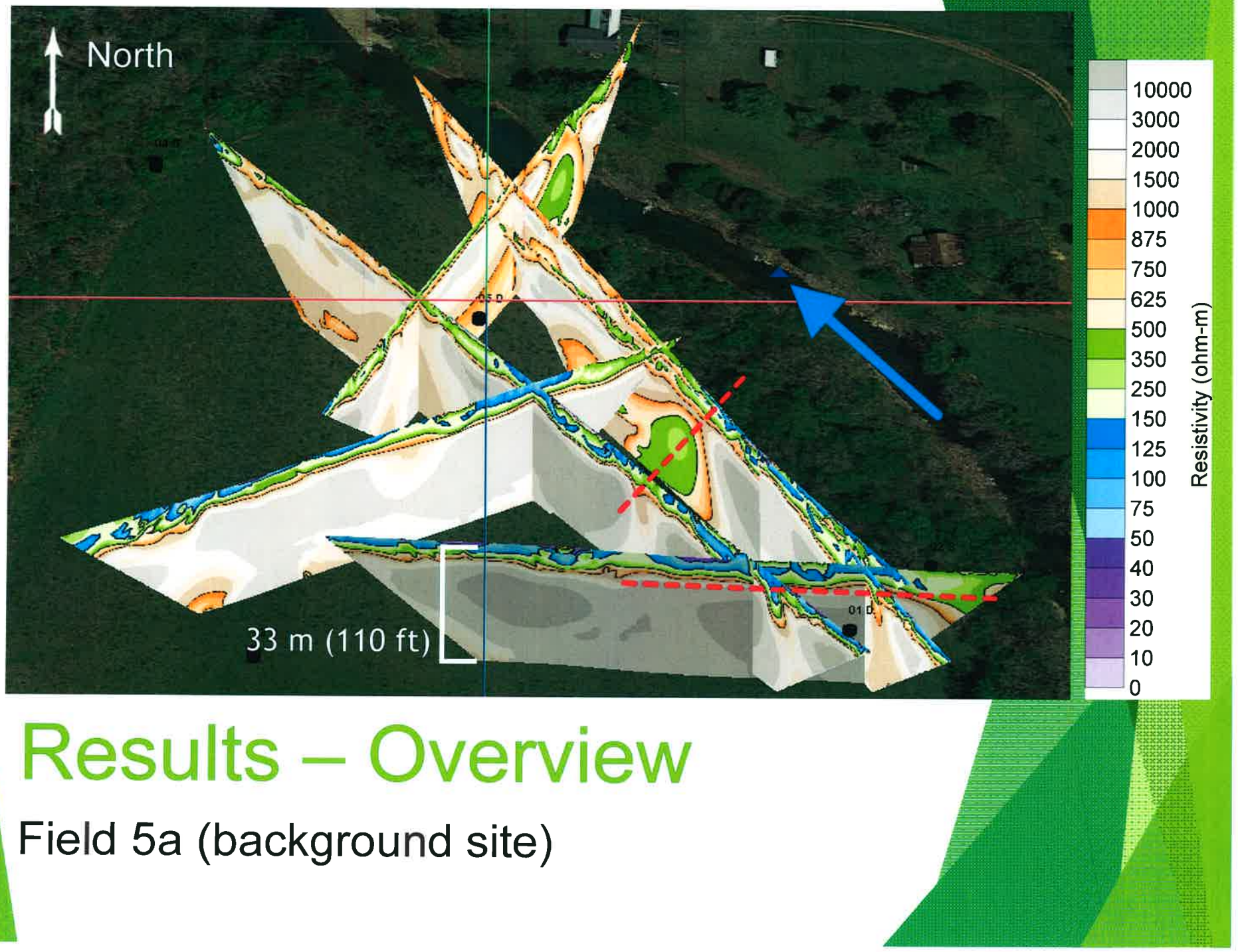
- Zone extending from the base of the soil zone to the surface of the competent bedrock
  Klimchouk 2004
- Determined from soil coring and vertical electrical gradients



Bedrock

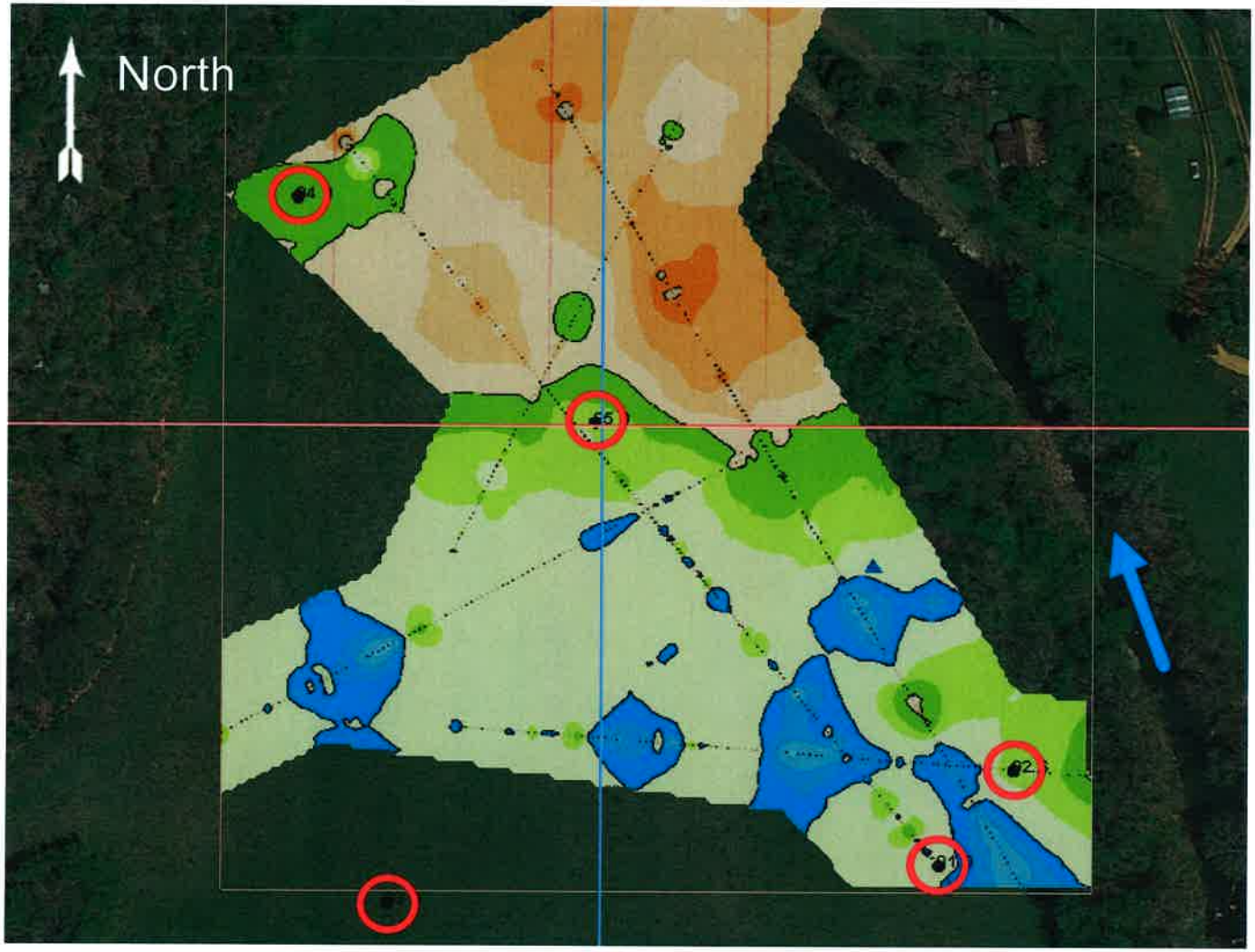
- Zone of competent rock beneath epikarst
- Generally highly resistive zone at depth

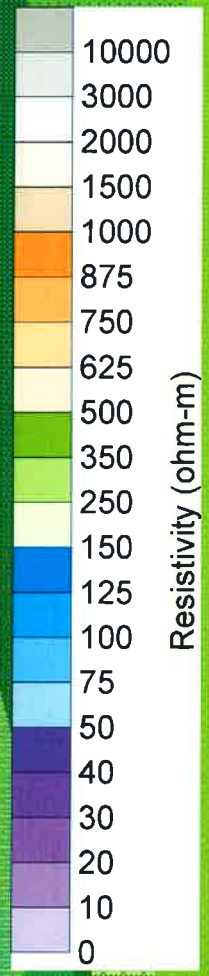




Results – Overview

Field 5a (background site)

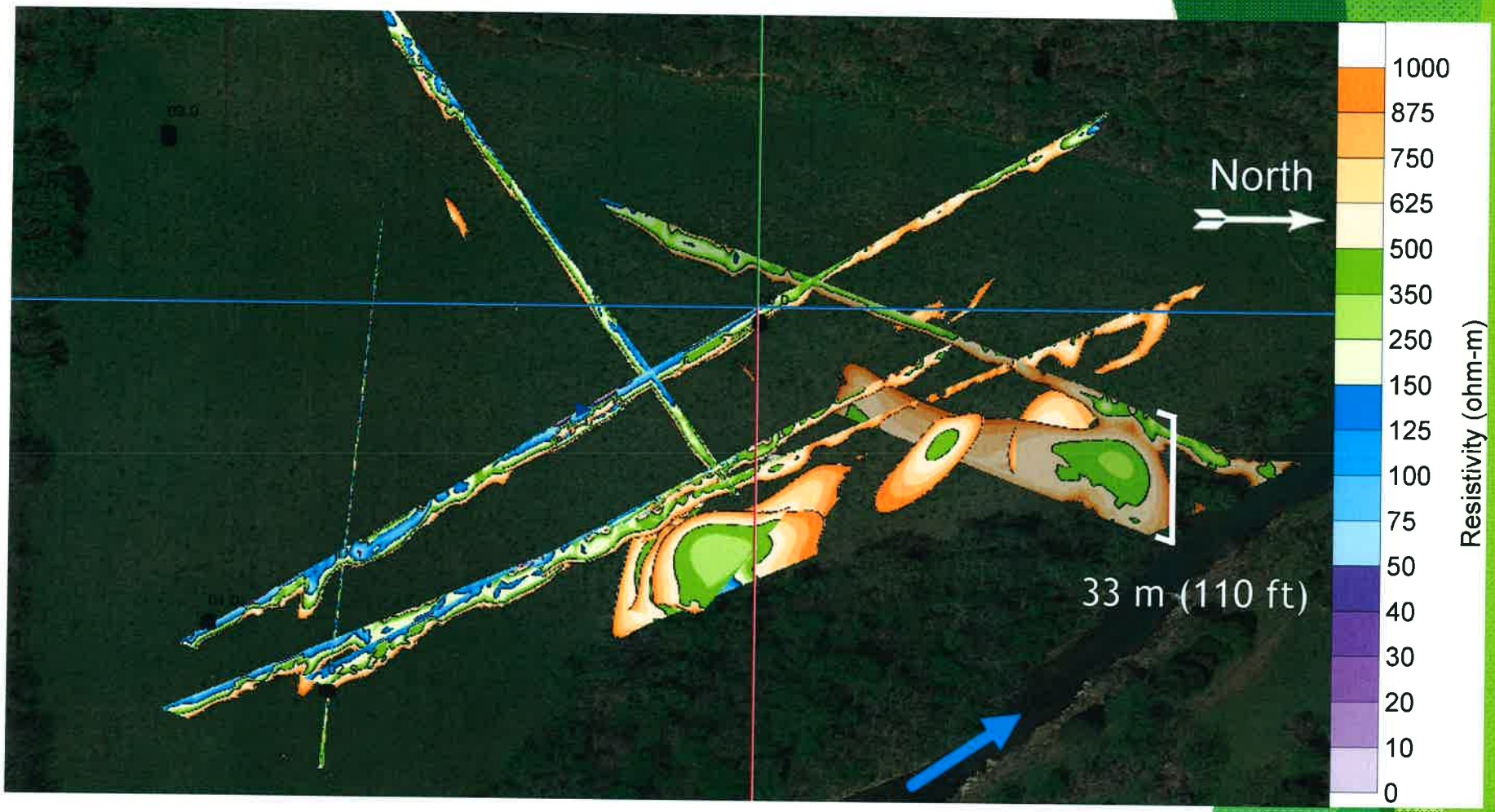




Soil Zone

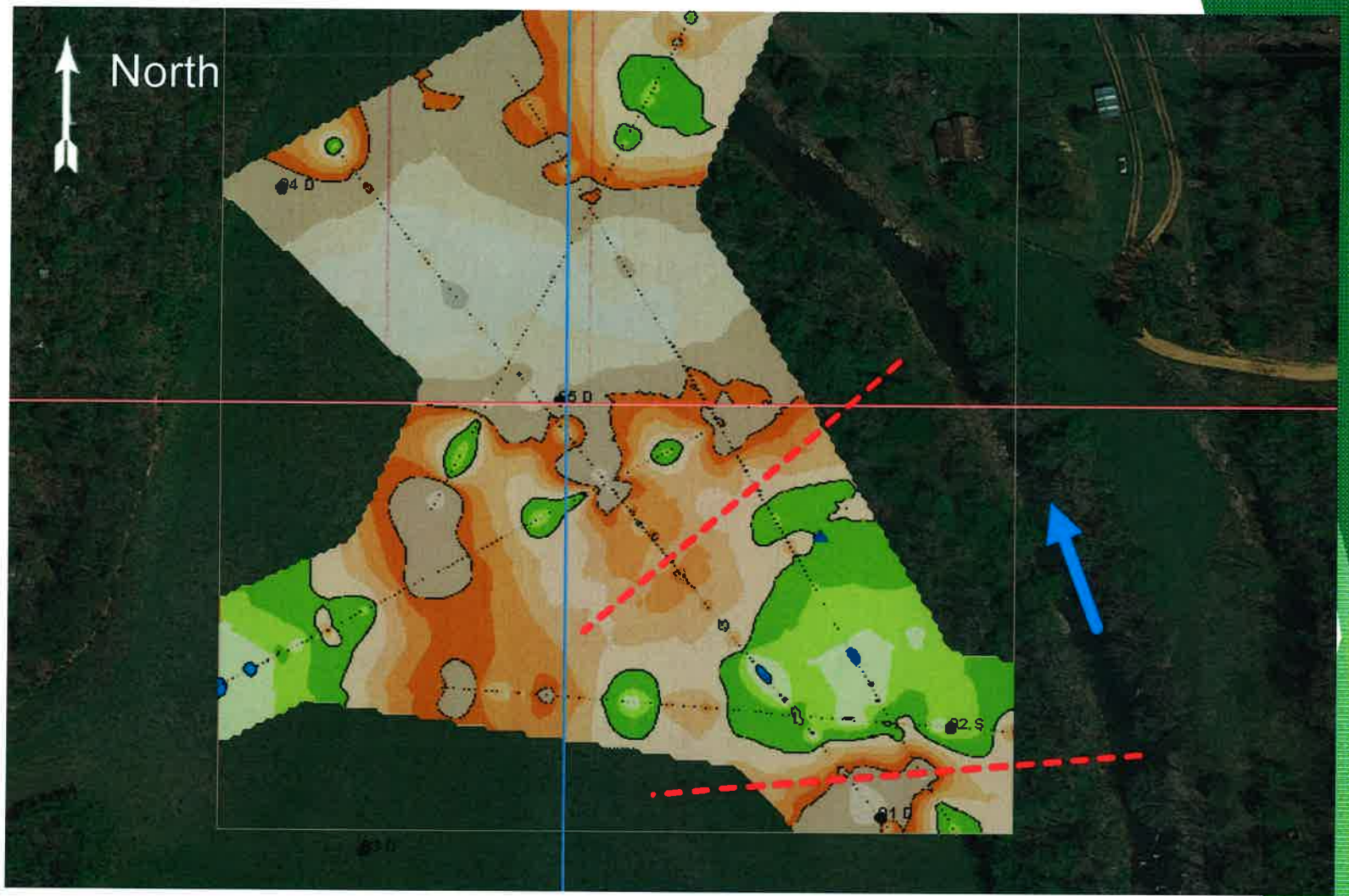
Field 5a (background site)

Horizontal Slice at
-1.5 m (-5.0 ft)



Soil / Epikarst Zones

Field 5a (background site)



Epikarst Zone

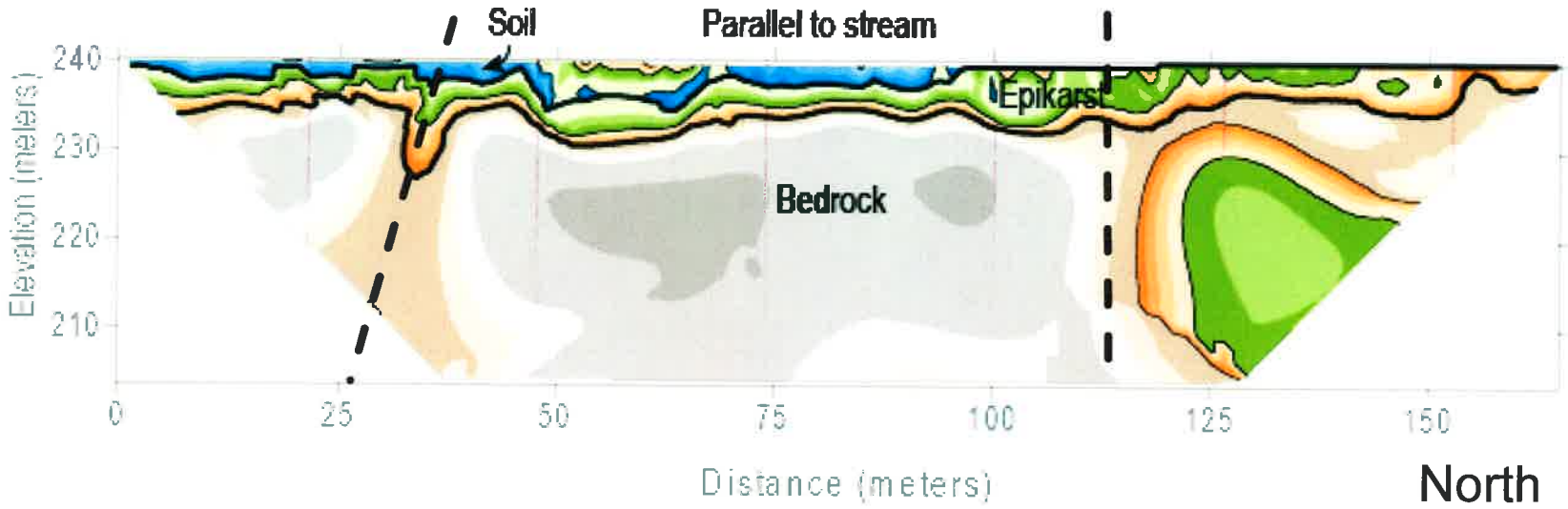
Field 5a (background site)

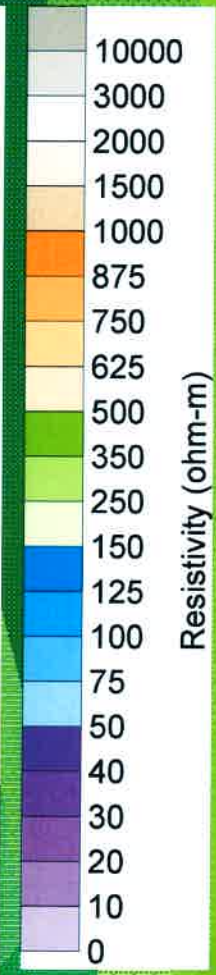
Horizontal Slice at -4.5 m (-15.0 ft)

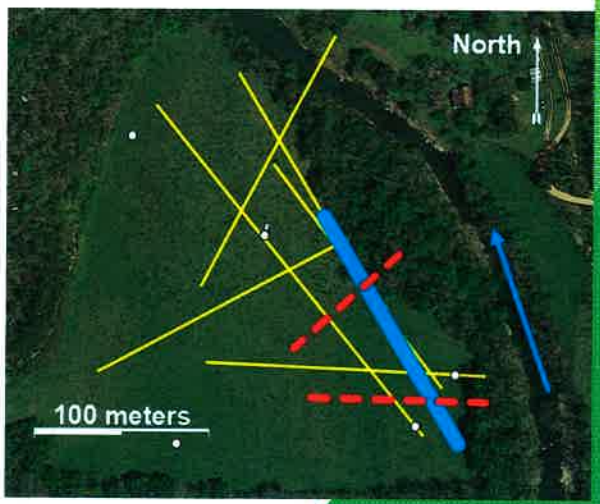
Epikarst Zone

Field 12 (application site)

Horizontal Slice at
-6.0 m (-20.0 ft)

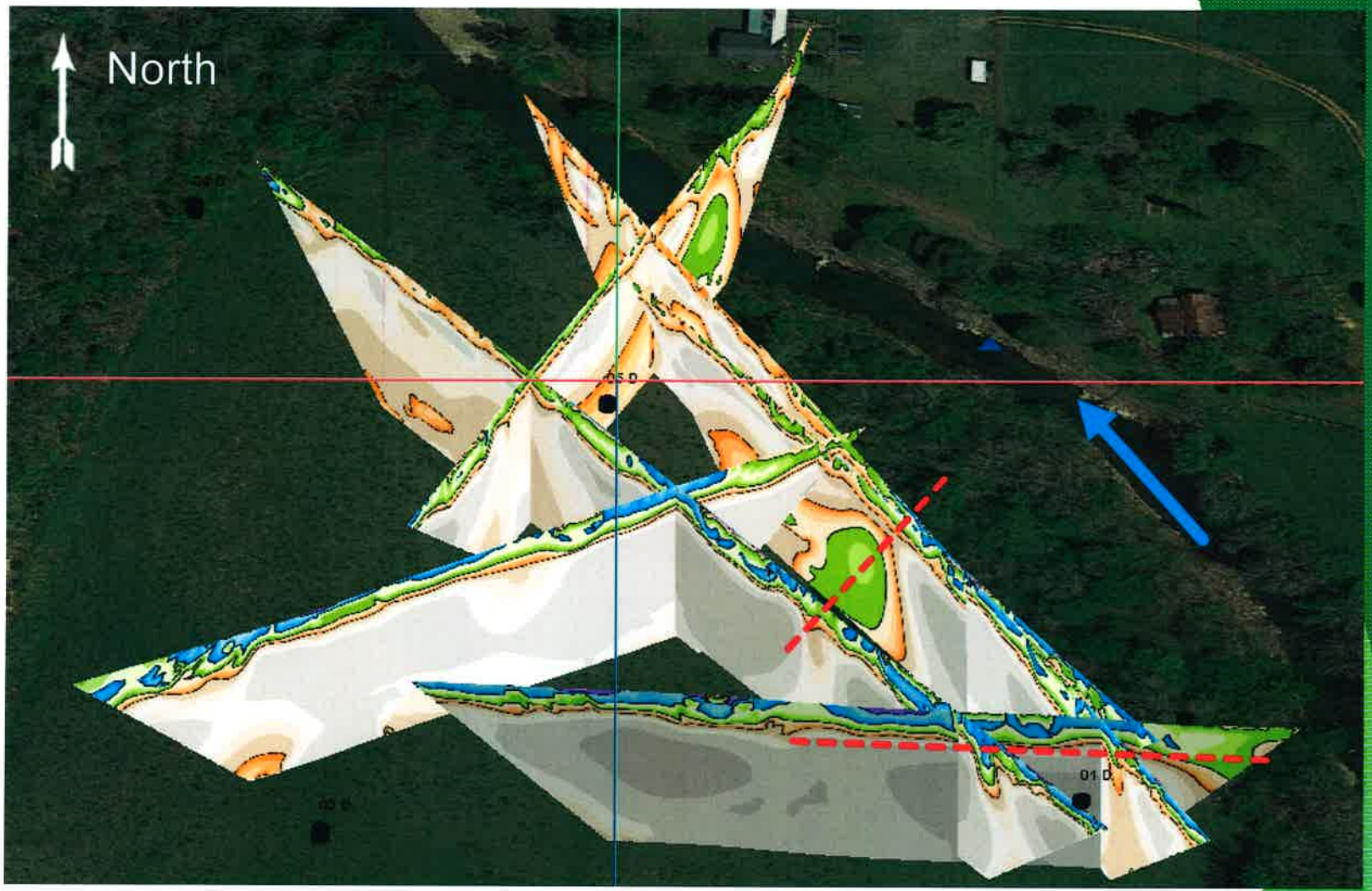






Bedrock

Field 5a (background site)

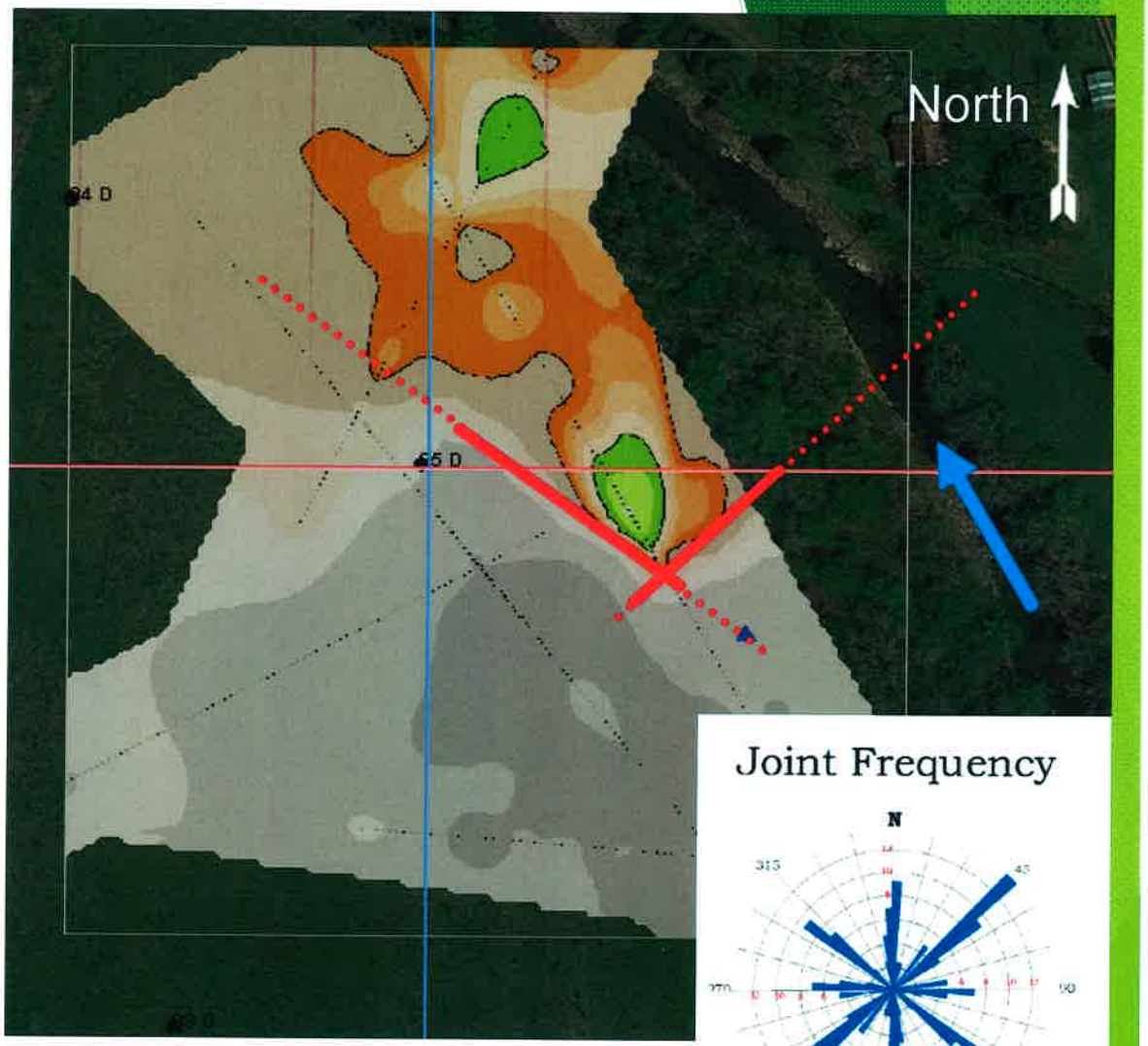


Bedrock

Field 5a (background site)

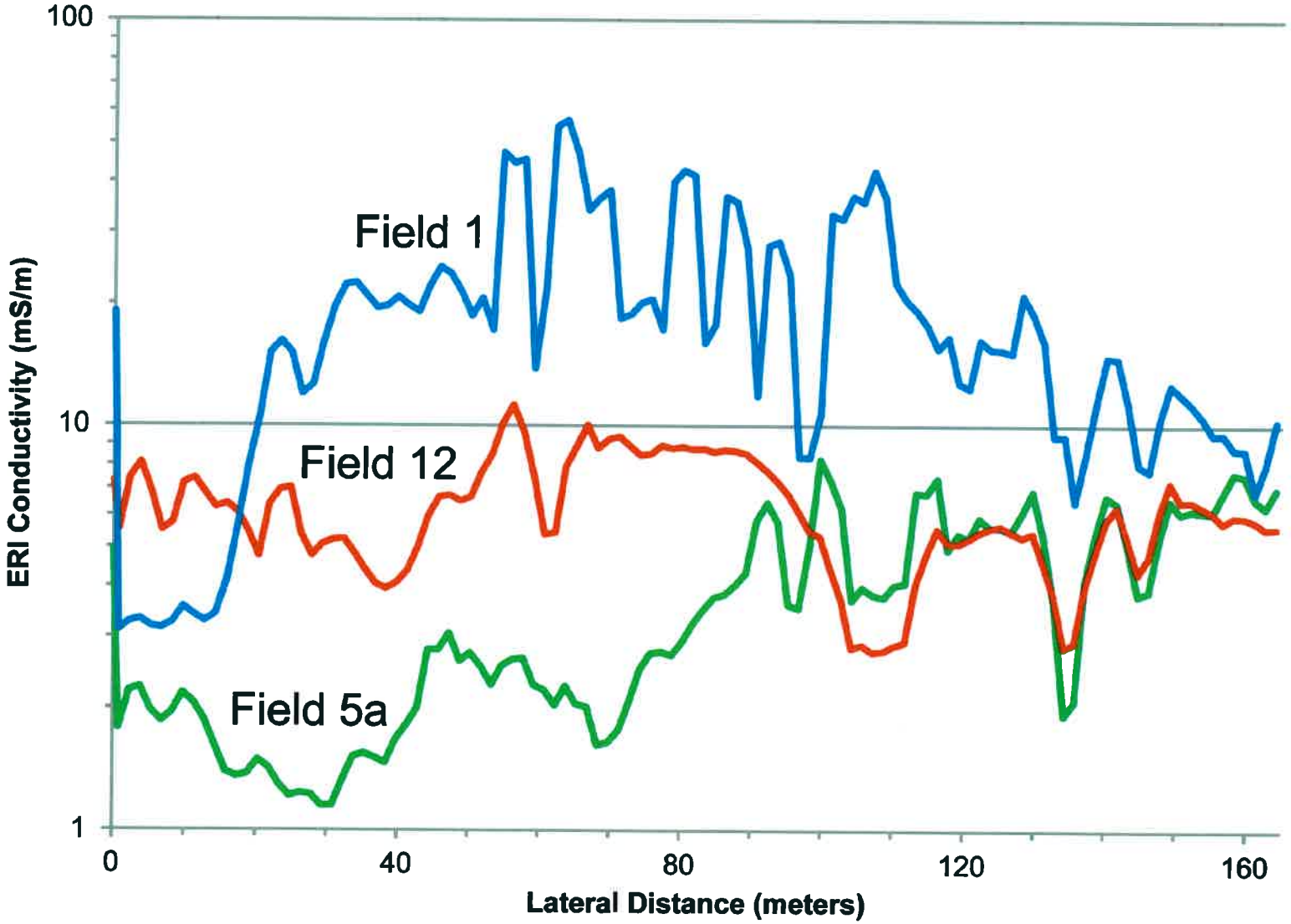
Bedrock

- Field 5a
  - Faulting / Regional Trends
  - NE and NW
  - Electrically Conductive Flowpaths



Horizontal Slice at -33 m (-110 ft)

Shallow Soil Signatures



Summary

- Soil Zone
  - Electrically conductive shallow features
  - Average thickness 0–3.5 m (0–11.5 ft)
- Epikarst Zone
  - More resistive features
  - Average thickness 4–7 m (13–23 ft)
- Bedrock
  - Highly resistive features
  - Evidence for possible flowpaths

Questions?
Thank You !