Exhibit 6

PRELIMINARY ELECTRICAL RESISTIVITY SURVEYS OF MOUNT JUDEA ALLUVIAL SITES

2nd Quarter 2015 Report

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Executive Summary

Electrical Resistivity Imaging (ERI) surveys were conducted in December 2014 to evaluate the use of the technique in the Mount Judea, Arkansas area in defining groundwater flowpaths, soil structure, and bedrock properties. ERI surveys generate a two dimensional cross section of geology based on the electrical properties of the subsurface. These properties are controlled by the type of soil or rock at a location and the electrical conductivity of the fluids in that soil. Rock that has low porosity and is very competent will be more resistive than rock that is fracture or weathered. Soil that is composed of fine grained material, like clay, is more electrically conductive than soils that are sandy. Features with more water content or higher salinity cause more electrically conductive features while those with less water or salinity generate resistive features.

This Phase I survey also conducted a preliminary evaluation of whether applied hog manure in this setting provided any electrical signatures that could be investigated further. The application of hog manure has the possibility of providing a more electrically conductive signature in soil within ERI surveys. However, these are not distinctly different from other electrically conductive fluids in the subsurface so other analysis and sampling must be done to determine if these electrically conductive features are the electrical signatures of hog manure.

Two fields were measured in December, one background site and one that had hog manure application in April 2014. Several datasets were collected and the following observations were made from the ERI data:

- ERI provided delineation of boundaries between soil, epikarst, and competent bedrock,
- The potential for rapid transport pathways in the underlying bedrock as joints or potential karst features were observed as conductive electrical features in a resistive background,
- Soil depth was measured to range from 0.7 to 3.0 meters (2.25 to 10 feet). On both fields, the depth of soil is less moving away from the stream and towards higher elevations, which is consistent with the direction to which the alluvium would be deposited near the stream,
- The average epikarst thickness is highly variable, ranging from 2 to 23 meters thick (6 to 75 feet), and
- There seems to be a correlation between the presence of applied hog manure and increased electrical conductivity in soil, but additional work is required to evaluate this potential relationship.

Glossary

Below are the definitions for heavily used technical terms throughout this report. Accompanying many definitions are abbreviations for the references (WS – Water Science Glossary; GG – Geologic Glossary; UT – Glossary of Hydrological Terms; ES – A Dictionary of Earth Science; CK – A Lexicon of Cave and Karst Terminology; NOAA – National Oceanic and Atmospheric Administration; TH – ERI of the Arbuckle Simpson Aquifer)

Alluvium: deposits of clay, silt, sand, gravel, or other particulate material that has been deposited by a stream or other body of running water in a streambed, on a flood plain, on a delta, or at the base of a mountain. (WS)

Apparent Resistivity: the resistance per length of a surface area, in essence the resistance of a cube to the one-way passage of electricity – this is used in many geophysical and hydrogeological applications. (UT)

Carbonates: frequently used with reference to those sedimentary rocks composed of 95% or more of either calcite or dolomite – examples include limestone and dolomite. (ES)

Conductive Fluid: fluid that readily conducts electricity – the degree to which the fluid is conductive depends on the concentration of dissolved ions within the fluid – examples include sodium and chloride ions from dissolving table salt in water. (TH)

Disconformity: unconformity such that the beds above and below the surface are parallel; some disconformity surfaces are highly irregular, whereas others have no obvious relief. (ES)

Dissolution Feature: dissolution is the process in which a solid becomes dissolved in (ground) water– features that develop include caves, sinkholes, enlarged fractures, and doline features. (UT)

Doline Feature: a closed topographic depression caused by dissolution or collapse of underlying rock or soil; synonymous with sinkhole. (UT)

Epikarst: a relatively thick (may vary significantly but up to 30 meters thick is a good generalization) portion of bedrock that extends from the base of the soil zone and is characterized by extreme weathering and enhanced solution. Significant water storage and transport are known to occur in this zone. (CK)

ERI: Electrical Resistivity Imaging – a geophysical method that injects an electrical current into the ground through two electrodes where the resulting potential is measured between two separate electrodes and the apparent resistivity is calculated. Thousands of these measurements allow for imaging of the subsurface. (TH)

Fault: a fracture in the Earth along which one side has moved relative to the other. (GG)

Flowpath: the subsurface course a water molecule or solute would follow in a given ground-water velocity field. (CK)

Fracture: a break or secondary discontinuity in the rock mass, whether or not there has been relative movement across it. Faults, thrusts, and joints are all fractures, but bedding planes, which are primary features, are not. (CK)

GPS: Global Positioning System – a space based satellite navigation system that gives time and location anywhere on the Earth where there is an unobstructed line of sight with four or more satellites.

Groundwater: water that flows or seeps downward and saturates soil or rock, supplying springs and wells. Water stored underground in rock crevices and in the pores of geologic materials that make up the Earth's crust. The upper surface of the saturated zone is called the water table. (WS)

Joint: a break of geological origin in the continuity of a rock body occurring either singly, or more frequently in a set or system, but not attended by a visible movement parallel to the surface of the discontinuity. (CK)

Karst: the result of natural processes in and on the Earth's crust caused by dissolution and leaching of limestones, dolomites, gypsum, halite, and other soluble rocks. (CK)

Limestone: a sedimentary rock made mostly of the mineral calcite; it is usually formed from shells of once-living organisms or other organic processes, but may also form by inorganic precipitation. (GG)

OPUS: Online Positioning User Service – a service run by the National Geodetic Survey (NGS) as part of the National Oceanic and Atmospheric Administration (NOAA) that solves the GPS position of the user by tying their survey-grade data to the National Spatial Reference System (NSRS). (NOAA)

Perched Groundwater: unconfined groundwater separated from an underlying body of groundwater by an unsaturated zone. The perching bed has a permeability so low that water percolating downward through it is not able to bring water in the underlying unsaturated zone above atmospheric pressure. (CK)

Perched Water Table: the water table for the perched groundwater. (CK)

Resistive Feature: fluids and rock bodies that do not readily conduct electricity – the degree to which a feature is resistive depends on porosity, salt content in the fluid, and rock or soil type. (TH)

Root Mean Square Error: is the average of the squares of the "errors", that is, the difference between the estimator and what is estimated.

Sandstone: a clastic sedimentary rock composed of sand sized grains. (GG)

Soil Zone: the zone between the ground surface and the epikarst. Water is able to pass through this zone to reach the water table. (ES)

Quaternary: the most recent Period in the Cenozoic Era. Encompasses the time interval of 1.6 million years ago through today. (GG)

Water Table: the upper surface of a zone of saturation except where that surface is formed by a confining unit; where the water pressure in porous medium equals atmospheric pressure. (CK)

1. Introduction

This quarterly report defines the electrical properties of two locations near Mount Judea, Arkansas in December 2014. One location (Field 5a) was selected for specific qualities that allowed us to measure background data on the soil and subsurface environment on a site that has been utilized for agricultural purposes, but has not yet received any hog manure. A second site (Field 12) was selected, where hog manure had been applied from the C&H Farm operation. Together, these sites created a better understanding of the three-dimensional subsurface characteristics of fields adjacent to Big Creek, which had received manure or the potential to receive it.

Electrical Resistivity Imaging

Electrical resistivity imaging provides a good method to understand the distribution of fluids and rock properties in the subsurface environment especially in the presence of fractures (Bolyard, 2007; Gary et al., 2009; Halihan et al., 2009). The method allows an electrical image to be created of the subsurface, which typically provides a meter-scale dataset that can be utilized to evaluate heterogeneity and fluid distribution. Improvements in sensitivity generated by the Halihan/Fenstemaker method (OSU Office of Intellectual Property, 2004), allow greater differentiation of these signatures (Miller et al., 2014). In a field setting, this will result in a two-dimensional mapping of subsurface electrical properties in vertical cross sections. Data interpolation can be utilized to construct map data at various depths below the surface.

Figure 1 – ERI equipment set up (Power Supply – AGI SuperSting R8/IP Resistivity Instrument - Switch Box - Electrode cables).

2. Site Description and Selection

Geologic Setting

The two test sites (Fields 5a and 12) utilized in December 2014, are located near the town of Mount Judea, Arkansas. These two sites were chosen to coincide with additional surface water quality monitoring on these fields by the University of Arkansas Big Creek Research and Extension Team and access to the sites was granted by the landowners. The positions of the selected sites are representative of fields adjacent to Big Creek and which are permitted to receive hog manure. Field 5a (background site) currently receives mineral fertilizers and poultry litter, while Field 12 (application site) has received one application of hog manure in late April of 2014.

Both sites are located on Quaternary alluvium deposits (stream sediments) that overlie weathered limestone bedrock. This alluvium consists of clay, silt, sand, and gravel deposited by a larger stream system in this river valley. Alluvium can be organic rich and flat lying, thus good for use as cropland. Underlying the alluvium is an epikarst system and underlying unweathered limestone bedrock (Williams, 2008). Epikarst is a zone that extends from the base of the soil zone to the unweathered portion of the limestone bedrock and is characterized by fracturing and weathered bedrock. This zone is generally a domain with faster fluid flow and greater water storage than the unweathered bedrock.

The Boone Formation is the underlying bedrock for each of these sites. It is an Early Mississippian Period limestone found in the Ozark regions of Eastern Oklahoma, Southern Missouri, and Northern Arkansas where karst dissolution features including sinkholes, caves, and enlarged fissures are common (Ferguson, 1920). These features average 90 – 120 meters (300 – 400 feet) thick (Ferguson, 1920). The Boone Formation is a gray, fine to coarse-grained fossiliferous limestone with interbedded dark and light chert. The basal unit of the Boone Formation in the area is the St. Joe Limestone (Ferguson, 1920). The St. Joe is a fine-grained, crinoidal limestone that can contain some smoothly bedded chert and display coarse bioclastic texture. The color is generally gray but can be red, pink, purple, brown, or amber. Thin calcareous shales can be found in sequences throughout the St. Joe. The base of the St. Joe contains phosphate nodules within a green shale or conglomerate and is disconformable in most places. At a few locations, a basal sandstone is found at the base of the St. Joe Limestone. It is a fine to medium-grained, moderately sorted, sub-rounded to rounded sandstone. It is white to light gray and tan on fresh surfaces, thin to thick bedded, and contains phosphate nodules and white to light gray chert. It is generally up to 3.5 meters (12 feet) thick (Ferguson, 1920).

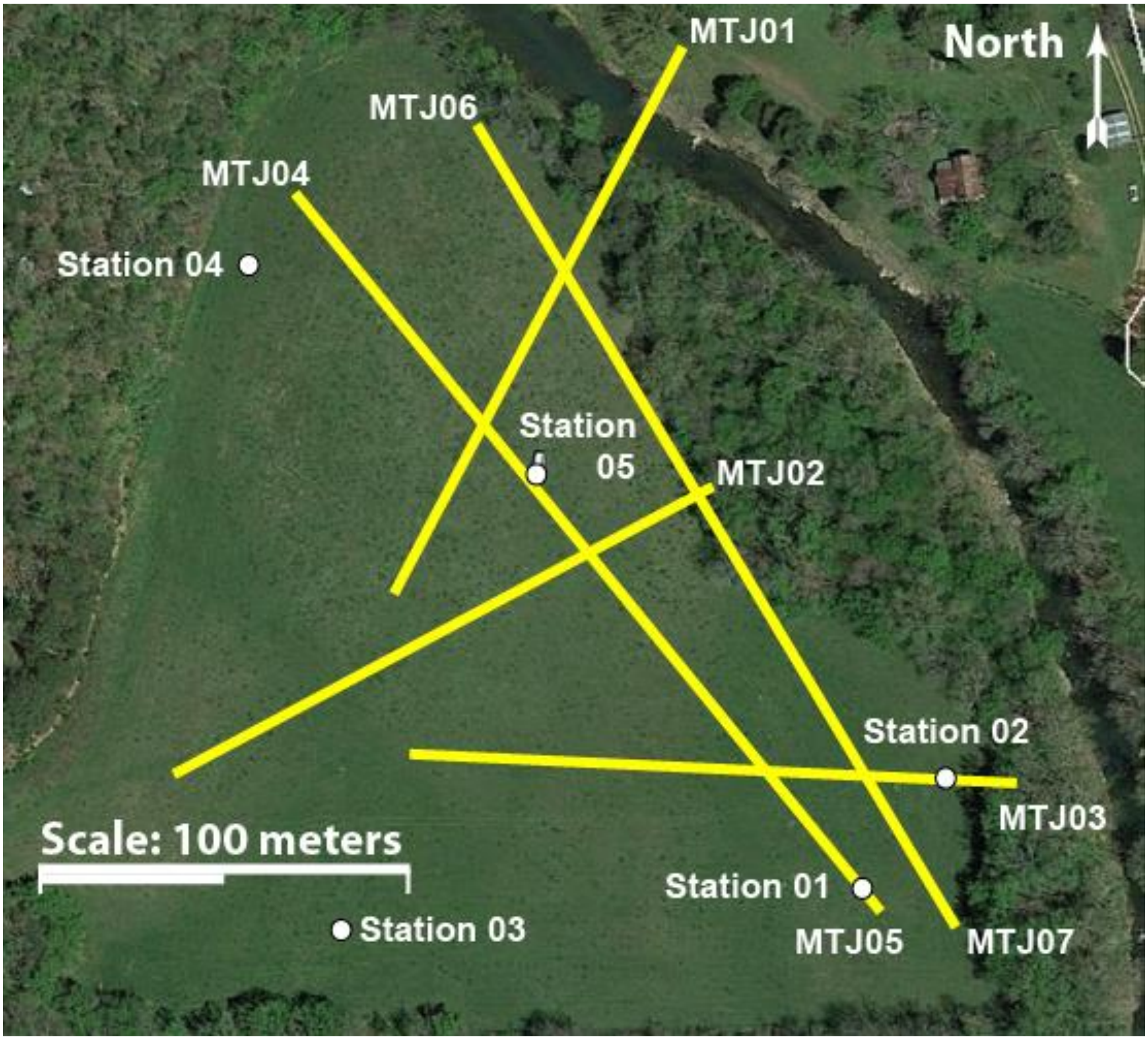

Figure 2 – Field 5a (Background site) ERI transects collected during December 2014 in yellow, shallow well locations (stations) also noted.

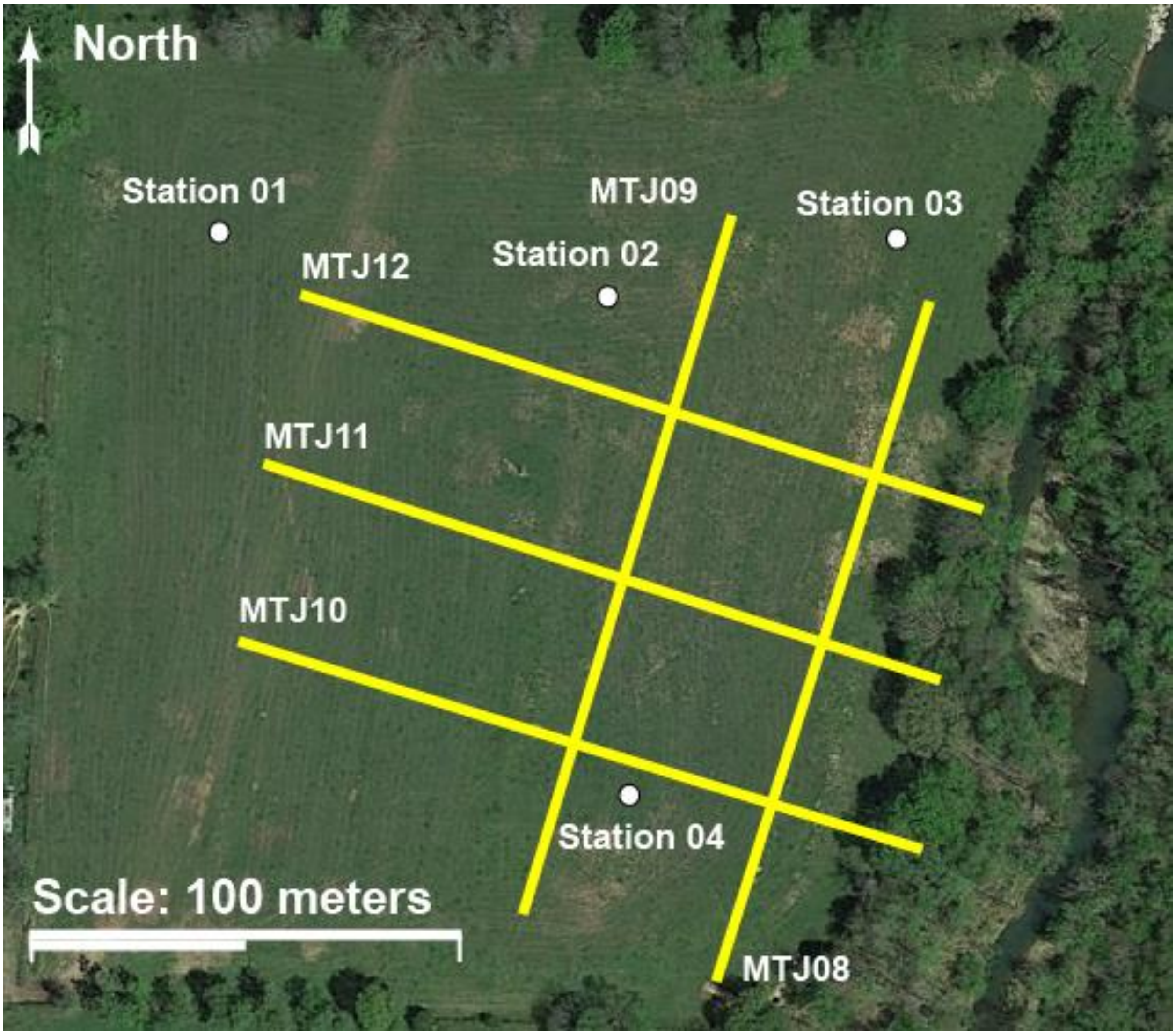

Figure 3 – Field 12 (Application site) ERI transects collected during December 2014 in yellow, shallow well locations (stations) also noted.

Hydrologic Setting

The hydrologic setting for the sites is a mantled epikarst with soil over epikarst over competent carbonate bedrock. Precipitation enters the subsurface through the soil zone and then enters the epikarst area. Finally, fluids enter the unweathered competent bedrock through fractures and other openings. Understanding the storage and transmission properties of these three zones is key to understanding the migration of nutrients from applied manure in these areas.

The soil zones in an alluvial setting are often reworked stream deposits that have been mobilized several times since they were originally deposited. They are often highly variable in grain size and organic content. For the two field sites evaluated, silt-sized grains should result in the ability for the soil to hold fluids for some period of time.

In geologic settings like northern Arkansas, the epikarst zone is a significant source of water storage and transmission and many springs have been tapped to support local communities (Galloway, 2004). These types of groundwater systems can include perched water tables, which exist above regional water tables. These are called perched because they are places where low permeability soil or bedrock layers hold water within an unsaturated zone. These generally produce springs on the side of a bluff or sometimes in an open field if the relief is high enough to expose this feature. In the area of this study, the boundary of the soil zone with the epikarst zone is visible in some locations. However, these perched features are not apparent at either site. This zone is expected to have wide variability in flow rates and a high amount of storage (Williams, 2008). There can be slow seepage through weathered pores and pieces of less weathered bedrock to relatively rapid flow through fractures and karst features. The electrical features measured at these sites generally indicate high porosity zones and the extent of weathering in these locations (Williams, 2008; Halihan et al, 2009).

Flow through the bedrock will depend on the location of fractures or karst features. These features will most commonly be electrically conductive relative to the unweathered bedrock beneath the water table. In settings with little dissolution, but strong faulting or fracturing, these features will appear as linear features in ERI datasets (Halihan et al, 2009), but in the event of karst features, they can appear wider (Bolyard, 2007; Gary et al., 2009).

At the two sites, the water table was shallow during the investigation. For Field 5a, the depth to the water table was approximately 1.5 meters (5 feet) below the land surface. For Field 12, the water table was approximately 2 meters (6.5 feet) below the surface. Precipitation previous to and during the investigation resulted in both sites having moist to saturated soil conditions.

3. Methods

As part of cooperative research, Oklahoma State University (OSU) designed and conducted ERI experiments and are integrating the ERI data with well data and other site data to provide an understanding of the subsurface distribution of flowpaths at sites near Mount Judea, Arkansas. Field methods included ERI surveys as well as topographic site surveying using differential GPS (global positioning system) techniques.

General Procedures and Setup

The ERI data collection instrumentation used was a SuperSting R8/IP resistivity instrument. This instrument is a multi-channel portable memory earth resistivity meter with memory storage. The multi-channel design allows for measuring times to be quickened and increases the number of electrodes able to be run. The project design from OSU was to use 56 electrodes at 3 meter spacing (9.8 feet). This spacing allowed for detailed data collection at 1.5 meter (4.9 feet) resolution for a lateral distance of 165 meters (541 feet) and a depth of investigation of 33 meters (108 feet) for each image. The spacing is dependent upon balancing how far down the depth of investigation needs to be with how much resolution is needed to see the features. This spacing can be as large or as small as desired but balances resolution and depth.

Each ERI line was placed using field measuring tapes to 165 meters (541 feet). For each line 56 stainless steel stakes were inserted into the soil approximately 1 foot deep in a straight line. The resistivity cable was then laid out and each electrode on the cable was connected to each stake. Once the line was laid out, the cables were connected to the instrumentation. A generator and 12-volt power supply were used to power the instrument.

Before collecting data, tests are run on the instrument and cable to ensure each electrode was properly connected to each stake and the instrument is running properly. Contact resistance tests were conducted to ensure the circuits were complete. Electrodes with contact resistance greater than 2,000 ohms fails the test and that particular stake needs to be pushed deeper in the soil to help create a better contact with the soil or have an electrically conductive fluid like salt water poured around the stake to help with contact between the stake and underlying soil. In general, the lower contact resistance indicates better contact with subsurface material and increases signal strength, which improves better data quality and accuracy. With the high soil moisture at the site during the surveys, no extra fluids were required at the sites, to obtain good electrode contact.

Site Topographic Surveying

The Global Positioning System (GPS) used was a Topcon Positioning Systems, Inc. HyperLite GNSS Base and Rover with Bluetooth connected handheld unit. Personal GPS units come to within approximately 3 meters (10feet) of a person’s true location, but this commercial grade instrument provides locations to within approximately a centimeter (1/2 inch) of its true location. This instrument sets up by positioning a base receiver and utilizing a second mobile receiver to obtain data. Tree cover can be problematic for the Rover to obtain satellite data. At times, points cannot be collected because the Rover is under too much tree canopy. This was the case on both sites near the stream (i.e., Big Creek) and along the site boundaries if tree canopy was dense. The majority of the data were collected in open field conditions, allowing good coverage of the ERI locations.

Geologic Features

Both sites, the Fields 5a and 12, are located on the Boone Formation. On each site, soils were hand-augured for collection of soil samples until hitting a surface hard enough to prevent further penetration (also known as depth of refusal). These depths were evaluated along with the ERI surveys to produce a clearer picture of the soil depth and thickness across the sites. The epikarst thickness is found using the ERI surveys based on the use of a strong resistivity gradient used to delineate weathered epikarst from competent bedrock. Electrically conductive features can be displayed as pathways within the soil and epikarst. Resistive electrical layers are interpreted as the limestone bedrock at depth on each site. Electrically conductive pathways through the bedrock that are linear are interpreted as potential joints or faults. Electrically conductive zones are interpreted as potential dissolution or weathered portions of the bedrock.

Field 5a

In December 2014, seven ERI transects (MTJ01-MTJ07) were collected at Field 5a (Figure 2). Three transects ran approximately east-west, while the other four transects ran approximately north-south. Each transect was 165 meters long and had 3 meter spacing so that each one shared a similar depth of investigation. Transect MTJ01 was the sole transect to cross Big Creek. Transects MTJ02 and MTJ03 were oriented at an angle to MTJ01 but both shared the east-west trend. MTJ04 and MTJ05 are two of the four that ran north-south and were paired to create a longer total transect. These transects ran roughly parallel to the stream and the fence line, and crossed the three east-west trending transects. MTJ06 and MTJ07 were very similar to MTJ04 and MTJ05. They also ran parallel to the stream and fence line, and crossed the three east-west trending transects, but this pair of transects sat about 75 meters to the west of MTJ04 and MTJ05. Together, these datasets allowed coverage of Field 5a to evaluate the geologic context of the area.

Field 12

In December 2014, five ERI transects were collected from Field 12 (MTJ08-MTJ12) (Figure 3). Three of transects ran approximately east-west, while the other two transects ran north-south. Each transect was 165 meters long and had 3-meter spacing so that each transect shared a similar depth of investigation. Transects MTJ08 and MTJ09 ran parallel to each other and nearly parallel to Big Creek and covered almost the entire length of the field. Transects MTJ10, MTJ11, and MTJ12 ran at 90° to MTJ08 and MTJ09 and all three were also parallel to each other and the fence line. These three ran north-south and were separated from each other by about 40 meters. This set of transects cover a sufficient area of the field to evaluate the geologic objectives and also covers the boundary between the unapplied edge of the field and application zone in the center of the field.

4. Results

GPS Data Analysis

The location data collected using the GPS system was processed to evaluate the position of the ERI datasets and site topography. The base data were submitted to the Online Positioning User Service (OPUS), which is operated by the National Oceanic and Atmospheric Administration (NOAA), and the products are the corrected values for easting, northing, and elevation of the base positions. These were then applied to the datasets to obtain centimeter-scale accuracy for the topography datasets.

ERI Data Analysis

For the processed ERI datasets, it was found that the average root mean square error (RMSE) between the resistivity model and the field apparent resistivity data was 3.16% for Field 5a and 3.34% for Field 12. The lower the RMSE percentage, the better the collected data and the calculated data fit together giving a cleaner image. The range of RMSE for the site was 3.01% to 4.53%. The data quality for the site is good as there were no utilities or other anthropogenic features and the soil was moist at the time of data collection.

The resistivity values for the site range from *very electrically conductive* to *highly resistive*. Electrically conductive areas generally include the shallow portions of the images, with some strong resistors at depth. The resistivities for Field 5a range from 1 to $6x10^5$ Ohm-meters with a median value of 1500 Ohm-meters. The resistivities for Field 12 range from 20 to $6x10^5$ Ohm-meters with a median value of 1600 Ohm-meters.

The interpretation of the images is that electrical features;

- **Above 1000 Ohm-meters** generally represent unweathered bedrock with fresh groundwater and will be referred to as *highly resistive*.
- **Between 500 to 1000 Ohm-meters** represent weathered bedrock with fresh groundwater and will be referred to as *very resistive*,
- **Between 150 and 500 Ohm-meters** typically represent significantly weathered bedrock material with fresh groundwater and will be referred to as *resistive*.
- **Less than 150 Ohm-meters** but greater than 50 Ohm-meters are interpreted as soil and/or possible electrically conductive fluids and referred to as *electrically conductive*.
- **Below 50 Ohm-meters** represent fine soils and/or electrically conductive fluids and referred to as *very electrically conductive*.

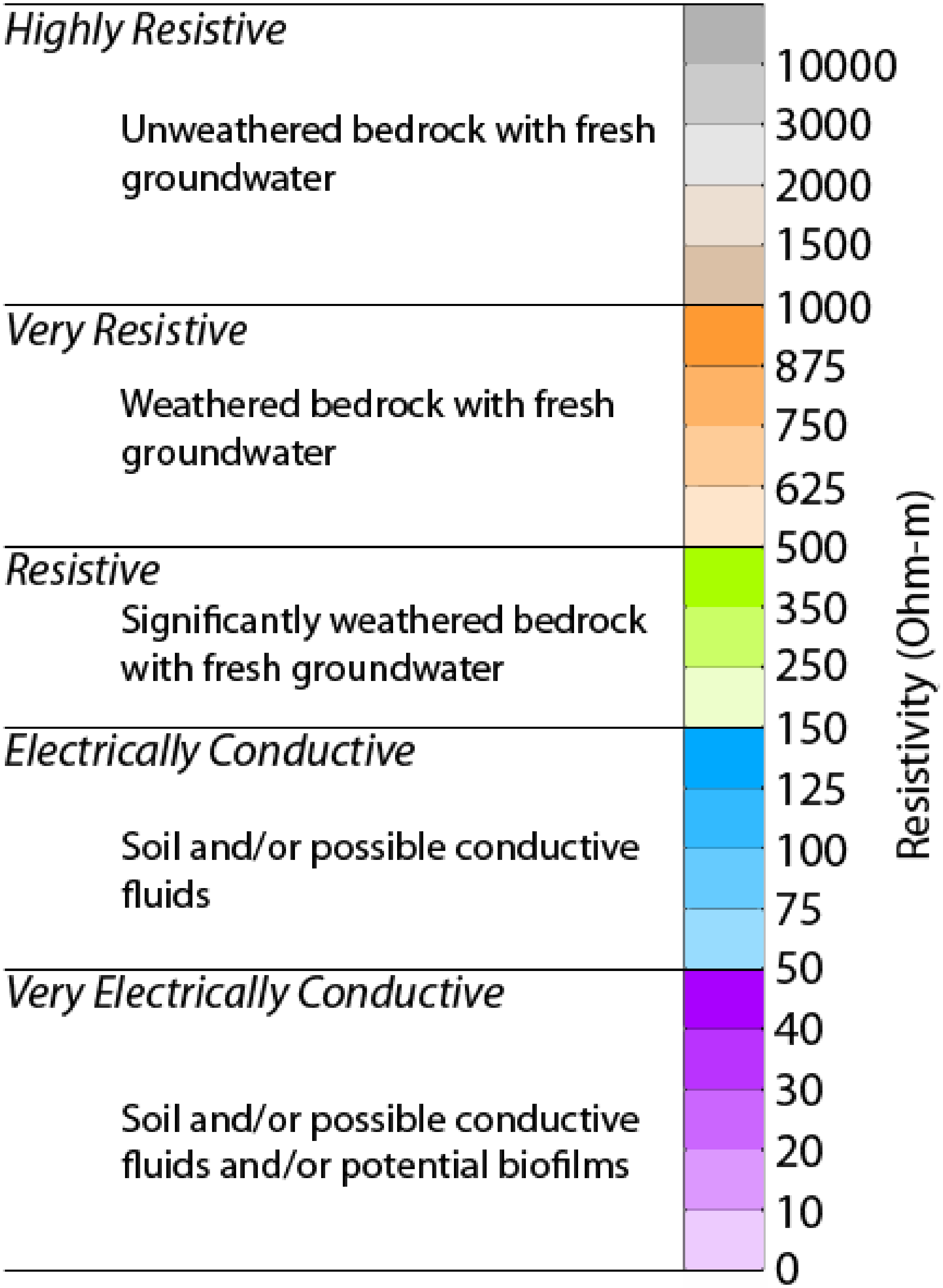

Figure 4 – Resistivity Key for Mount Judea ERI datasets. Cool colors are used to indicate more electrically conductive subsurface locations and warm colors are used to indicate more resistive locations.

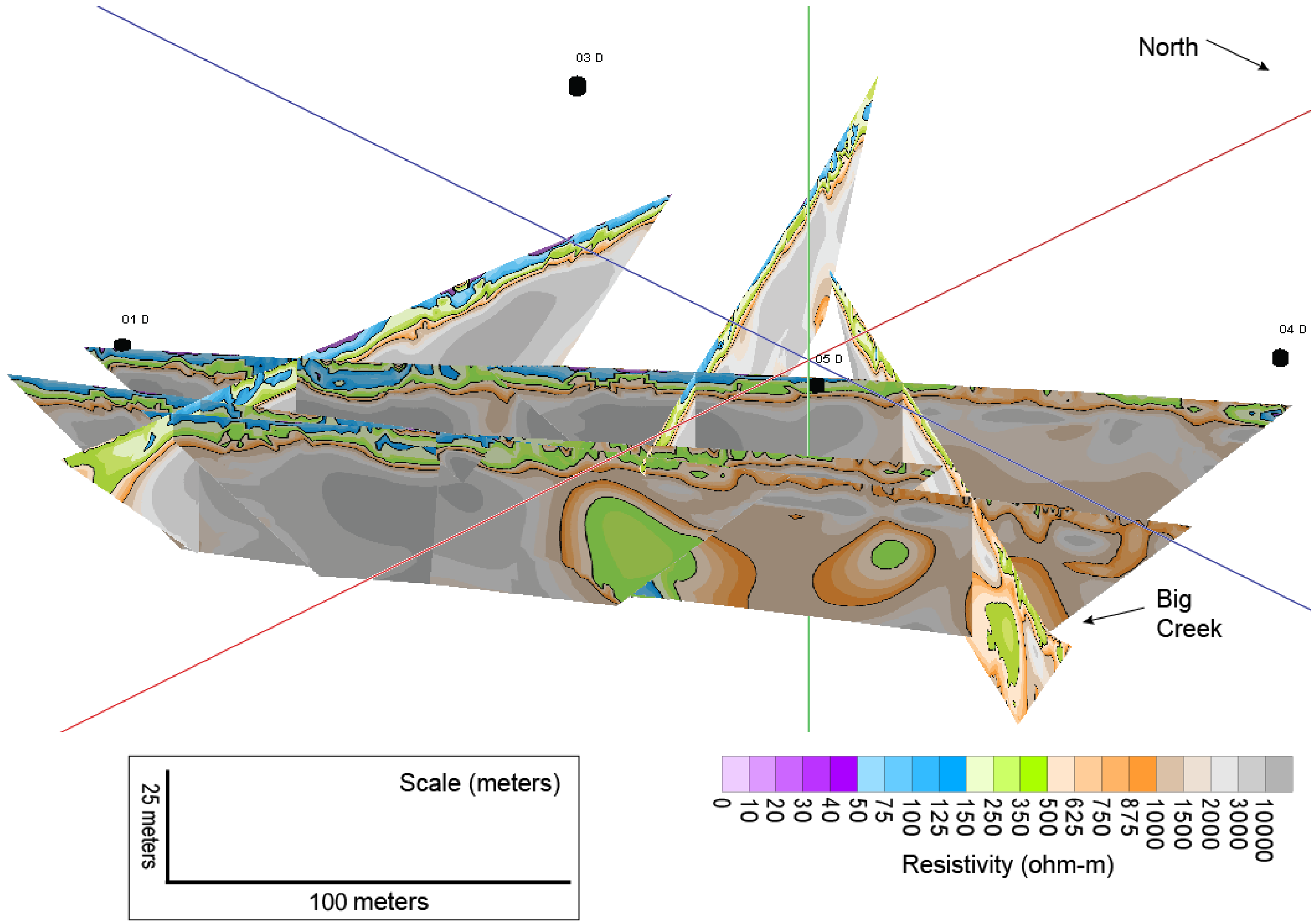

Figure 5 – Field 5a (Background site) view from Northeast corner of field (from Big Creek toward the field).

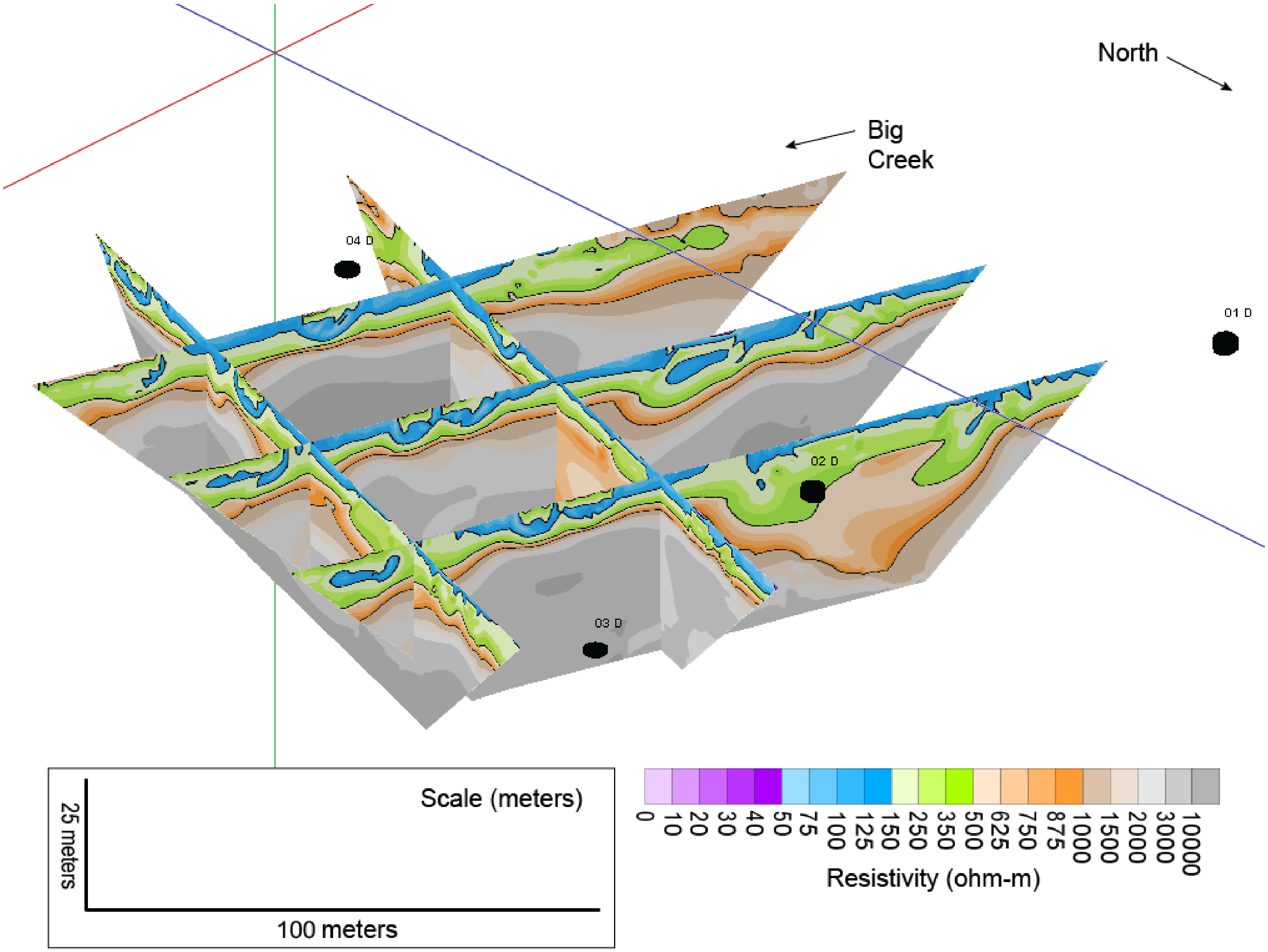

Figure 6 – Field 12 (Application site) view from Northeast corner of field (from Big Creek toward the field).

Soil Structure

Both Fields 5a and 12 are low-lying croplands with low relief and an uneven topsoil surface. The thickness of the soil varies throughout Field 5a, but a there is a significant resistivity difference between the *highly* to *very resistive* north and more *electrically conductive* southern portion (Figure 5). This is similar to Field 12, but the *very resistive* portion of the site in the shallow soil area is in the southwest portion of the investigation area (Figure 6).

Field 5a exhibits soil thicknesses of 0.7 to 3 meters (2.25 to 10 feet) that are confirmed through hand dug wells on site. Field 12 exhibits similar soil thickness at 0.7 to 2.5 meters (2.25 to 8 feet) also confirmed through hand dug wells on site. These wells were dug to refusal, or where the soil turns to significantly weathered bedrock. Although there is a broad mound northwest of the center of Field 5a, the soil thickness is thinner to the far north and far west of the field. Soils on transects MTJ06 and MTJ07 (Figure 7A) are those *electrically conductive* features, which thin to near zero toward the far north.

Field 12 is flatter and the soil thins to the west. MTJ12 (Figure 8) shows thinning where the *electrically conductive* features become thicker as the image gets closer to the stream. Areas where the soil profile is thinner on the images for both sites are consistent with the rocky soils which were encountered when electrodes were placed for data collection. On both Field 5a and 12, the depth of soil is less moving away from the stream and toward higher elevations, which is consistent with the direction to which the alluvium would be deposited near the stream.

The soil depth on Fields 5a and 12 averaged 8 to 10 feet near the stream and decreased to 2.25 feet on the side of the fields furthest from the stream (i.e., Big Creek).

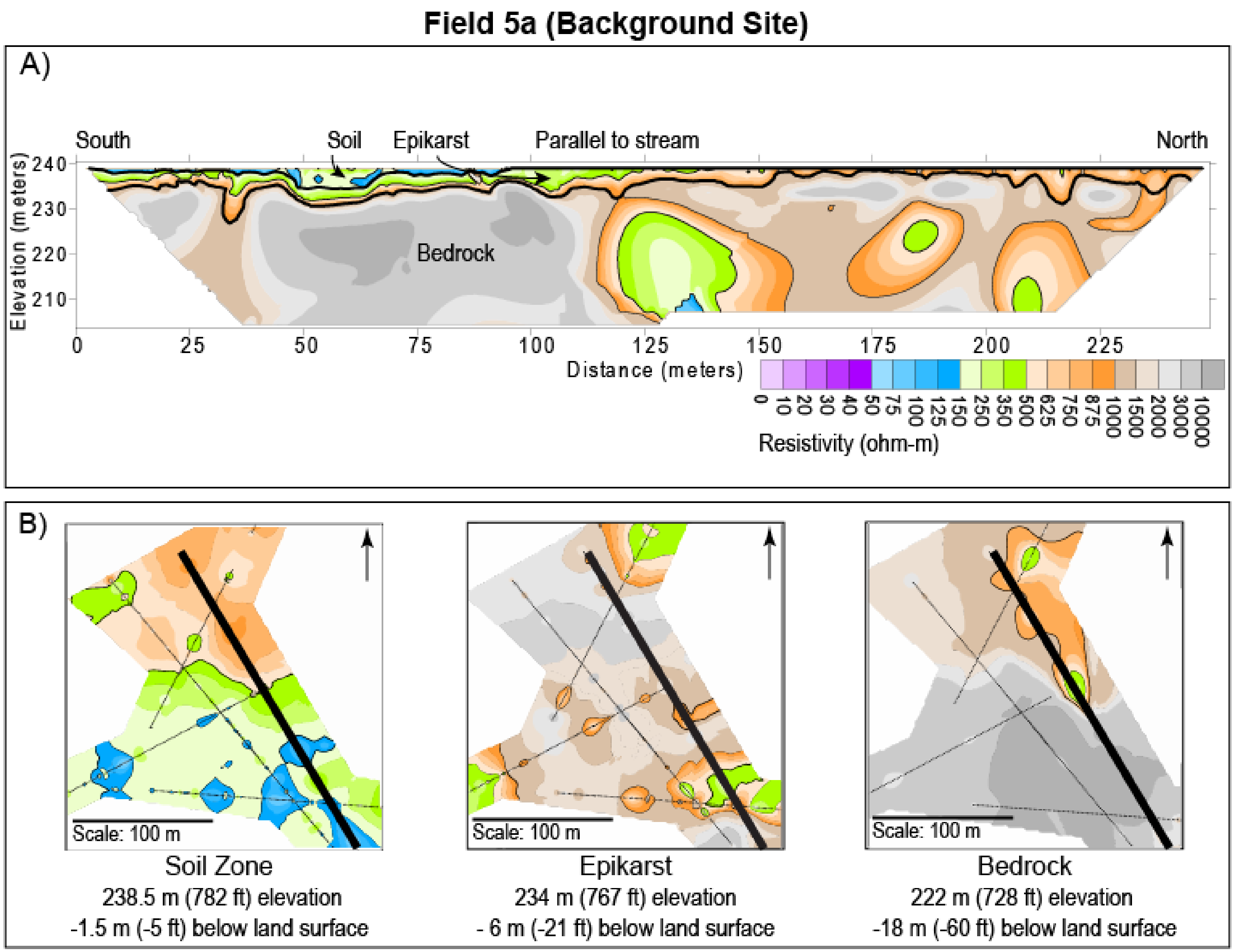

Figure 7 – A) Interpreted Soil-Epikarst boundary and Epikarst-Bedrock boundary for the Field 5a for combined ERI datasets MTJ06 and MTJ07 (Background site) cross sections. B) Interpolated 2D depth slices of resistivity at differing elevations illustrating a map view of the subsurface. Heavy black line indicates location of cross section in A).

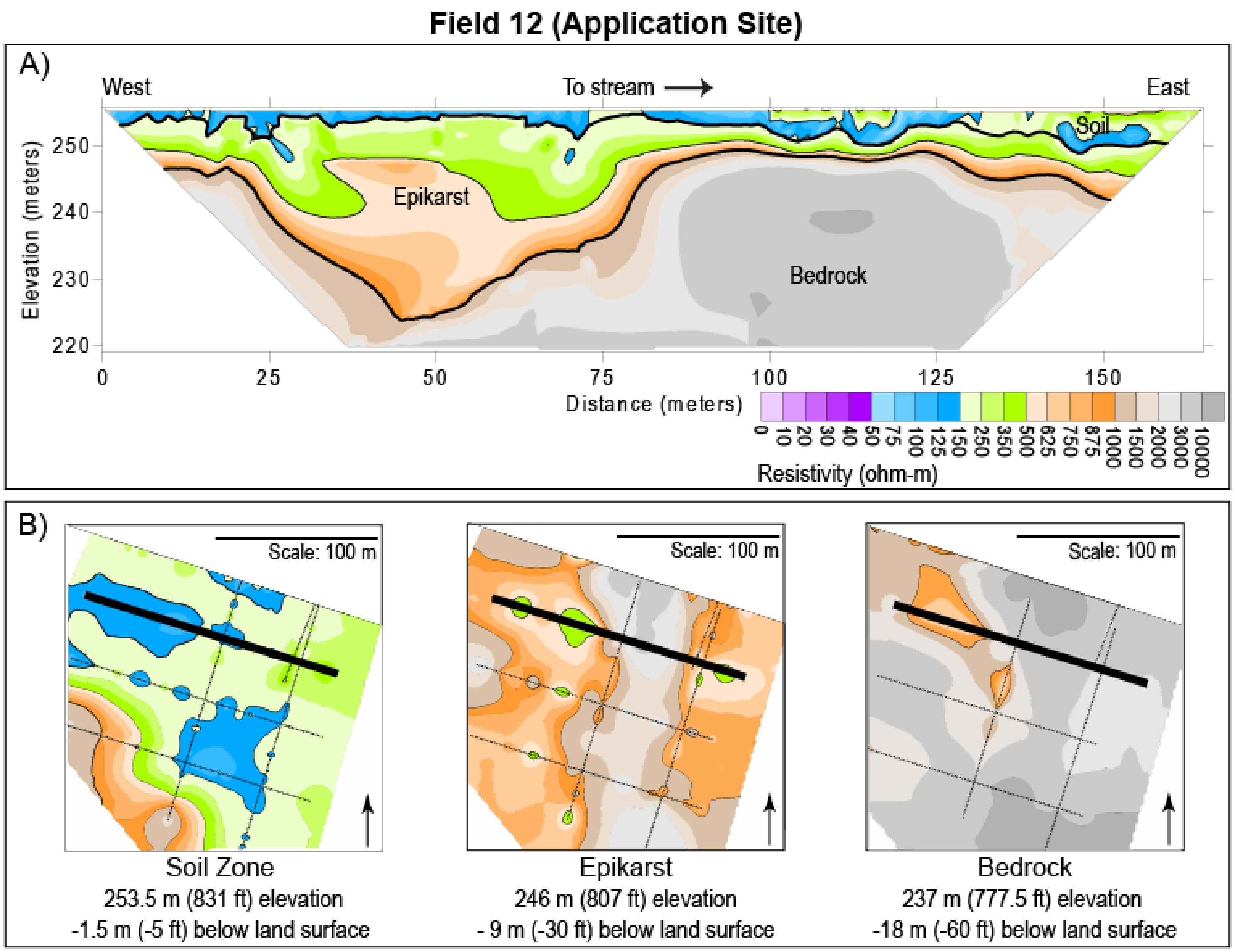

Figure 8 – A) Interpreted Soil-Epikarst boundary and Epikarst-Bedrock boundary for Field 12 for ERI dataset MTJ12 (Application site) cross sections. B) Interpolated 2D depth slices of resistivity at differing elevations illustrating a map view of the subsurface. Heavy black line indicates the location of the cross section from A)

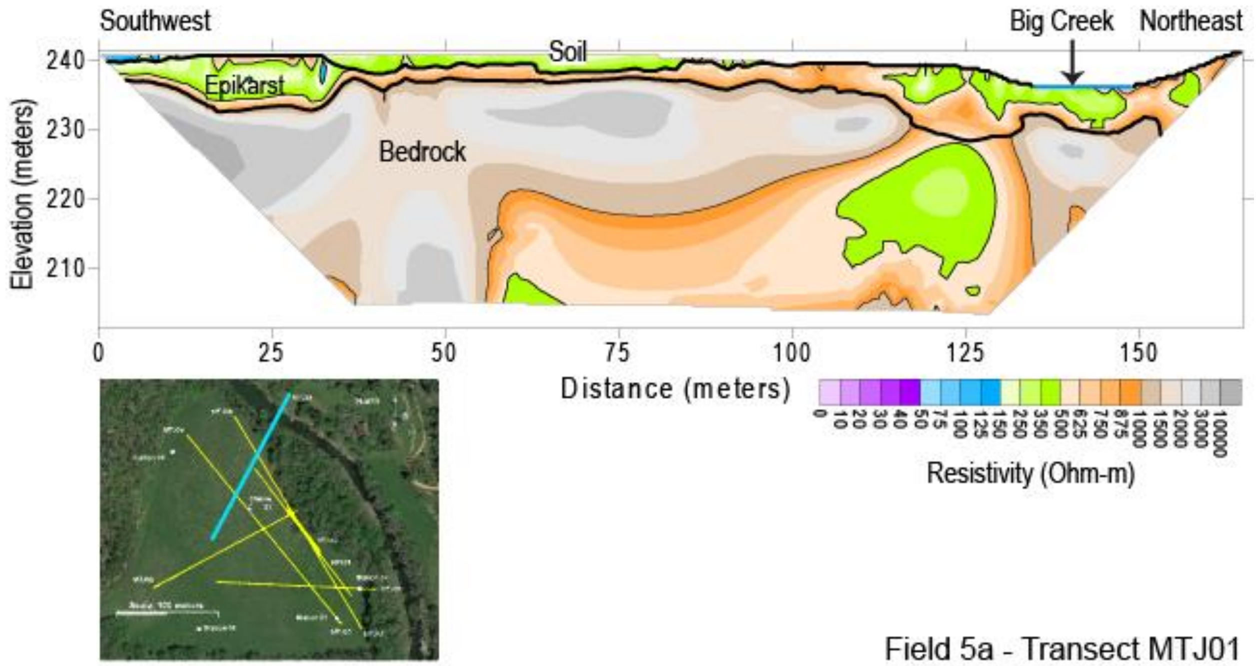

Figure 9 – Transect MTJ01 – This transect runs perpendicular to the stream and shows an average soil thickness of 1 meters (3 feet) and an average epikarst thickness of 5 meters (16.5 feet).

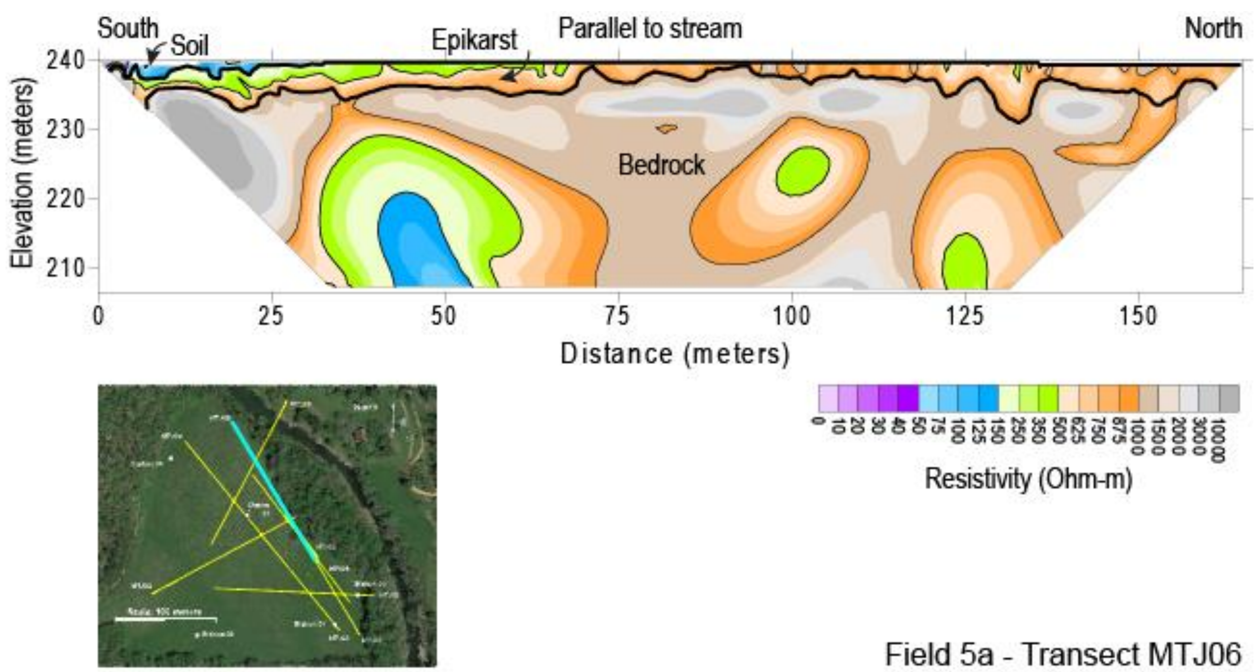

Figure 10 – Transect MTJ06 – This transect runs parallel to the stream and shows an average soil thickness of 0.5 meters (1.6 feet) and an average epikarst thickness of 3 meters (10 feet) with a large higher porosity zone at the bottom, left-hand corner of the image.

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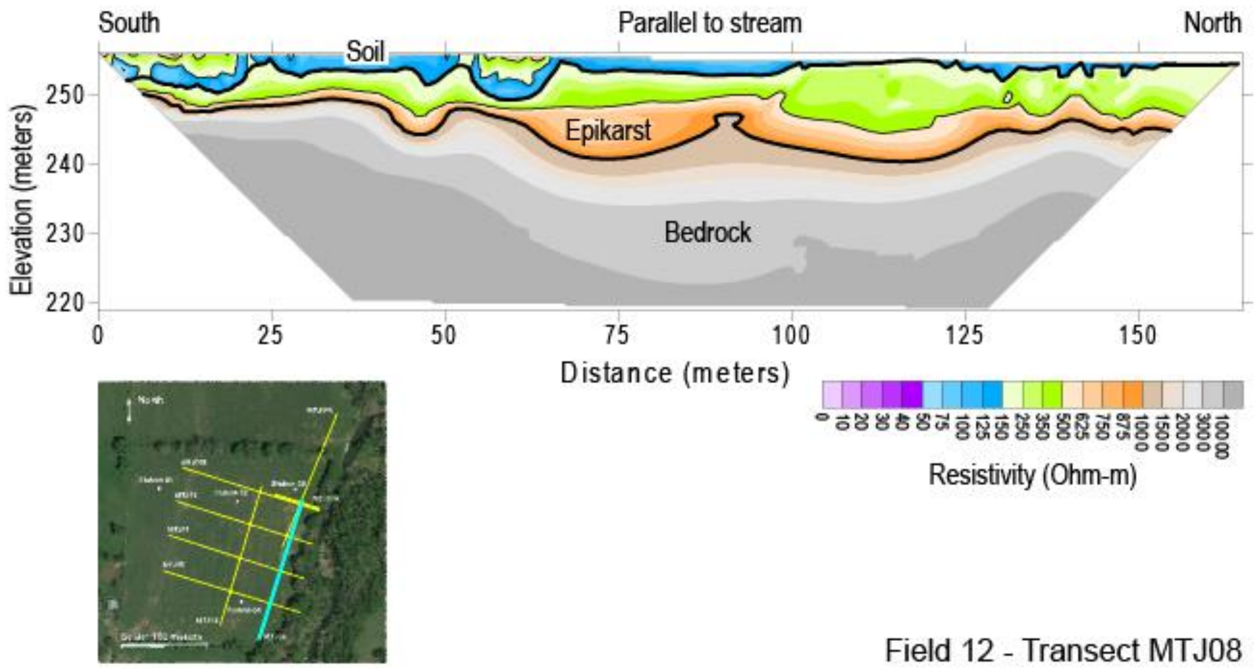

Figure 11 – Transect MTJ08 – This transect runs closest to the stream at this site and shows an average soil thickness of 6 meters (20 feet) and an average epikarst thickness of 10 meters (33 feet).

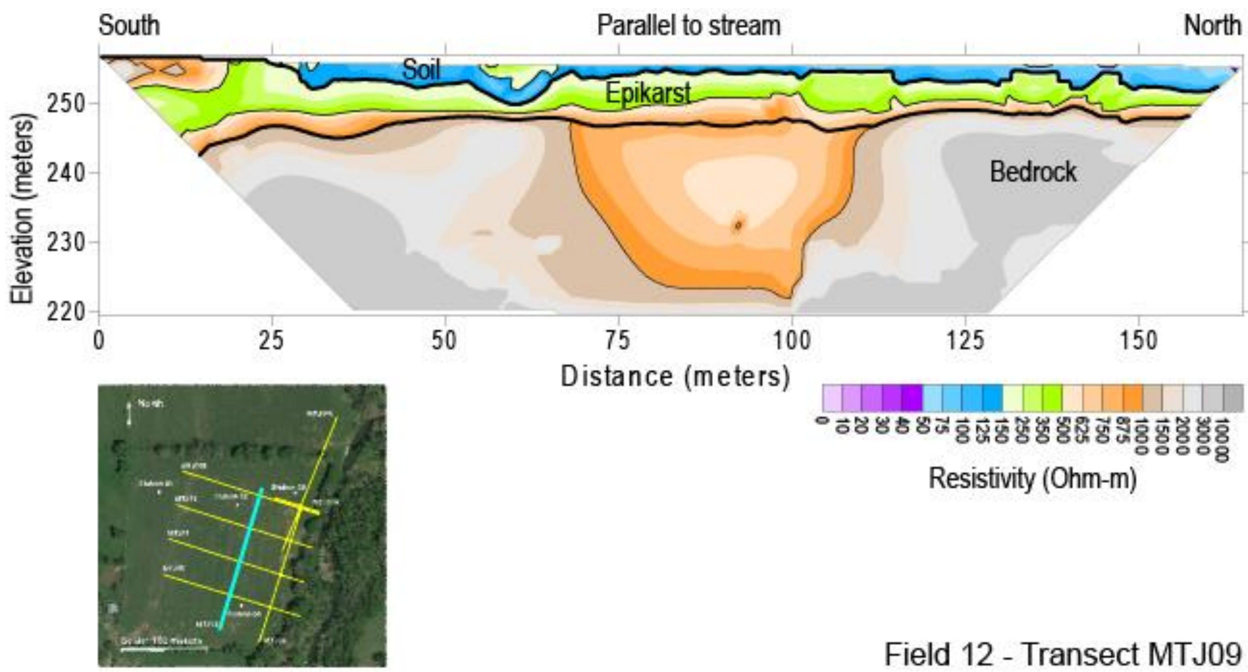

Figure 12 – Transect MTJ09 – This transect runs parallel to the stream and shows an average soil thickness of 3 meters (10 feet) and an average epikarst thickness of 8 meters (26 feet) with a 20 meter (65 feet) higher porosity zone (funnel shape) in the middle of the image.

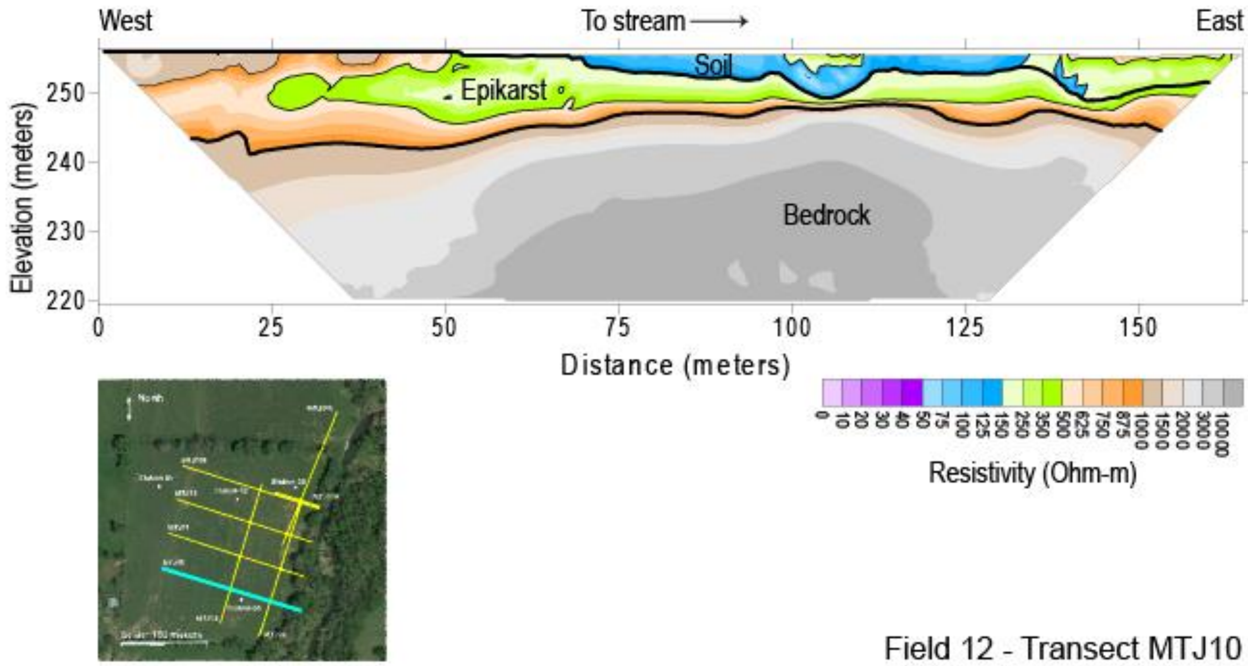

Figure 13 – Transect MTJ10 – This transect runs is the southern-most line running perpendicular to the stream and shows an average soil thickness of 3 meters (10 feet) and an average epikarst thickness of 10 meters (33 feet).

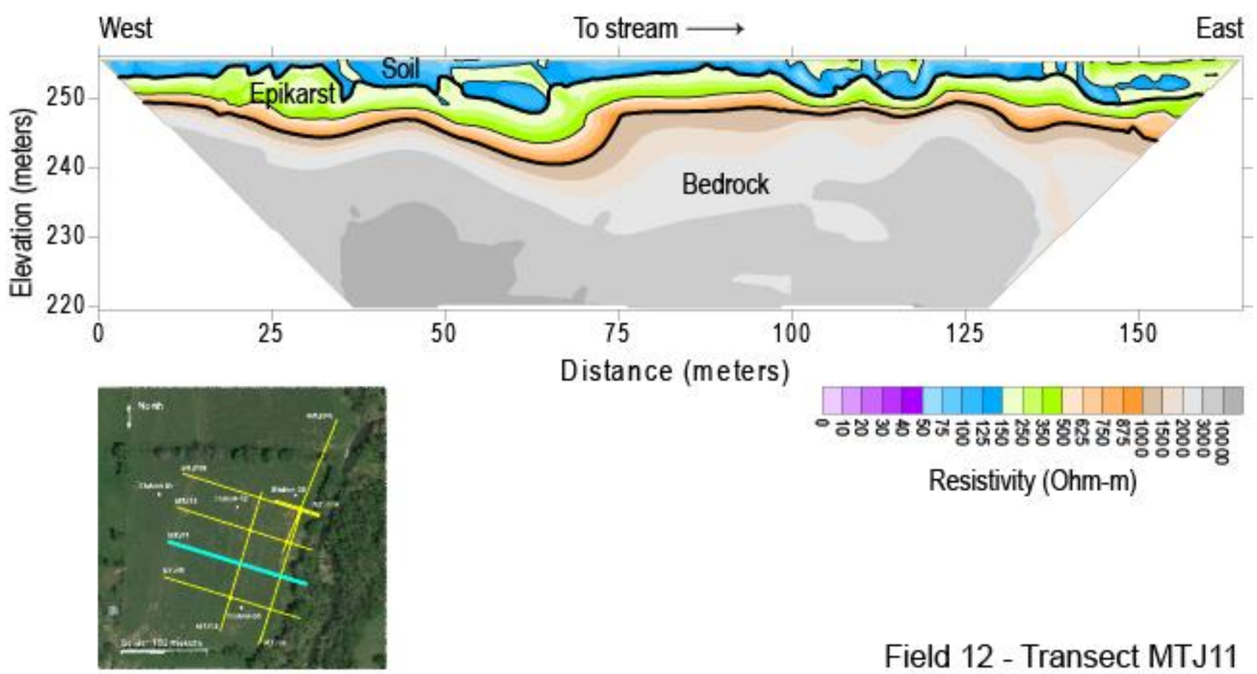

Figure 14 – Transect MTJ11 – This transect runs perpendicular to the stream and shows an average soil thickness of 5 meters (16.5 feet) and an average epikarst thickness of 7 meters (23 feet).

Epikarst Structure

The epikarst zone is visible on both Field 5a (Figure 7) and Field 12 (Figure 8) as a more *resistive* to *electrically conductive* region below the base of the soil and above the *highly resistive* competent bedrock zones. No confirmation borings are available to evaluate rock properties in these zones on either site. Because the base of the epikarst varies from site to site, the threshold for competent rock was quantified at values larger than 1000 Ohm-meters consistent with a strong horizontal resistivity gradient across the images (Figures 7 and 8). The average thickness of the epikarst zone is highly variable (from 2 to 23 meters or 6.5 to 75.0 feet) throughout each field. MTJ01 shows the most variation in epikarst thickness on Field 5a.

At Field 5a, the epikarst is relatively thin. At locations where electrically conductive features exist in the bedrock, the epikarst generally appears connected in space with these features (Figure 7).

The epikarst surface on Field 12 is very irregular in transects MTJ08 (Figure 11), MTJ11 (Figure 14), and MTJ12 (Figure 8A), while on transects MTJ09 and MTJ10 (Figures 12 and 13) it is more uniform depth across each image. MTJ12 has the most variable epikarst surface across Field 12, as there is a deep and broad weathering feature present alongside a shallow and flat weathering surface in the cross-section (Figure 8A). There appears to be a large doline feature, a closed topographic depression caused by dissolution or collapse of underlying rock or soil, within the weathered bedrock on transect MTJ12 that stretches nearly 61 meters (200 feet) at the top of the feature and starts 8 meters (26 feet) below the land surface and delves 23 meters (75 feet) downward (Figure 8A).

Bedrock

The Boone Formation is the underlying rock unit across these fields. In many of these cross-sections, the limestone is interpreted as very large, *highly resistive* blocks. The values for the more competent limestone are interpreted as those greater than 1000 Ohm-meters. It is evident on both the background and Field 12, that a *highly resistive* bedrock is located at depth (Figure 8). This bedrock is located at similar depths at each field underlying an epikarst zone and a layer of alluvium. No confirmation borings are available in the bedrock zones to confirm rock properties.

Field 5a is very resistive and is located on top of a thin layer of alluvium at the foot of a steep hill to the west of the field (Figure 7). The majority of the surveys taken in this field display a very large and blocky *highly resistive* limestone. Lines MTJ01 and MTJ06 (Figures 9 and 10) both show that the northern corner of the field is electrically different bedrock than the southern portion of the field (Figure 7B). This zone also has a number of *electrically conductive* features that could be interpreted as weathered karstic zones. The largest of these zones is at 120 meters along ERI line MTJ06/07 (Figure 7A).

Background site vs Application site

Both sites share many electrical and soil-depth characteristics, which allow geologic comparison between the sites. The soil presents an electrical signature that would support additional investigation utilizing ERI technology. Field 12 appears to have somewhat more electrically conductive soil over a broader area than Field 5a. This electrically conductive area is not located near the stream, where application of manure would not occur under the recommended protocols of the comprehensive nutrient management plan.

5. Conclusions

The data collected in Mount Judea, Arkansas, in December 2014 characterizes the subsurface of Fields 5a and 12 with 1.5 meter resolution on scales of 165 meters laterally and 33 meters vertically. These initial results were useful in defining the characteristics of the soil zone, epikarst zone, and the bedrock. Future work with additional transects would better define site features.

Soil

This series of ERI surveys contributed to understanding the structure and distribution of material underlying Fields 5a and 12. The surveys confirmed the soil thickness, presence, extent, and depth of epikarst features and bedrock material.

Epikarst

The 33 meter (108 feet) depth of investigation for this experiment was accurate in finding the vertical electrical changes to high resistivity that are interpreted as the bottom of the epikarst zone. There is not confirmation drilling at the sites to evaluate the rock properties of the epikarst zone, but the results are consistent with other investigations of epikarst zones (Williams, 2008). The surveys were consistent among orthogonal lines across the sites in depicting the extent of the weathering of the bedrock and the amount of weathering at each site.

Bedrock

The ERI surveys show the bedrock as consistent, *highly resistive* features. Lateral variations in resistivity values of the bedrock potentially indicate depositional setting of beds or channels and deformation such as faulting. The ERI surveys determined depth to bedrock and highlights possible dissolution features and deep fracturing typical of this geologic formation.

Background site vs Application site

The two sites are very similar with a few exceptions. The soil thickness across the sites is very similar (2.5 to 3 meters or 8 to 10 feet) except for the area in which Field 5a exhibits thinning of the soil (to 0.7 meters or 2.25 feet). The average epikarst thickness is similar on both fields at about 2 to 23 meters (50 to 75 feet), 7 meters (23 feet) below surface, but the distribution of possible fracturing in bedrock or karst features was variable as expected. The bedrock at each site contained potential pathways for groundwater flow. One difference between the sites that may be useful for application evaluation is the possibility of hog manure electrical signatures present on Field 12.

Future Work

Future work on these fields could enhance the delineation of possible karst features at depth along the MTJ06 and MTJ07 transects. A shorter, higher resolution image (1 meter spacing, 0.5 meter resolution) would provide a more accurate picture of soil thickness and structure. Additional ERI surveys for Field 12 would be needed to obtain a more complete view of the site to understand connections between surface water and groundwater.

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