Geophysical Investigations for the Sonoma Valley, Petaluma Valley, and Santa Rosa Plain Groundwater Sustainability Agencies



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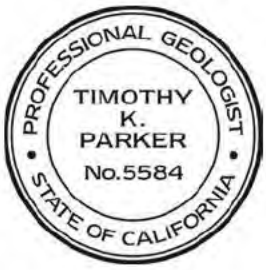
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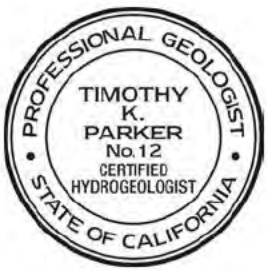
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STATEMENT OF LIMITATIONS

The information presented herein is intended for the use of the Sonoma Valley Groundwater Sustainability Agency (GSA), Petaluma Valley GSA, and Santa Rosa Plain GSA and is a record of the work performed, and findings associated with the completion of multi-method geophysical investigations. The project was performed in accordance with recognized geoscientific industry methods and standards. The information and interpretations that are presented were developed based on inferences from geophysical measurements. Collier Geophysics, LLC and Ramboll cannot guarantee the accuracy of any interpretations of geophysical data and shall not be liable or responsible for any loss, costs, damages, or expenses incurred or sustained by anyone resulting from the reliance upon any of the interpretations or recommendations made by any of our officers, agents, or employees.

1.0 INTRODUCTION

The team of Collier Geophysics, LLC and Ramboll (Collier/Ramboll) is pleased to provide this technical report on the geophysical investigations conducted for Sonoma County Water Agency (Sonoma Water) to support three Groundwater Sustainability Agencies (GSAs) in Sonoma County (the Santa Rosa Plain, Sonoma Valley, and Petaluma Valley GSAs) in July and August of 2025. **Figure 1** shows the three groundwater subbasins/basin. The goal of the investigations is to fill data gaps identified in the Groundwater Sustainability Plans (GSPs) related to the understanding of the aquifer systems hydrogeologic framework, the distribution and potential effects of faults on groundwater flow, and basin boundary characteristics through analysis of existing and new geophysical data. Primary objectives for the investigations in each of the basins are summarized below:

- In Sonoma Valley, the primary objectives were to better understand the role faults and aquifer and aquitard distribution and continuity play in the movement, distribution, recharge and availability of groundwater within and near the El Verano and Eastside Priority Areas where undesirable results related to chronic lowering of groundwater levels have occurred.

- In Petaluma Valley, the primary objectives were to provide insights on the distribution and flow paths of higher salinity brackish groundwater between the tidal marshlands and inland portions of the basin and identify any geologic structural controls on groundwater fluxes across the northern basin boundary shared with the Santa Rosa Plain.

- In the Santa Rosa Plain, the primary objectives were to improve mapping of the Sebastopol fault and hydrogeologic changes across the fault, map aquifer and aquitard characteristics and recharge potential along Copeland Creek in the southeastern portions of the basin and identify geologic structural controls on groundwater fluxes across the southern basin boundary shared with Petaluma Valley.

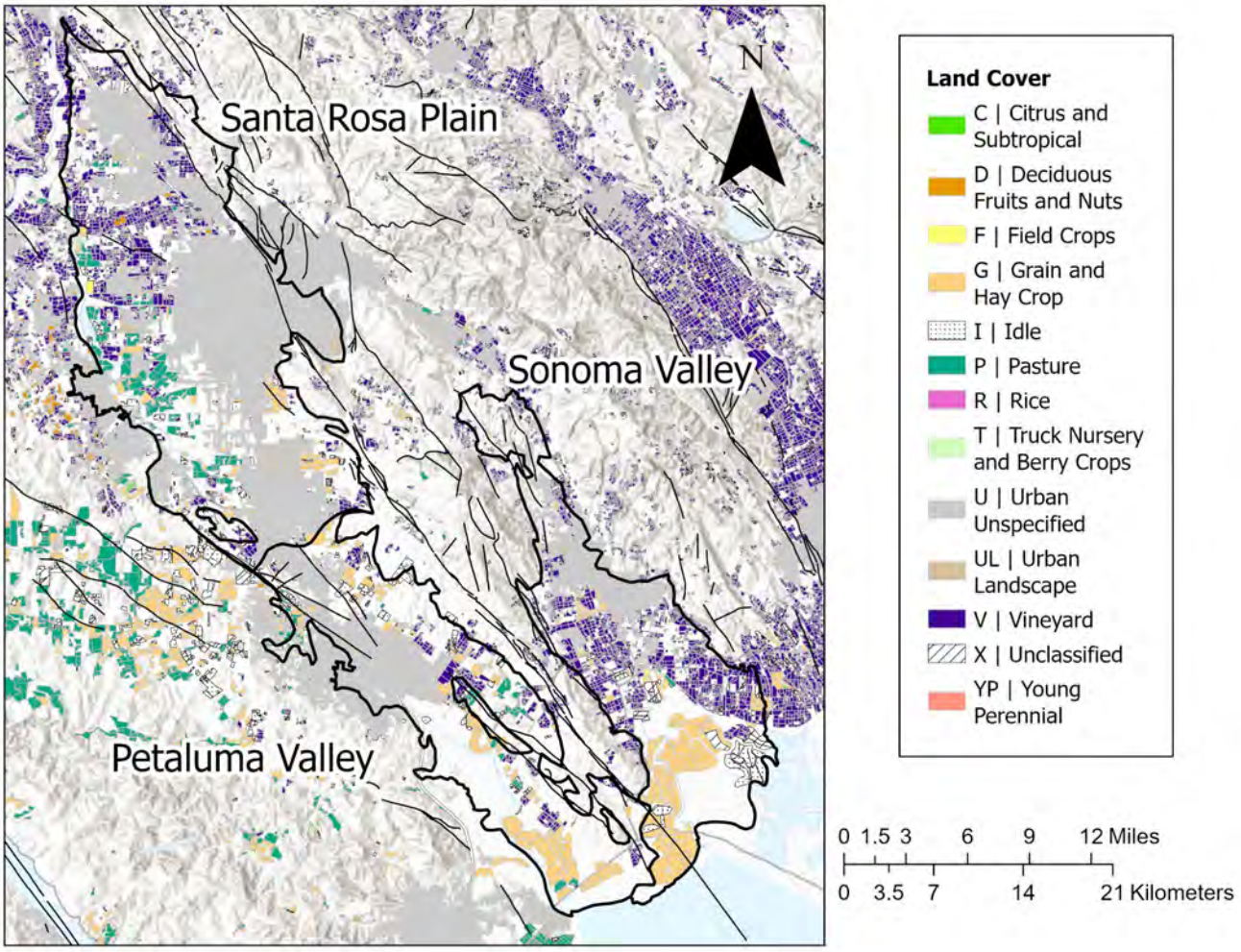


Figure 1: Map of the study area showing the three groundwater subbasins (Petaluma Valley, Sonoma Valley, and Santa Rosa Plain Groundwater Subbasins), land cover, and quaternary faults in black. Note that most land is classified as vineyard or urban.

2.0 REGIONAL HYDROGEOLOGIC SETTING

The information in this section is a summary based on information reported in the three GSPs (Sonoma Water, 2021a, b, c), except as noted below.

General Geological Setting

Sonoma County is located within a region of geologic complexity, a result of long periods of active tectonic deformation, volcanic activity, and sea level changes, altered by anthropogenic modification to the geomorphology and hydrology. The northern Coast Ranges geologic structure is dominated by the northwest trending San Andreas Fault zone to the west, the active Rodgers Creek, Mayacamas Fault and lesser known, smaller Bennet Valley fault zones, and other basin specific faults. The faults are important hydrogeologically as they may form barriers or conduits to groundwater flow and that characteristic may vary along each individual fault zone.

The regional tectonic faulting has helped shape the three basins subject to the report, the surrounding similarly trending valleys and ridges, and underlying geology. The faulting and associated folding has compartmentalized the geology of the basins into partially separated units and in cases, structural troughs, further complicating the ability to map continuous groundwater flow paths.

The regional geology of the three basins that are the focus of geophysical surveys for this report, has similarities and differences, a result primarily of basin location relative to depositional environment. The basement of the basins, which has limited groundwater production, consists of Mesozoic Franciscan Complex dominated by metamorphosed greywacke sandstones, shales and conglomerates that include chert, basalt and pillow basalt, limestone, serpentinite, blueschists and eclogites overlain or faulted against Great Valley sequence of marine sandstones and shales (Graymer, et al., 2007). The marine deposited Wilson Grove formation and transitional shallow marine and continental deposited Petaluma formation are found in the Santa Rosa Plain and Petaluma Valleys and absent or only minimal presence in the Sonoma Valley. The local centers of volcanic activity depositing the Sonoma Volcanics dominate in Sonoma Valley and the surrounding mountains and interfinger with contemporaneous deposition in the Petaluma Valley and Santa Rosa Plain. Key groundwater-bearing formations and the geophysical properties relevant to survey planning are discussed below, focusing on the goal of addressing data gaps.

Geophysical surveys measure the physical properties of rocks and minerals and detect the measurable physical contrast between different rock/lithology types, so it is useful to catalogue the different rock types and formations as part of the geophysical survey planning process. Electrical geophysical investigations include electrical resistivity and electromagnetic induction methods and are useful tools for identifying water bearing aquifers versus clay rich aquitards. The formation descriptions presented below provide the general geo-electrical response of the units as an indicator of how the units may respond to an electrical survey. Principal groundwater production formations (aquifer system) in at least one of the three basins, with geologic descriptions largely referenced from the three basin GSPs, include:

- Mesozoic Era Basement Rocks (part of ub and KJf in Figure 2) - characterized by a variety of consolidated and deformed rock types and thinly interbedded shale and sandstone; likely high resistivity.

- Tolay Volcanics (part of Pvb in Figure 2) – predominantly mafic composition, with lava flows, breccias, tuffs, and agglomerates with interbedded stream channel deposits, overlain by both the Petaluma and Wilson Grove Formation; likely high resistivity.

- Sonoma Volcanics (part of Pv and Pvb in Figure 2) - thick and highly variable sequence of volcanic rocks interbedded with volcanoclastic sedimentary deposits, with lava flows and some interbedded ash flows, mud flows, tuffs, and volcanoclastic sedimentary deposits of tuffaceous sands and volcanic gravels; high resistivity on electrical geophysical surveys.

- Wilson Grove Formation (part of Qal and Pu in Figure 2) - fine- to medium-grained, thick bedded to massively-bedded, moderate- to well-sorted, uncemented to weakly cemented fossiliferous marine sandstone; high resistivity on electrical geophysical surveys.

- Petaluma Formation (part of Qc, Pmlc and Pu in Figure 2) – largely fills basin, mostly moderately to weakly consolidated, silty to clayey mudstone with local beds and lenses of

poorly sorted sandstone and minor beds of nodular limestone and conglomerate; generally low to low-moderate resistivity on electrical geophysical surveys.

- Huichica Formation (part of Qc in Figure 2) – fluvially deposited, massive yellow silt and yellow and blue clay with interbedded lenses of sands, gravels, and tuff beds; from low to high resistivity on electrical geophysical surveys.

- Glen Ellen Formation (part of QP in **Figure 2**) – heterogeneous, fluvially deposited clay-rich stratified stream deposits of poorly sorted sand, silt, and gravel; low to low moderate resistivity on electrical geophysical surveys.

- Quaternary Mixed Unit (part of Qal in Figure 2) – heterogeneous, alternating thin beds of conglomerate, sand, and mudstone; variably low to moderate resistivity on electrical geophysical surveys.

- Quaternary Alluvium (part of Qal in Figure 2) - Holocene to recent stream channel and stream terrace deposits including loose alluvial sand, gravel, and silt, and surrounding late Pleistocene to Holocene undissected stream terrace deposits, older alluvium, and alluvial fan deposits; low-moderate to high resistivity on electrical geophysical surveys.

An additional important formation, owing to its potential to transport brackish groundwater into the basins, is the very conductive (low resistivity) Bay Muds that occur at the south end of the Petaluma and Sonoma Valleys, which consist primarily of organic rich muds and silts with small amounts of sand and containing brackish water.

Figure 2 shows a generalized geological map of the Sonoma County area.

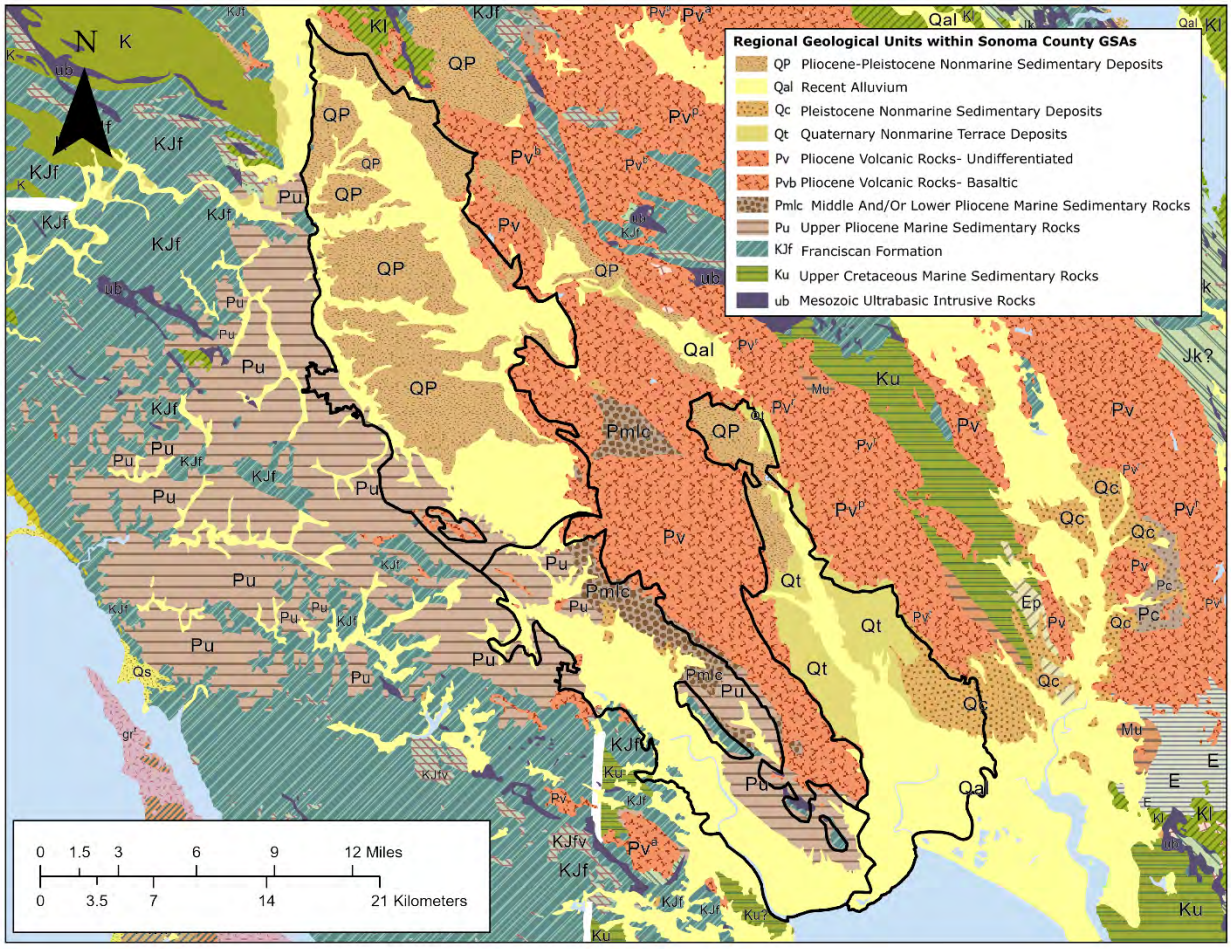


Figure 2: Generalized geological map of Sonoma County GSAs. Basin boundaries are colored black. Geological mapping from Koenig (1963)

The following provides a concise summary of key aquifer systems and factors affecting regional groundwater movement within each basin, as well as an outline of conceptual geophysical survey approaches and locations selected to address data gaps associated with the respective basins.

Sonoma Valley

Principal groundwater producing formations (aquifer system) in the Sonoma Valley include: Sonoma Volcanics, Petaluma, Glen Ellen and Huichica Formations, and Quaternary alluvial deposits.

- The Eastside fault that occurs along the east side of the southern portion of Sonoma Valley has been mapped on the basis of geophysical studies and on the down dropping of geologic formations (Glen Ellen, Huichica, Sonoma Volcanics) on the west. This fault may act as a horizontal barrier to flow, and through uplift of the Sonoma Volcanics roughly coincides with the eastern boundary of the subbasin along the prevalent geothermal zone shown on **Figures 3 and 4**. Based on the presence of elevated total dissolved solids (TDS) and other parameters within the prevalent geothermal zone, this fault may also act as a conduit for the upward circulation of deeper geothermal waters in the valley.

- The Bennett Valley fault zone parallels the west side of the southern portion subbasin, east of the Rodgers Creek fault zone, and then continues northwest into the contributing watershed. The fault intersects quaternary alluvium, Glen Ellen and Huichica formations and Sonoma Volcanics, and may form a barrier to flow on the basin west side.

- The eastern boundary with Napa-Sonoma Lowlands intersects the Huichica, Quaternary alluvium and Bay Muds.

- The shallow aquifer is considered to occur between depths of approximately 100 to 200 feet below land surface, and the deep aquifer is generally separated from the shallow aquifer by an aquitard consisting of thick sequences of clay down to about 400 feet below land surface. The deep aquifer generally occurs under confined conditions within sedimentary deposits of the Glen Ellen and Huichica formation and, to a lesser degree, Petaluma formation and Sonoma Volcanics.

- Bay Muds, currently understood to be a primary source of brackish water from the south and limited well water quality sampling has indicated relatively low (<1,000 milligrams per liter) TDS in general. Tidally influenced surface water along the Sonoma Creek is also considered a potential source of brackish water in the southernmost basin.

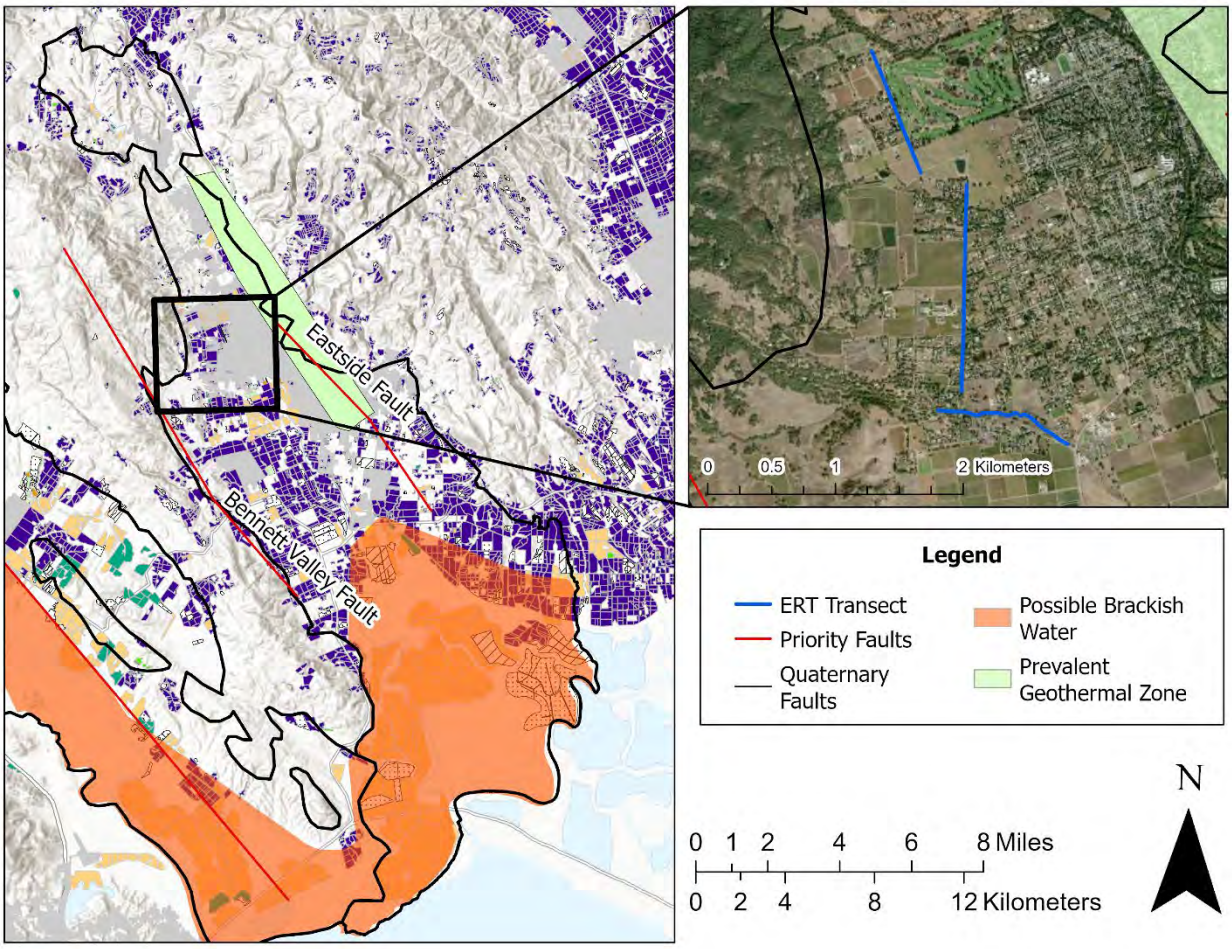


Figure 3: Map of the Sonoma Valley Groundwater Basin with identified priority faults, area of possible brackish water, and the zone of prevalent shallow geothermal resources. Several ERT profiles collected to characterize aquifer structure in both the shallow and deeper aquifers are shown in the inset map.

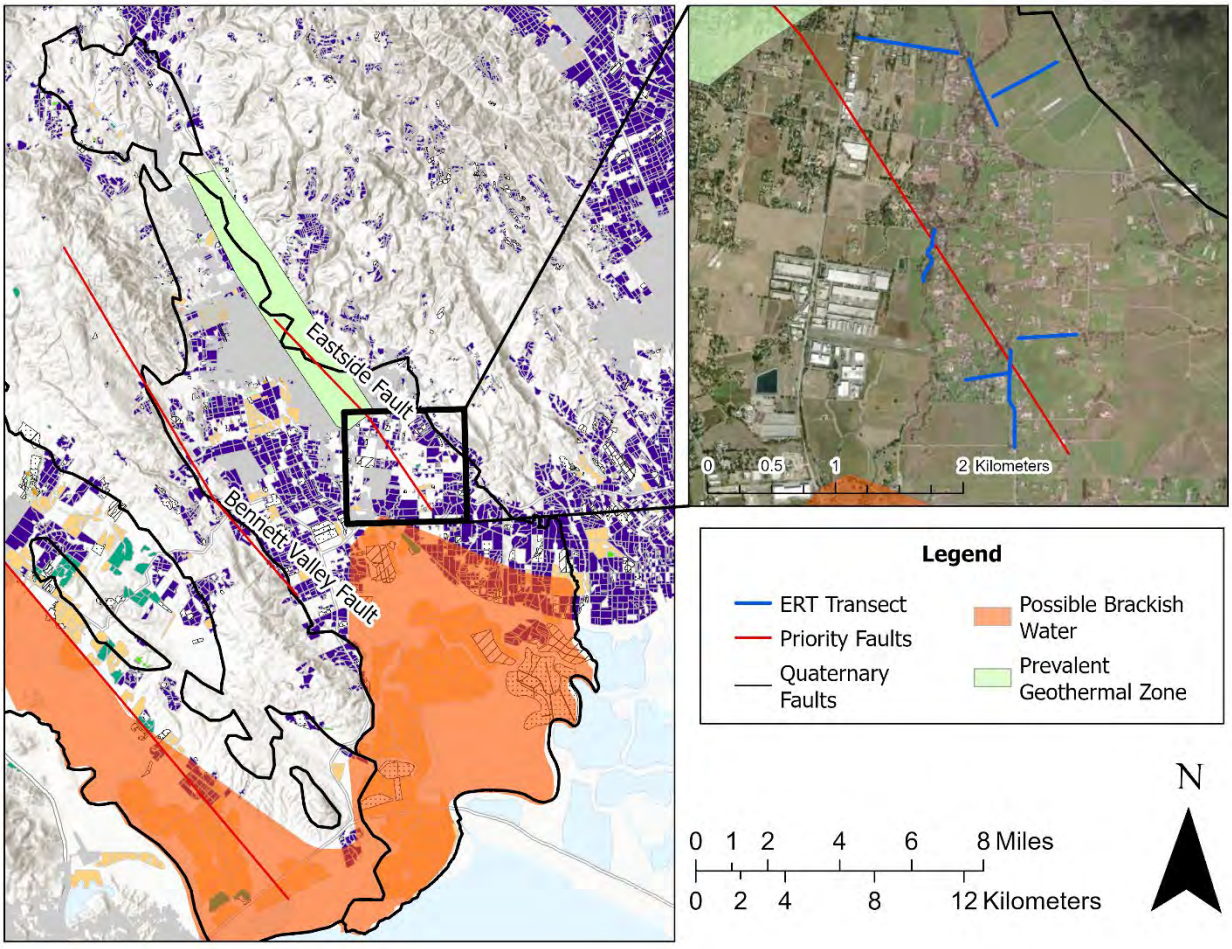


Figure 4: Map of the Sonoma Valley Groundwater Basin with identified priority faults, area of possible brackish water, and the zone of prevalent shallow geothermal resources. Several ERT profiles collected to characterize the fault zone and geothermal resources are shown in the inset map.

Petaluma Valley

Principal groundwater producing formations (aquifer system) in the Petaluma Valley include: Tolay Volcanics (west of Petaluma), Sonoma Volcanics (southeastern portion of the basin), Wilson Grove and Petaluma Formations, Quaternary mixed unit and alluvial deposits.

- The Meacham Hill and Cinnabar School faults are mapped, respectively, as occurring within the Wilson Grove formation or within or abutting the Quaternary mixed unit against the Wilson Grove formation.
- The Petaluma Valley fault is mapped as abutting the Petaluma Formation against the Quaternary mixed unit and the Bay Muds as shown in **Figure 5** and **Figure 6**.
- The northern basin boundary with the Santa Rosa Plain is underlain by Quaternary Alluvium and the Petaluma Formation as shown in **Figure 7**.

- The short basin boundary between the Petaluma and Sonoma Valleys is underlain by Bay Muds and possibly underlain by Sonoma Volcanics.
- Improving the understanding between the contributing watershed and the underlying basin would largely involve the interface of the Sonoma Volcanics to Petaluma Formation on the east and the low to moderate resistivity Franciscan Complex to Wilson Grove on the west.
- Bay Muds are currently understood to be a primary source of brackish water from the south and limited well water quality sampling has indicated relatively low (<1,000 milligrams per liter) TDS. Tidally influenced surface water along the Petaluma River is also considered a potential source of brackish water in the southernmost basin.

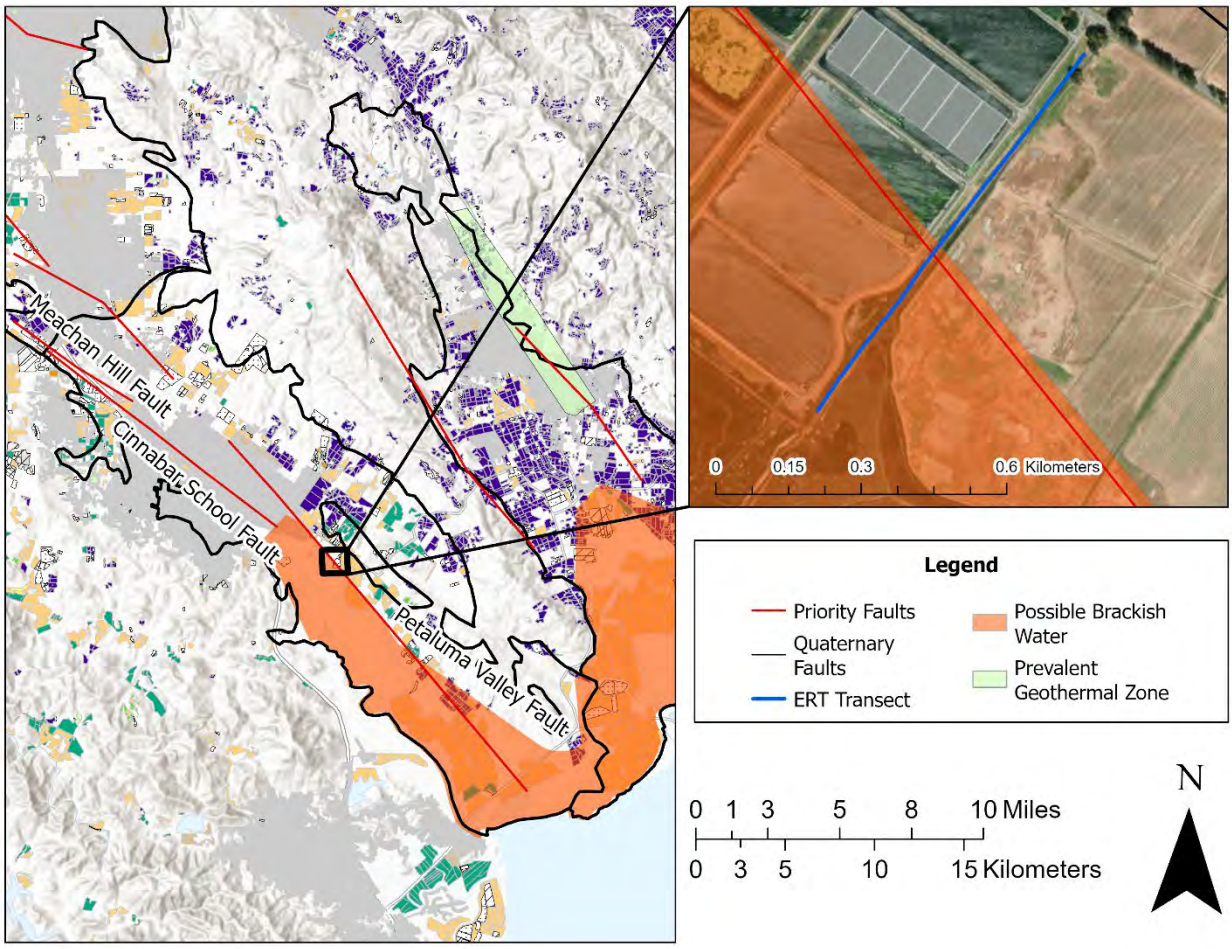


Figure 5: Map of the Petaluma Valley Groundwater Basin with identified priority faults, and area of possible brackish water. An ERT profile collected to characterize the fault zone and potential brackish water interface is shown in the inset map.

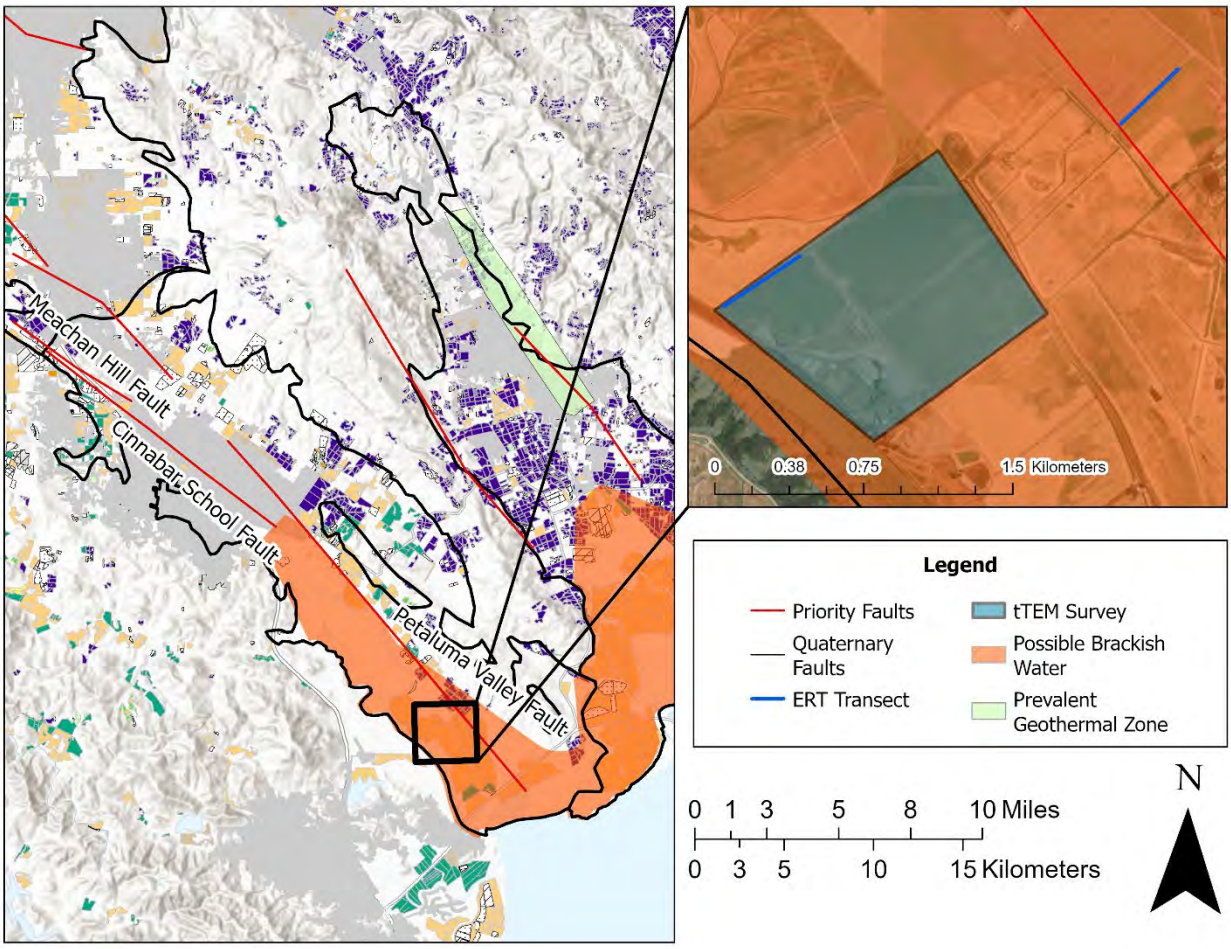


Figure 6: Map of the Petaluma Valley Groundwater Basin with identified priority faults, and area of possible brackish water. A tTEM survey area and ERT profiles collected to characterize the fault zone and potential brackish water interface are shown in the inset map.

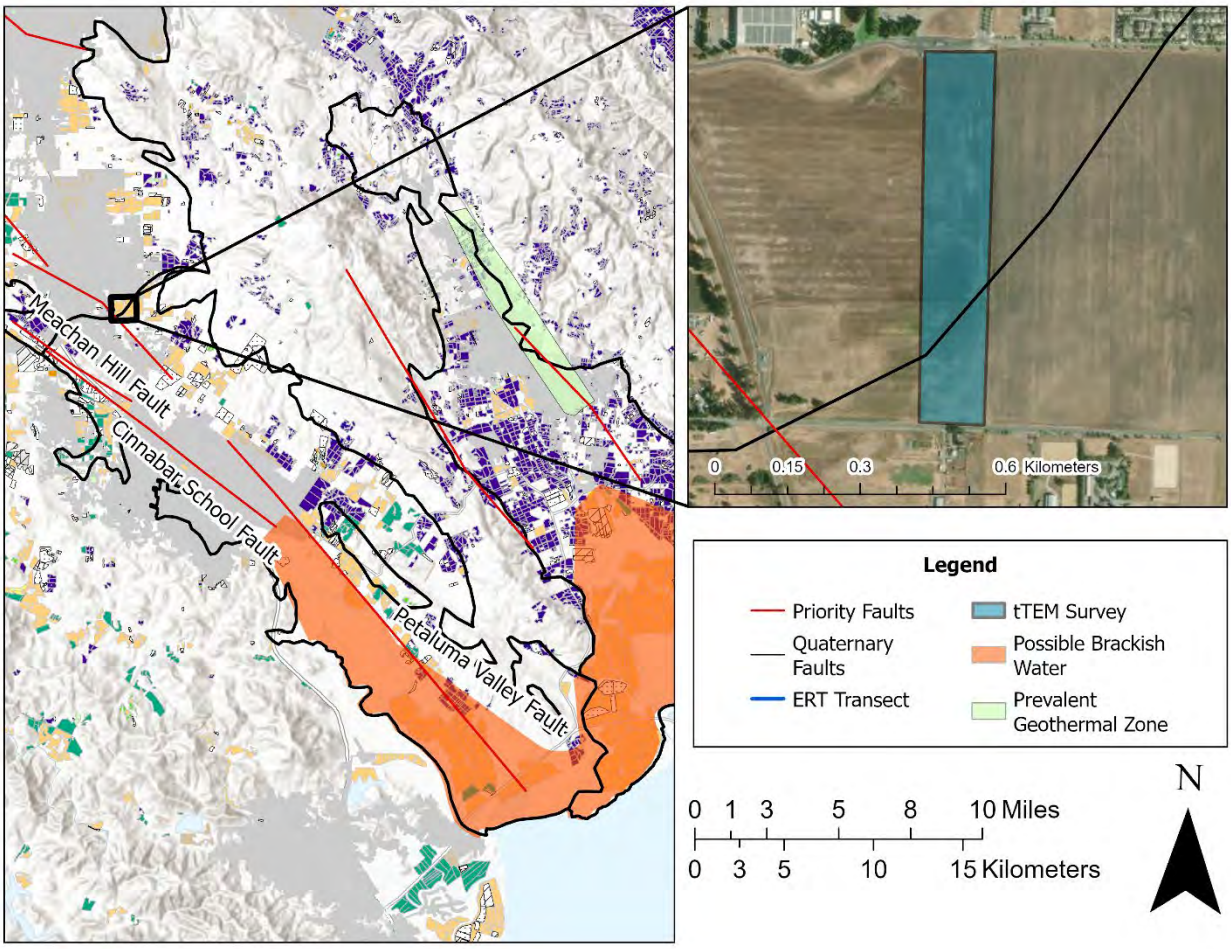


Figure 7: Map of the Petaluma Valley Groundwater Basin with identified priority faults, the area of possible brackish water. A tTEM survey area collected to characterize the groundwater flow between basins is shown in the inset map.

Santa Rosa Plain

Principal groundwater producing formations (aquifer system) in the Santa Rosa Plain include: Sonoma Volcanics, Wilson Grove, Petaluma and Glen Ellen Formations, and Quaternary alluvial deposits.

- The Sebastopol Fault, as shown in **Figure 8**, is mapped as paralleling the western Santa Rosa Plain basin boundary, cuts through the Wilson Grove and Petaluma formations, and has been described as varying between barrier and conduit for flow.

- The Unnamed Fault east of the Sebastopol Fault, as shown in the main panel in **Figure 8**, has been described as possibly a branch of the Sebastopol Fault and important for deep groundwater flow and may form a barrier or conduit to flow between the Wilson Grove, Petaluma Formations and Quaternary alluvium.

- The northeast dipping Trenton Ridge thrust fault that forms a ridge between the two structural troughs making up the deeper portions of the basin, cuts through the Sonoma

Volcanics and Petaluma Formation, and may extend up to 1,000 feet below ground surface

- Improving the understanding between the contributing watershed and the underlying basin would largely involve the interface of the Sonoma Volcanics to Quaternary alluvium, Glen Ellen and Petaluma Formation on the east and the Wilson Grove to Quaternary alluvium, Glen Ellen and Petaluma Formation on the west. A location where these hydrogeological features may be present is shown in **Figure 9**.

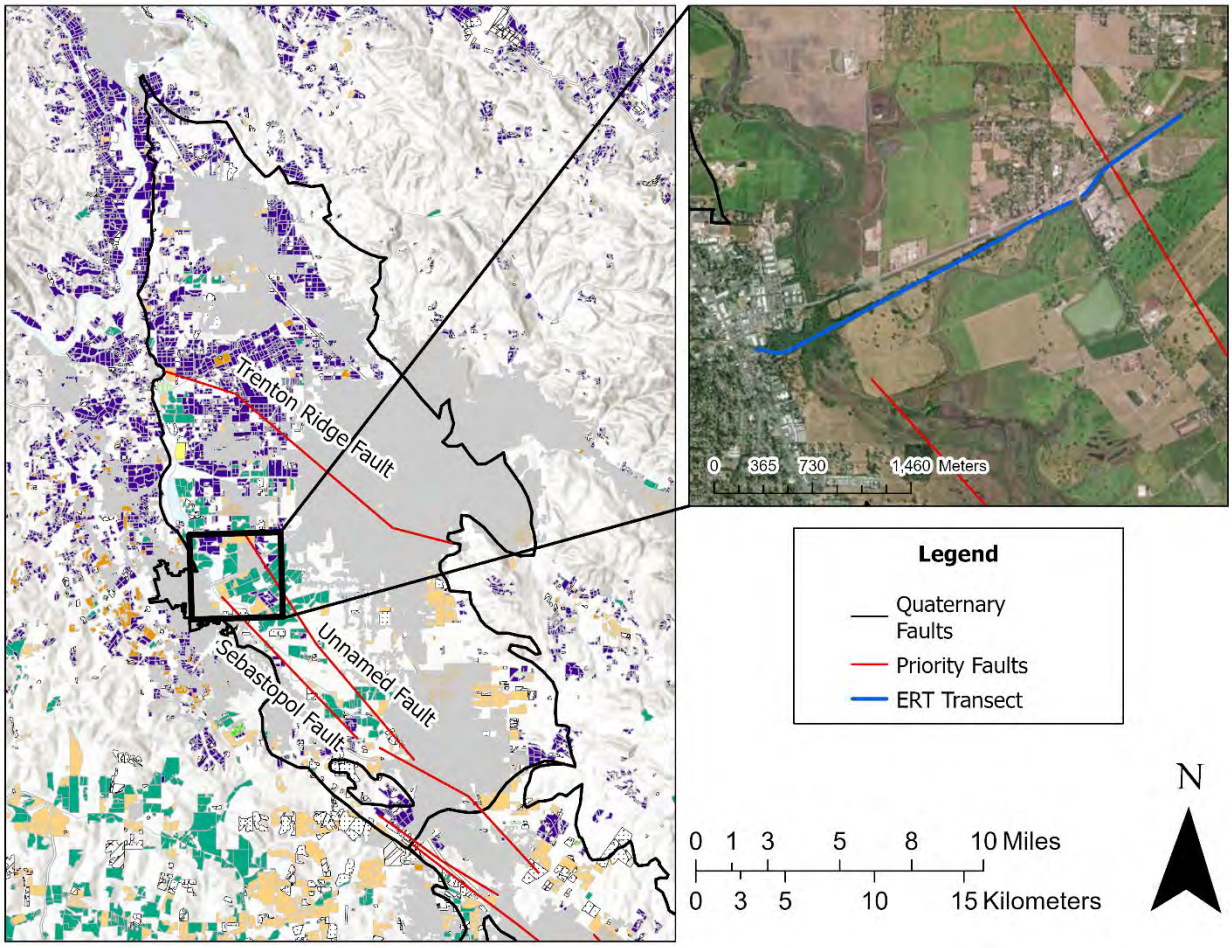


Figure 8: Map of the Santa Rosa Plain Groundwater Basin with identified priority faults. Two ERT profiles collected to characterize the fault zone are shown in the inset map.

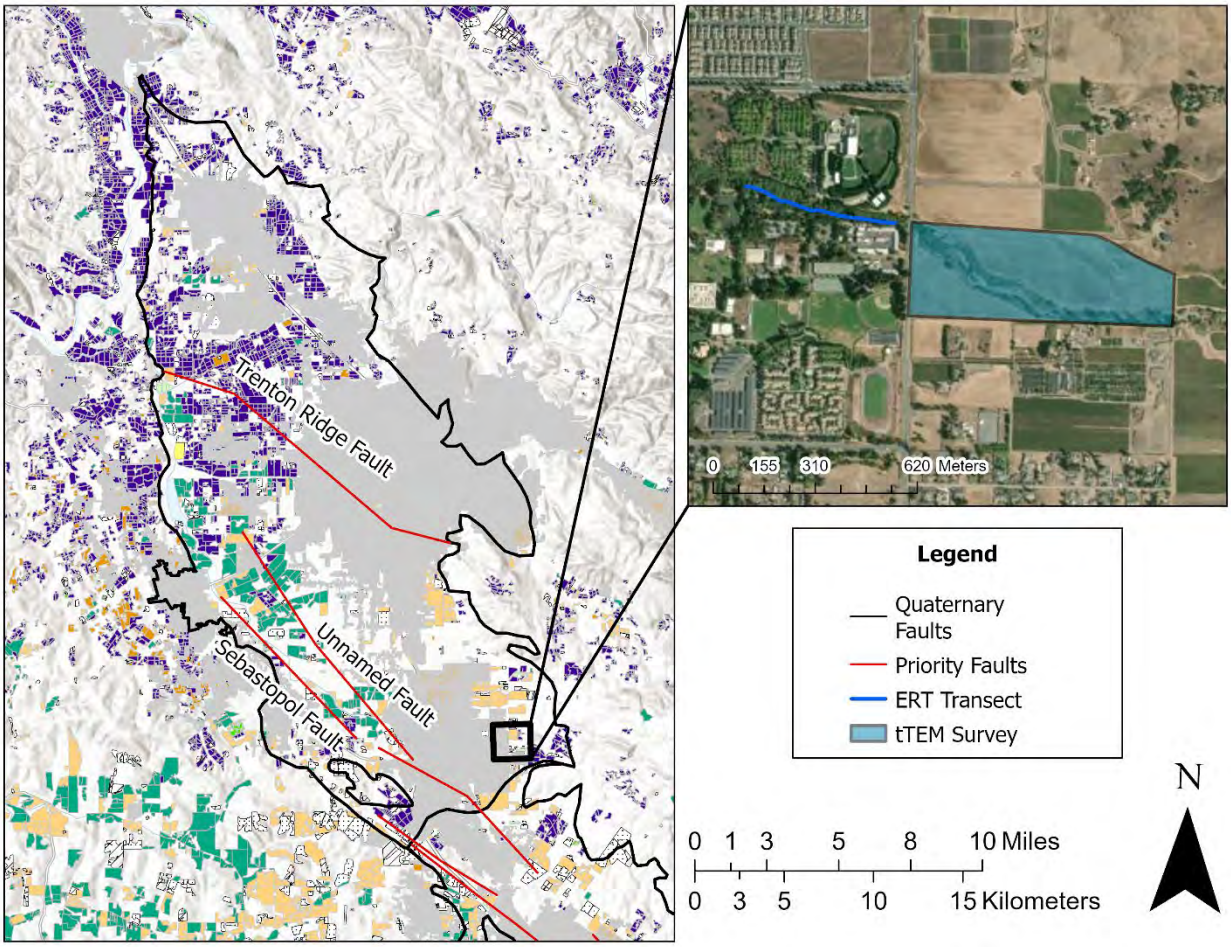


Figure 9: Map of the Santa Rosa Plain Groundwater Basin with identified priority faults. One ERT profile and location for tTEM survey collected to evaluate recharge potential and volcanic extent are shown in the inset map.

3.0 GEOPHYSICAL METHODS DESCRIPTIONS

The selection of an appropriate geophysical method is closely tied to project objectives, required resolution and depth, target characteristics, and site-specific conditions. The following section provides a detailed overview of the geophysical methods employed during geophysical investigations conducted for Sonoma Water and local GSAs and the theory behind these methods.

The geophysical methods described below are used to characterize subsurface lithology and/or materials in terms of electrical resistivity. Electrical resistivity (the reciprocal of conductivity) is a material property which is diagnostic of the type of geologic material present. When describing the subsurface materials at a site, resistivity and conductivity can be used interchangeably since they represent the same material property regarding the flow of electricity. In other words, if a sediment layer is described as highly resistive, it means the same as saying it has low conductivity. As shown in **Figure 10**, unsaturated soils have higher resistivity (lower conductivity)

than saturated soils (higher conductivity). Sand and gravel with minimal silt/clay content have higher resistivities than soils with high silt/clay content. Sandstone, limestone, and granite typically have higher resistivity values than shale and siltstone. Materials saturated with saline or brine waters have very low resistivity values and can be analogous to highly conductive clays.

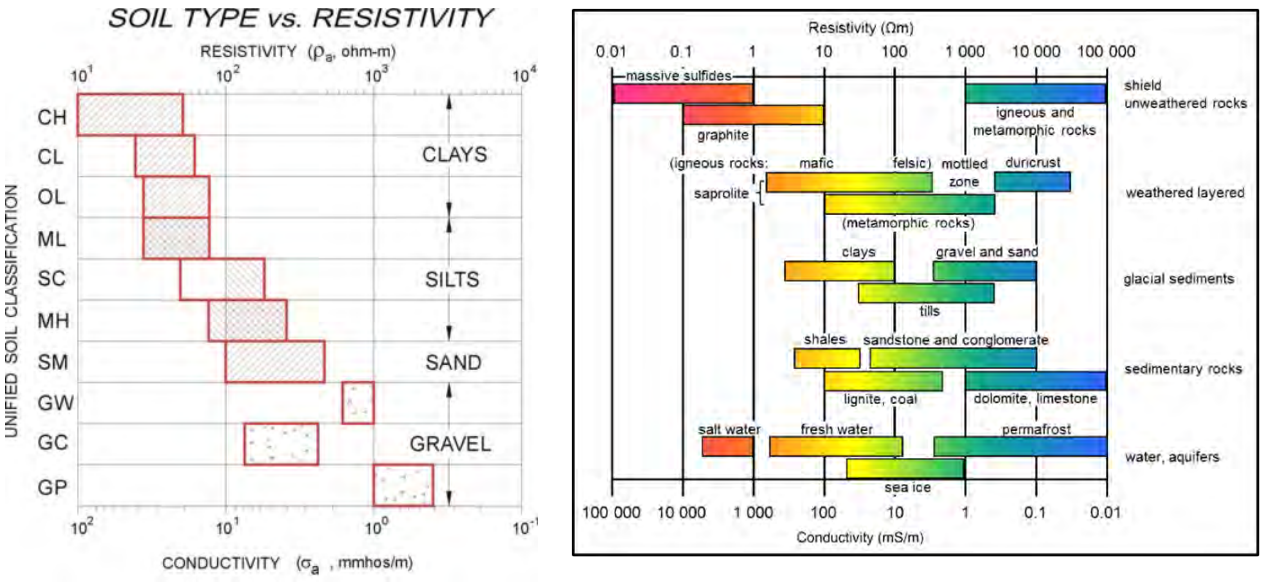


Figure 10: (Left) resistivity distributions of common USCS soils. (Right) presents ranges of resistivity values for various lithologies.

Electrical Resistivity Tomography (ERT)

The ERT method incorporates the injection of an electrical current into the ground through a pair of electrodes (current electrodes) while simultaneously measuring the potential or voltage between an offset electrode pair (potential electrodes). The subsurface apparent resistivity is then calculated from the measured voltages, according to electrode geometry. This measured apparent resistivity represents the bulk resistivity of earth materials where the majority of injected current flows. The geometry between 2 current electrodes and 2 or more potential electrodes defines an array. The distance between the potential electrodes is directly related to resistivity measurements with depth. The amount of current injected and distance between the current electrodes determines the investigation depth, i.e. larger spacing forces more available current to flow at depth. Calculated apparent resistivity values for a set of measurements are then used in a tomographic inverse modeling scheme to build a best fit model of the true resistivity distribution of the subsurface. ERT data are susceptible to interference from objects that act as subsurface conductors and draw injected current away from the ERT array in ways not related to geologic structures. Grounded above-ground metallic objects and buried subsurface utilities and metallic objects are typically the primary source of noise in ERT measurements.

For this project, the ERT investigations were conducted using an IRIS Instruments Syscal Pro 10-channel multiple electrode resistivity imaging system. The equipment consists of a transmitter/receiver control unit and cables capable of utilizing up to 96 takeouts for electrodes. The ERT investigations utilized multiple array types including the dipole-dipole array and the reverse-Schlumberger array. The dipole-dipole array, which is most sensitive to lateral changes in resistivity and can achieve a maximum depth of investigation of about one-fifth of the total

electrode array length. The electrode spread geometry is controlled by the transmitter switching system of the resistivity meter. Multiple measurements are made along the line to measure the lateral and vertical changes in subsurface resistivity. The dipole-dipole array is a common type of electrode array using equal spacing between the electrodes. The dipole-dipole electrode array consists of two sets of electrodes, the current (source) and potential (receiver) electrodes. A dipole is a set of two connected electrodes with separate dipoles used to transmit the current (A&B) and record the potential (M&N) (**Figure 11**).

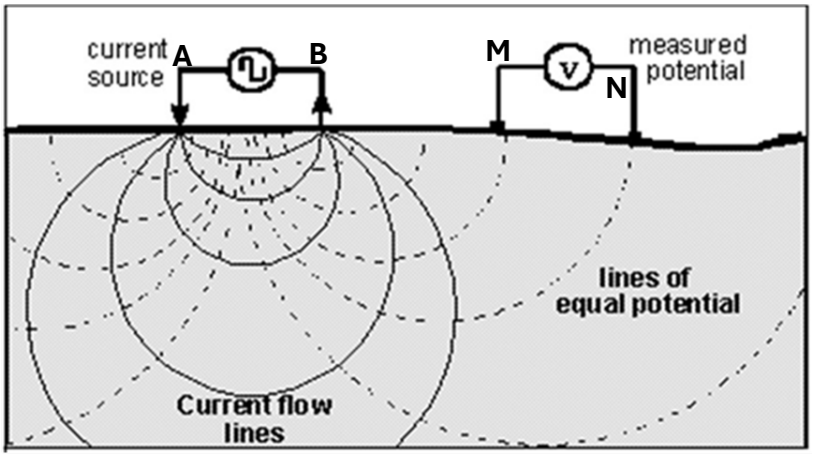


Figure 11: Dipole-Dipole array.

The Reciprocal Schlumberger array was used to achieve deeper, vertical soundings with stronger signals, but less lateral detail than the dipole-dipole array. The Reciprocal Schlumberger array is an arrangement of electrodes, where current injection electrodes (A & B) are located interior to receiving electrodes (M & N) with a common midpoint (**Figure 12**). Measurements are made by successively increasing the separation between the M &N electrodes (a) followed by increasing the spacing between the A and B electrodes (s). This process is repeated to generate a vertical electrical sounding curve of apparent resistivity with electrode spacing. Moving the A & B / M & N quadrupole to multiple midpoints along a profile allows for a 2d pseudo-section of apparent resistivity to be measured.

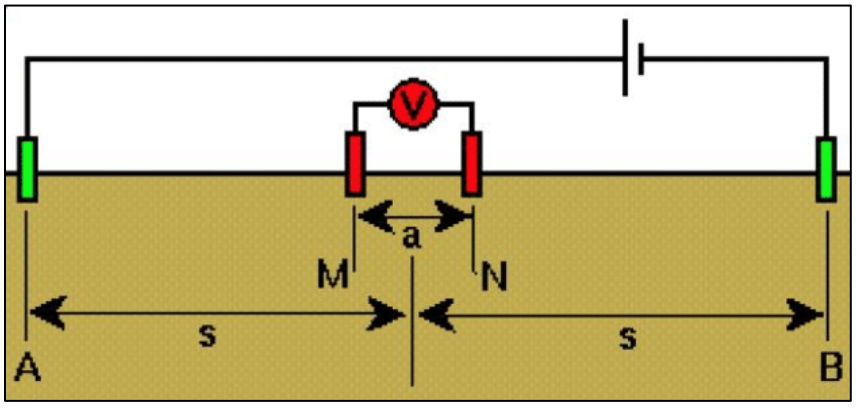


Figure 12: Reciprocal Schlumberger array.

Towed-transient Electromagnetics (tTEM)

The tTEM system is a very efficient geophysical tool for detailed three-dimensional mapping of the subsurface. A tTEM survey consists in towing the tTEM system behind an all-terrain vehicle (ATV) using a specially designed sled frame with non-metallic parts to avoid potential interference. The tTEM system has a depth of investigation of up to 60 to 80 m (195-260 ft) below the ground surface (bgs). The full tTEM system consists of an ATV that tows the transmitter (TX-Coil) coil followed by the receiver (RX-Coil) coil. The transmitter and receiver instruments and power supplies are mounted on the back of the ATV. Collected data are synchronized with the geographical position and time provided by a GPS system. A tablet computer is mounted on the ATV and used to control the navigation and data collection and for monitoring other relevant investigation information. A general schematic of the tTEM system is shown in **Figure 13**.

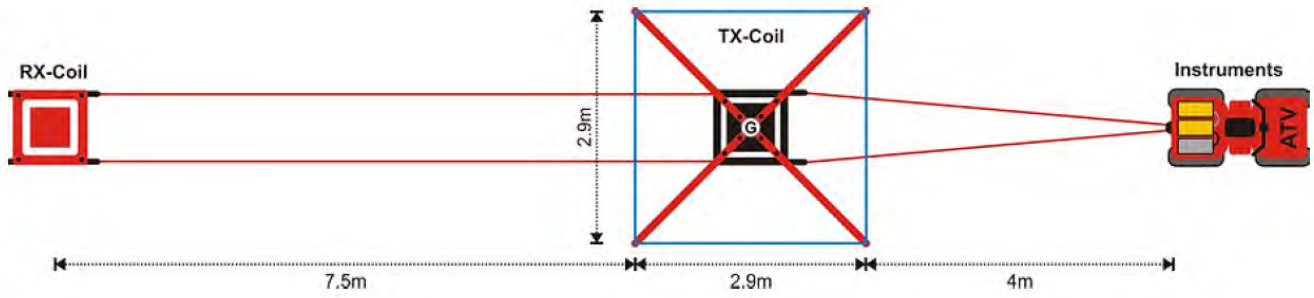


Figure 13: Layout of the tTEM system. Distances: RX-coil to TX-coil edge: 7.5 m (24.6 ft); width and length of TX-coil: 2.9 m (9.5 ft); total length of the system behind the ATV: 14.4 m (47.2 ft). Image credit: TEMcompany.

The method works by injecting a time-varying current into the transmitter. The variations in the current generate a primary electromagnetic field that propagates into the subsurface. As this electromagnetic (EM) field travels, it interacts with subsurface materials which generate secondary EM fields. The decay of this field is then measured by the receiver. Continuous measurements are made, later to be stacked and averaged in processing. Through geophysical inversion, the EM data acquired by the tTEM system are used to estimate the electrical resistivity using a 3D spatially constrained inversion algorithm. The depth of investigation is calculated based on the site composition, data, and inverted models and varies under normal conditions between 60 to 80 m (195-260 ft) bgs. The dense dataset can depict the 3D spatial distribution of structures in the subsurface, including layering of unconsolidated materials. **Figure 14** shows the general TEM method with both primary and secondary EM fields shown.

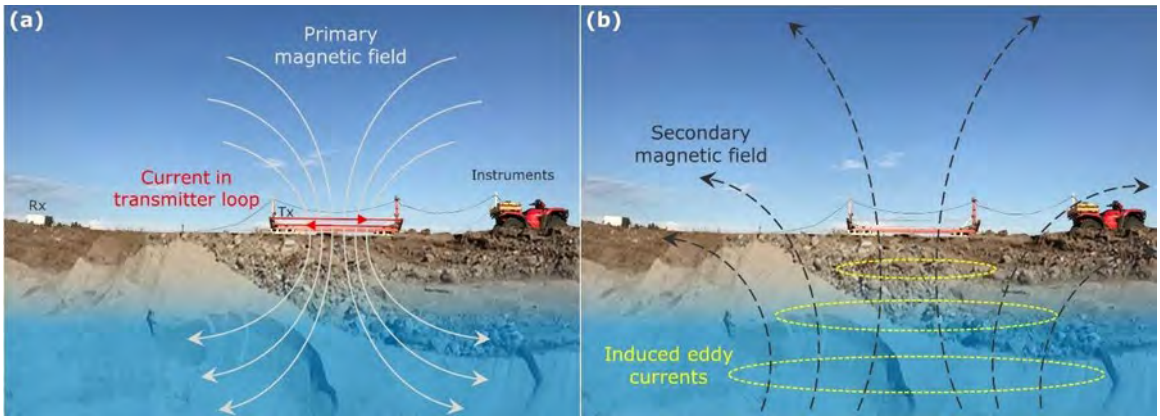


Figure 14: A) The primary EM field generated by the current in the transmitter loop. B) When the current is turned off in the transmitter loop (no primary field), eddy currents are generated in the subsurface. The eddy currents create secondary magnetic fields that are measured with the receiver.

tTEM data (and all EM methods) are compromised by different type of noise components. Noise can cause bias signals and affect the depth of investigation and if not properly identified and removed, can result in incorrect geological and hydrological interpretations. The different sources of noise are described below:

1. Galvanic coupling is caused by the electromagnetic signal induced in a metal object, such as a metal pipe, metal fence or the loop, following the ground-wire through the power-masts to the ground as sketched below. The challenge is that the signal component caused by a galvanic coupling can be hard to detect as the nature of the decay is similar to the response from the ground as illustrated in **Figure 15**. Galvanically-coupled data are identified by looking at the data along the survey lines while paying attention to the signal level and its correlation with potential coupling sources on the GIS map.

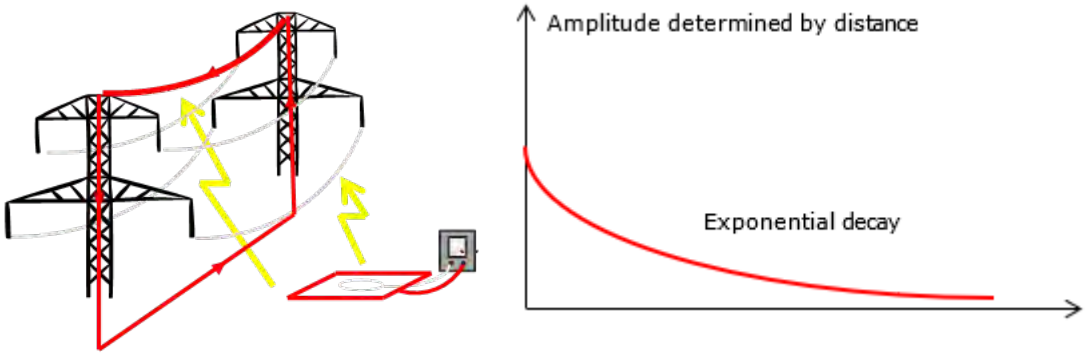


Figure 15: Illustration showing the effects of galvanic coupling.

2. Capacitive coupling is caused by the induced electromagnetic signal in an insulated installation such as a power cable. The noise creates an oscillating signal as illustrated in **Figure 16**. It is normally easy to distinguish capacitive coupling noise from the ground response.

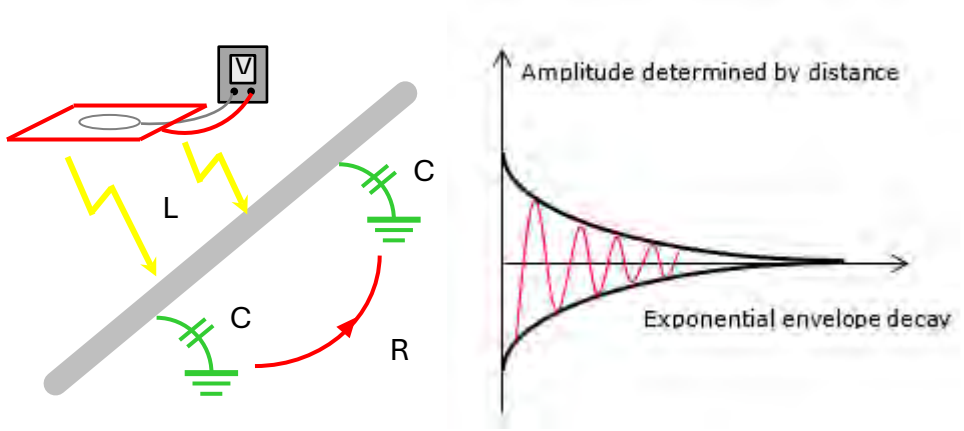


Figure 16: Illustration showing the effects of capacitive coupling.

1. Coherent noise from electrical powerlines has the same pattern as sketched for the capacitive coupling. It is often easy to identify these features during processing of the data.

2. Atmospheric noise is more random in nature and is typically handled by none-spike filtering and by simple averaging of the data. In case of a strong lightning or an electromagnetic storm the background noise can prevent the acquisition of data with satisfactory signal-to-noise ratio.

3. Motion induced noise due to vibrations in the receiver coil. Vibration of the receiver coil in the earth magnetic field will create a noise component. It is only a problem for moving systems, such as SkyTEM (airborne) or the tTEM system. This noise is minimized by suspending the receiver coil and keeping the survey speed within recommended limits (**Figure 17**).

4. Internal noise in the instrumentation.

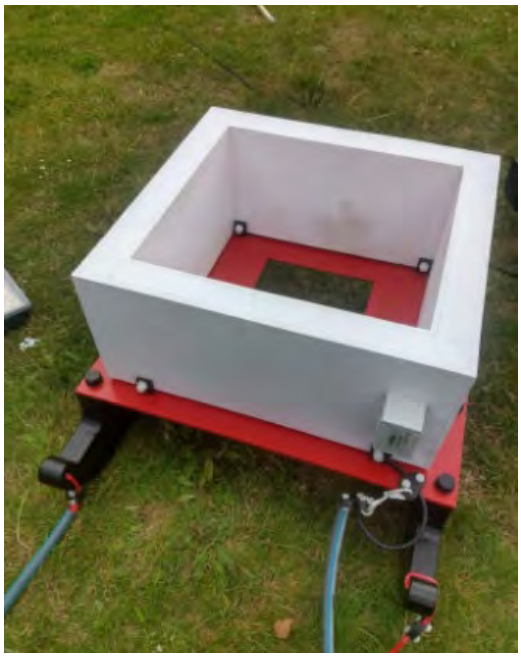


Figure 17: The TEM Receiver coil is suspended to reduce motion induced noise.

The depth of investigation (DOI) depends on the geological and hydrogeological settings within the survey area and the signal-to-noise ratio determined by the power of the transmitted electromagnetic field, internal noise in the instrumentation and the actual ambient noise during the survey. The length of the TEM decay curves, i.e. how late in time the signal can be measured before reaching the noise level, determines the DOI. In **Figure 18**, the earth response (the green curves) reaches the noise floor for the system at ~ 500 μs. The DOI can be increased by increasing the induced signal. This is typically done by injecting higher current, increasing the size of the transmitter loop and/or increasing the number of decay curves being averaged (stack size). The DOI for the tTEM system is typically 60-80 m bgs. The DOI will be larger when the ground is more resistive and smaller when the ground is more conductive. During the inversion, the DOI is estimated for each resistivity model.

The inversion process is the step where the measured voltage values are fitted with the TEM response of the geophysical model. The model is described by its layer thicknesses and corresponding electrical resistivities. The results are typically presented as smooth (multi-layer) resistivity models. The processed data were inverted by applying spatially constrained inversion (SCI) and laterally constrained inversion (LCI) approaches, where neighboring soundings are constrained in a multi-layer inversion scheme.

Prior to data acquisition, GIS layers containing geographic locations of the target study area and planned tTEM lines are loaded into the tTEM navigation software, which enables real-time tracking of the paths. This also allows the operator to view the density of the data being acquired and facilitate proper coverage of the site with the tTEM. During the tTEM investigation, data quality and the entire system functionality are checked by the operator. While the conceptual planning lines served as the initial investigation path, it is important to note that the planning phase relied on a desktop study utilizing Google Earth and GIS software. However, once in the field, the operator exercises discretion regarding safe and effective towing of the system, which may lead to deviations from the planned lines.

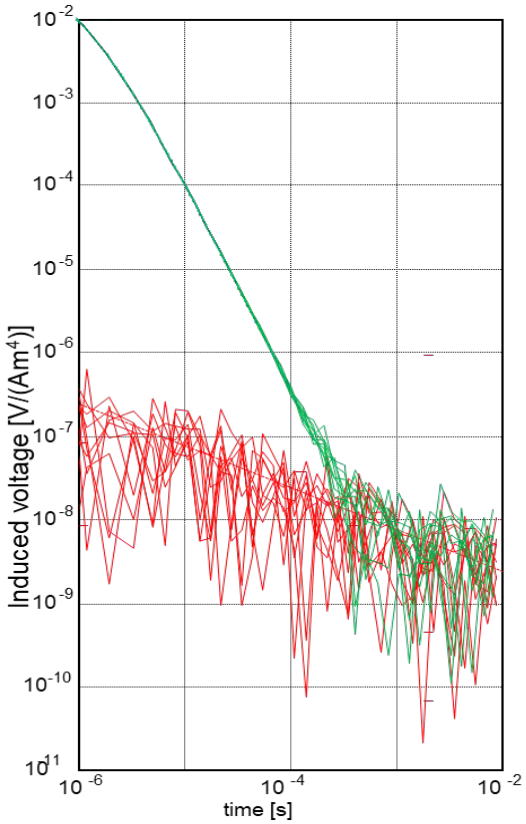


Figure 18: An example of decay curves created by a TEM system (Green curves) and the background noise floor (Red curves).

Fixed Loop sTEM

The fixed loop sTEM system is a very efficient, mobile, and lightweight geophysical tool for detailed mapping of the subsurface where traditional land-based or airborne methods are not possible. The sTEM profiler system has a depth of investigation of up to 150 to 200 m (492-655 ft) bgs, depending on the local geology present. The full sTEM profiler system consists of a transmitter (TX-Coil, 3 x 3 m) and receiver (RX-Coil, 3 x 3 m) coils connected in the middle by a small computer and can be seen in **Figure 19**. The transmitter and receiver instruments and power supplies are lightweight and portable, making it possible for a two-man crew to collect data challenging terrain. Data at each collection point can be collected under 5 minutes and are synchronized with the geographical position as well as time provided by a GPS system. A mobile phone app (iOS and Android) is used to control data collection, and for monitoring acquisition parameters such as measurement times, temperature, current, etc.

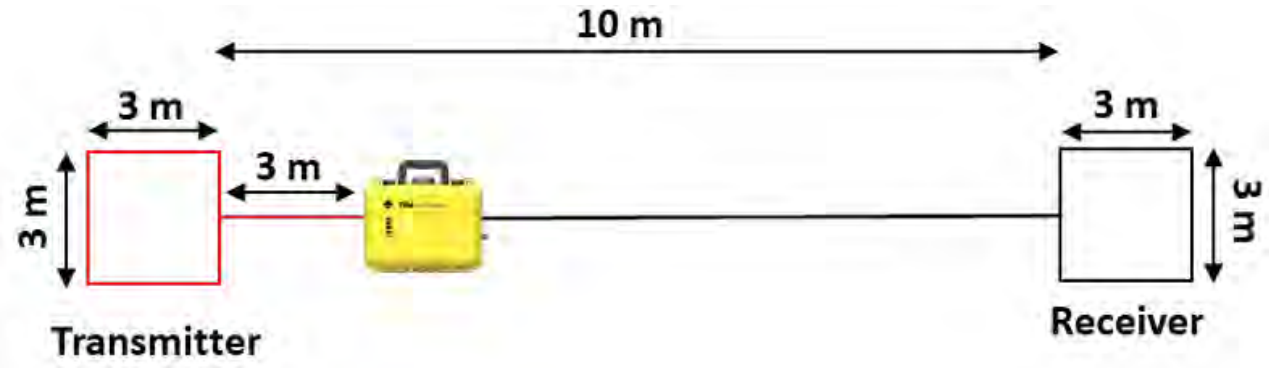


Figure 19: Layout of the sTEM system. Distances: RX-coil to TX-coil edge: 16 m (52.5 ft); width and length of TX-coil: 2.9 m (9.5 ft). Image credit: TEMcompany.

The sTEM method is nearly identical to the tTEM method but uses a static transmitter loop to pass a current of several amps. The current is shut off nearly instantaneously to create an electromagnetic (EM) pulse which propagates into the subsurface. A receiver coil is positioned in line with the transmitter loop and used to measure the change in magnetic field with time as the EM pulse propagates to greater depth. The data are modeled to determine a geo-electrical section of unit thickness and electrical resistivity. For a detailed description on TEM induction, please see the tTEM section.

Airborne Electromagnetics

Though not collected as a part of this geophysical investigation, the present study benefits from existing airborne electromagnetic (AEM) data collected as a part of California's Department of Water Resources (DWR) Statewide AEM Survey. The purpose of this effort was to improve the understanding of aquifer system structures in support of the implementation of the Sustainable Groundwater Management Act throughout the state. All AEM and compiled data from the DWR Statewide AEM Surveys are publicly accessible and are hosted, along with reports detailing existing data compilation, the AEM surveys, data processing, inversion, and further products, at the following website: https://data.cnra.ca.gov/dataset/aem.

The AEM method follows the same principles as outlined for the previous two EM methods (tTEM and sTEM) as shown in **Figure 20**. However, instead of being stationary or towed behind an ATV, the AEM system is carried as a sling load, suspended 40 m (120 ft) beneath a helicopter and flown 30-50 m (98-164 ft) above the land surface while flying at a ground speed of 60-80 kph (37-50 mph). The full system consists of a transmitter loop, two receiver coils, two inclinometers, two altimeters, and two differential global positioning system units. A more detailed description of the survey and SkyTEM system specifications can be found in Appendix 2 of the DWR Statewide Surveys Report (DWR, 2022).

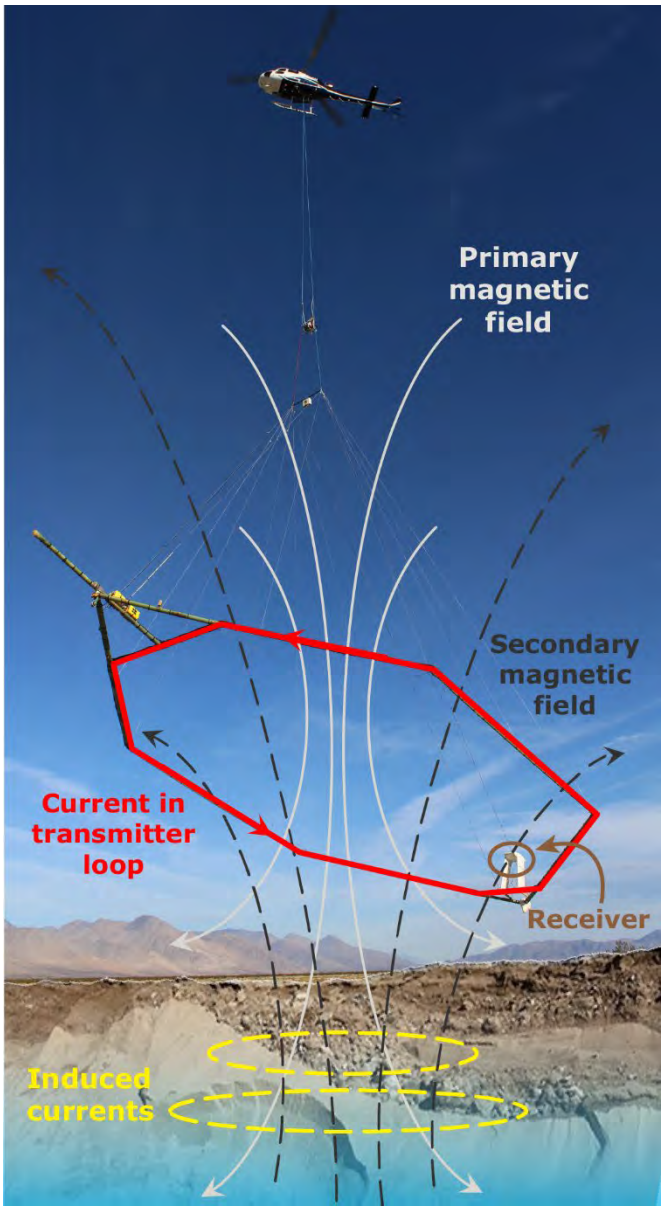


Figure 20: AEM survey schematic including the transmitter loop (current in red), the primary magnetic field (in grey), the induced subsurface currents (in yellow), and subsurface response (in dashed black lines) which is picked up by the system receiver (circled in brown).

The AEM surveys intersecting the study area for the current project come from Survey Area 3, completed in November 2021, which covers the Big Valley (Lake County), Ukiah Valley, Santa Rosa Plain, Petaluma Valley, and Sonoma Valley Groundwater Basins (DWR, 2022). The flight lines corresponding to Survey Area 3 within Sonoma County area are shown in **Figure 21.**

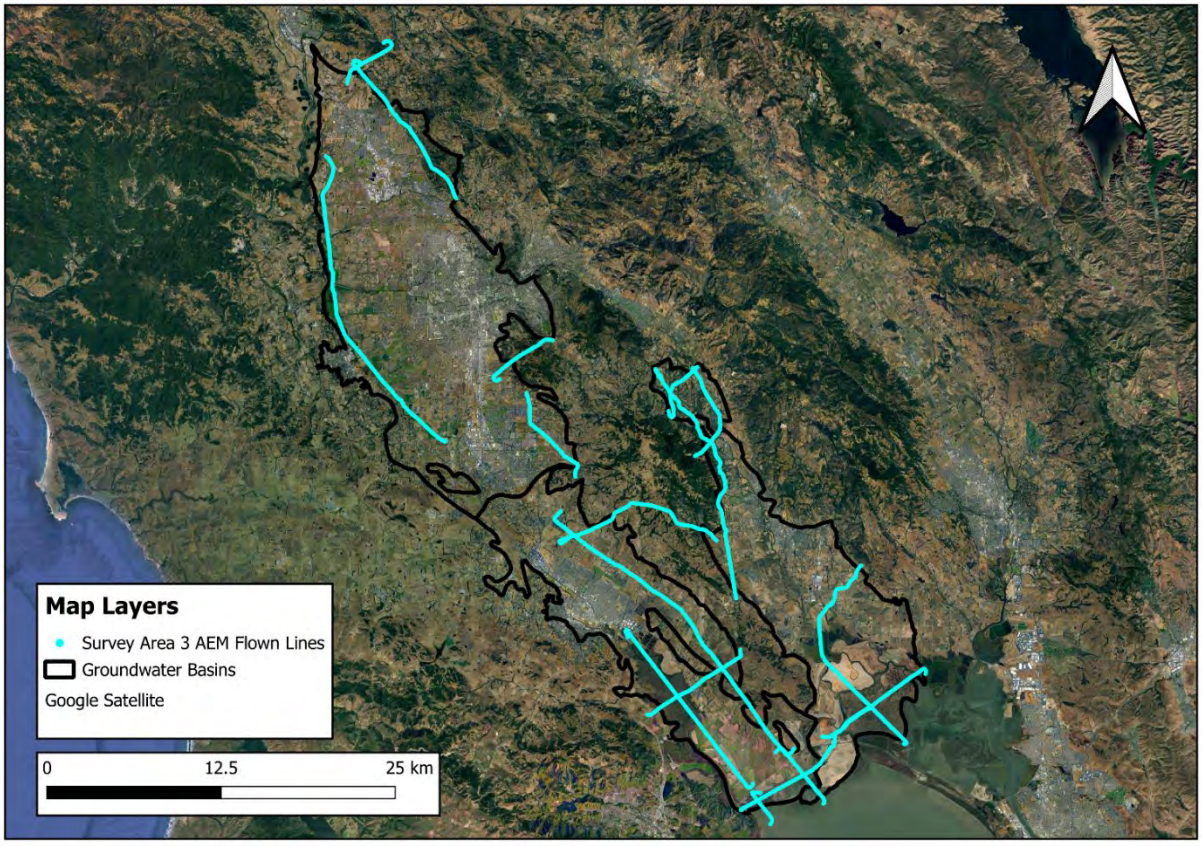


Figure 21: AEM lines within the three GSAs flown as a part of the DWR Statewide AEM Survey.

5.0 PROCESSING AND INVERSION

Data Processing Steps

tTEM and sTEM Data Processing Steps

The processing and inversion of the tTEM and sTEM data were completed with the software package, Aarhus Workbench (https://hgg.au.dk/software/aarhus-workbench/). Workbench is a well-documented and technically sound software package used for processing and inversion of electromagnetic and geoelectrical data. An application within Workbench, AarhusInv, was used that is specifically designed for processing and inversion of the tTEM and sTEM data.

The tTEM data were acquired with 1055 Hertz (Hz) and 315.1 Hz repetition frequencies for the low and high moment, respectively. This is equivalent to 1055 and 315 decay curves per second for the low and high moment respectively. The sTEM data were acquired with 2016 Hz and 212 Hz repetition frequencies for the low and high moment, respectively. The high number of data points allows for an advanced data processing scheme to achieve the best possible signal to noise ratio.

The acquired tTEM and sTEM data underwent the following processing steps:

1. Check if useful data have been mistakenly masked during the data acquisition process.
2. Import data into a database using the Geophysical Relationship database (GERDA) format.
3. Check if data are masked at turning points to avoid data where the system is not aligned properly.
4. Check all secondary data to ensure they are within specifications and do not vary significantly along the lines.
5. Assign a standard uniform 3% noise to all data.
6. Define a standard processing scheme to automatically reject data and assign noise to the data.
7. Manually inspect each line. Data determined noisy that has not already been rejected in the previous step are removed. The noise can be due to overhead powerlines, buried power cables, metal fences, and other man-made noise sources. This is done for the individual soundings, as well as for a sequence of soundings along the line.
8. Assign elevation from a digital elevation model grid to each data point.
9. Average data along the lines using a trapezoidal filter, where more data from the late time gates are averaged compared to fewer data at the early time gates. This is to improve the signal to noise ratio for the data representing the deeper zones and to maintain the high-resolution near-surface features along the line.
10. Develop a final processed dataset with a sounding distance of approximately 5 meters (m) (~ 16 feet [ft]) for tTEM data.

ERT Data Processing Steps

The ERT data was reviewed for quality control and pre-conditioned using ProsysIII by Iris Instruments to remove spurious data, high Q value data, and data outliers. The electrode X (eastings/longitudes), Y (northings/latitudes) positions were measured using GPS and the electrode elevations were extracted from the digital elevation model (DEM). The pre-conditioned ERT data were then processed using Res 2D INVx64 using a standard workflow to remove any remaining erroneous and noisy data and to perform tomographic inversion.

Inversions were performed to maximize resolution, reduce noise, and provide a good fit between modeled and measured data. The resulting 2D ERT geo-electric cross section is then interpreted for anomalous resistivity zones using Surfer, by Golden Software. **Table 1** below details the ERT processing and interpretation workflow.

While the data processing workflow was designed to remove low quality data, some isolated features in the ERT sections may be due to modeling artifacts. Where ERT lines are adjacent to or cross buried subsurface utilities measured apparent resistivities can be affected by interference.

Processing Step	Process	Details
1	Remove noisy data	High contact resistance results in noisy data. Noisy data points are removed to improve inversion stability
2	Georeference the data	Positional coordinates and elevation data are tied into the resistivity data to get accurate geometry and apparent resistivity calculations
3	Invert apparent resistivity data	Resistivity data inverted in Res 2D INVx64 to produce a 2D resistivity earth model

Table 1: ERT general processing workflow

Inversion Steps

tTEM and sTEM

The entire processed data were then used together during the inversion and underwent the following steps:

1. Define horizontal and vertical constraints on the resistivities as well as the number of model layers and layer thicknesses.
2. Invert the processed data using the laterally-constraint inversion (LCI) and spatially-constraint inversion (SCI) approaches (Auken et al., 2005; Viezzoli et al., 2008).
3. Present the data as cross sections. In case the cross sections reveal some distinct anomalies, the processing of the corresponding data is revisited and the data are re-inverted.
4. Calculate the depth of investigation (DOI) for each resistivity model, based on a sensitivity analysis of the model.

ERT

Resistivity data was inverted using Res 2D INVx64. The general inversion workflow is described below:

1. Data Input
    I. Import the field apparent resistivity data.
    II. Define electrode array type and geometry.
2. Data Inspection and Editing
    I. Check data quality (noise, negative or extreme values).

II. Remove or down-weight bad data points if necessary.

III. Add topography.

3. Model Discretization
   I. The software divides the subsurface into a 2D grid of rectangular blocks.
   II. A starting model is generated, usually a homogeneous half-space.
4. Selection of Inversion Parameters
   I. Choose inversion method (e.g. smoothness-constrained least squares or robust inversion).
   II. Set damping factors, convergence criteria, and number of iterations.
   III. Define constraints if required.
5. Forward Modelling
   I. Calculate theoretical apparent resistivities from the current resistivity model.
6. Model Updating (Inversion)
   I. Compare calculated data with observed field data.
   II. Adjust block resistivities to minimize the data misfit using an iterative least-squares algorithm.
7. Iteration and Convergence
   I. Repeat forward modelling and model updating over several iterations.
   II. Stop when RMS error stabilizes or the maximum number of iterations is reached.
8. Result Display
   I. Display the apparent resistivity pseudo-section.

4.0 EXPLANATION OF REPORT, DELIVERABLES & ADDENDA STRUCTURE

Reports for each of the three basins are provided as Addenda (A through C) to this report and provide an overview of each basin's objectives and hydrogeological context. The basin-specific fieldwork undertaken to address identified data gaps is detailed, including site descriptions, methodological approaches, survey protocols, and processes for data preparation and analysis. Each basin-specific report concludes with results, discussions, interpretations, and recommendations. Additionally, the geophysical data collected during this project, along with its delivery format, are described in their respective basin reports.

A Leapfrog Work project has been provided to Sonoma Water for each of the three basin / sub-basin GSAs as separate three-dimensional (3D) digital model space delivery. The Leapfrog Works Viewer is a free software tool that allows the Leapfrog Works Project to be viewed with no editing rights to the data in the model. Collier/Ramboll assembled all ERT, towed-TEM, sTEM and AEM geophysical data into each GSA Leapfrog Project. Digitized data provided by Sonoma Water

such as lithology logs, e-logs, water-level contours, mapped (by others) faults, geological maps, geologic cross-sections, and digital elevation maps (DEM) are also included.

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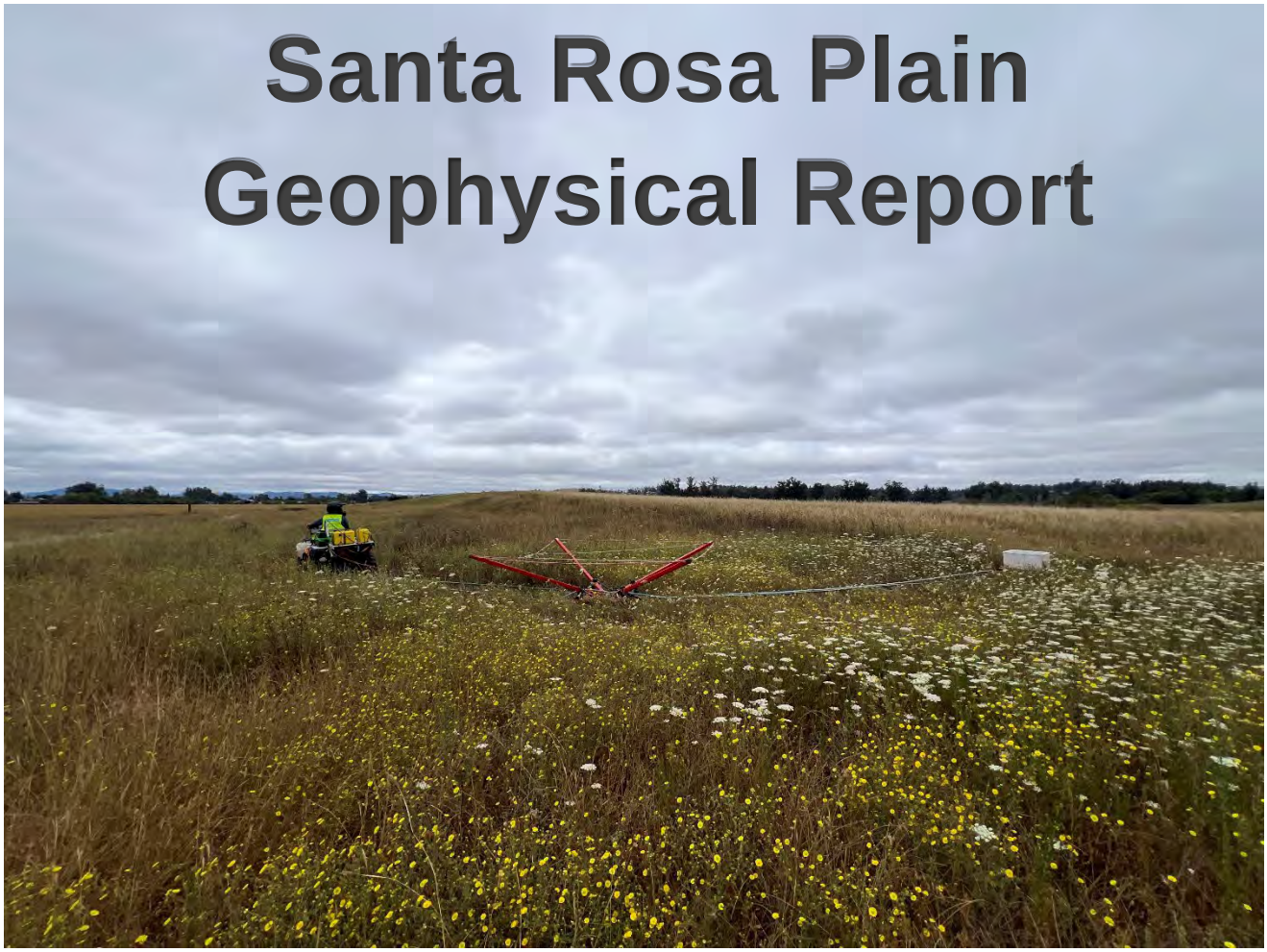
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ADDENDA C:
SANTA ROSA PLAIN SUBBASIN

Santa Rosa Plain Geophysical Report



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Executive Summary

This report presents the results of the ground-based geophysical investigations conducted within the Subbasin (Subbasin) in Sonoma County, California in July through September 2025, utilizing funding from a sustainable groundwater management act (SGMA) implementation grant. The purpose of this study is to support implementation of the Santa Rosa Plain Groundwater Sustainability Plan (SRP GSP) and to address data gaps related to fault location and influence, basin boundary dynamics with Petaluma Basin in the south, recharge mechanism and shallow aquifer characterization. Sonoma County Water Agency (Sonoma Water) engaged Collier Consulting and Ramboll (Collier/Ramboll Team) to review existing geophysical information, prepare a work plan, and conduct targeted geophysical investigations within the Subbasin. The Collier/Ramboll Team collected and analyzed electrical resistivity tomography (ERT) data and time-domain electromagnetic data (tTEM) at three investigation sites: Joe Rodota Trail, sections of Copeland Creek and its adjacent floodplain on both sides of Petaluma Hill Road, and an open parcel of land south of Valley House Drive where the boundary with the Petaluma Valley Basin is delineated. The Collier/Ramboll Team completed collection and analysis of three miles of electrical resistivity tomography data and 16 miles of towed time-domain electromagnetic data. At the three locations, the collected geophysical data provided valuable information to address the data gaps and meet the objectives of the study, as summarized below.

Sebastopol Fault along the Joe Rodota Trail

The objectives for this area were to characterize the location and alignment of the Sebastopol Fault and the differences between aquifer materials on either side of the fault along the Joe Rodota Trail. A 11,500 ft ERT file, approximately oriented west-east, was collected along the Joe Rodota Trail. Findings from the geophysical surveys indicate that the possible location of the Sebastopol Fault or strand associated with the fault as the location of the Highway 12 bridge over the Laguna de Santa Rosa. While the infrastructure associated with the bridge structure interfered with the geophysical data, the potential location of the fault is inferred from the observation that the Wilson Grove Formation is deeper on one side (east) than the other (west), which could be a result of normal fault movement.

The Joe Rodota Trail ERT results show high resistivity (coarse-grained) materials close to the surface in the west at distance 1,000 feet (ft) and at 250 ft below ground surface at 2,500 ft distance. These resistivity values indicating coarser materials are consistent with the Wilson Grove formation, which forms a primary productive unit within the deep aquifer system. This layer of coarse material is overlain by low resistivity (fine-grained) layer. This finer-grained layer is between 50 ft and -200 ft in elevation between the bridge and the steel pipe aqueduct. This finer grained material dominates the eastern side of the line and likely forms a significant aquitard overlying the Wilson Grove formation units of the deep aquifer system.

Copeland Creek Alluvial Fan

The objectives for this area were to characterize the distribution of shallow clay deposits which may inhibit recharge and locations of higher permeability shallow deposits along and surrounding Copeland Creek, including the transition from alluvial sediments to volcanic units. A 1,500 ft ERT profile, approximately oriented west-east, was collected along the eastern side of Copeland Creek, and approximately 13 miles of tTEM data were collected along the western side of Copeland Creek

in a 50x50 ft grid pattern. The results reveal a layered geology of interchanging channel deposits and floodplain deposits, with high resistivities displaying a channel-like geometry suggestive of former tributaries in the area. Primary results from the geophysical surveys indicate a strong recharge potential below a near surface, fine-grained unit. While coarse materials noted near the surface that appear to be in connection with the shallow aquifer may support surface spreading recharge operation and enhance baseflow to Copeland Creek, recharge to the deeper aquifer may be complicated by the fine-grained layers identified at around 15-20 m (50-65 ft) and below 40 m (130 ft).

The closest connection with the near surface to the deeper aquifer is to the east/northeast of the site where sediments coming off the hill may act as “mountain front” recharge but the potential for this would require further characterization. Airborne electromagnetic (AEM) data from California’s Department of Water Resources (DWR) Statewide AEM project collected near land-based surveyed locations indicate extremely resistive subsurface conditions in the hills northeast of Copeland Creek, with resistivity decreasing toward the valley. These high-resistivity signatures in the AEM data are believed to correspond to the Sonoma Volcanics east of the site, where the creek’s headwaters begin. These formations likely constitute the parent materials being surveyed by the ground-based geophysical surveys further downstream. It also appears that the Sonoma Volcanics extend west beneath the alluvial sediments within the Subbasin.

Southern Subbasin Boundary

The objectives for this area were to identify any geologic controls along the Subbasin boundary shared with the Petaluma Valley Groundwater Basin to the south. Approximately three miles of tTEM data were collected across the southern Subbasin boundary in a 50x100 ft grid pattern. Primary results from the geophysical surveys do not reveal a distinct geologic change across the basin boundary defined by Bulletin 118. Only slight mounding is visible with dips north or south. There is no resistivity evidence of a fault or separating stratigraphic unit, largely indicating geologic connectivity and absence of geologic barriers to groundwater flow between the basins, particularly in the deeper aquifer, though coverage was limited to mostly north-south transects.

Summary and Recommendations

In addition to addressing the data gaps, the geophysical results provide continuous electrical resistivity information along the survey lines that can be evaluated with nearby lithologic data to refine the hydrogeologic conceptual model and groundwater flow model. Additional geophysical surveys could be considered to refine the hydrogeologic conceptual model, including surveys south of the Joe Rodota Trailhead away from urban noise sources to better image the Sebastopol Fault, and additional ERT east of Copeland Creek to evaluate sand and gravel thickness and clay variability. A more extensive survey at Valley House Drive, using both tTEM and ERT, would help better characterize the basin boundary and assess potential groundwater divide conditions.

1.0 Preface

The Collier/Ramboll Team is pleased to present the results of the geophysical investigations conducted within the Santa Rosa Plain Subbasin (Subbasin) in Sonoma County, California. The purpose of this study is to assist in filling some of the data gaps identified in the Santa Rosa Plain Groundwater Sustainability Plan (SRP GSP) with the overall goal of supporting long-term groundwater sustainability. For the Santa Rosa Plain Groundwater Sustainability Agency (SRP GSA) the main objectives for the survey include:

- Location and alignment of the Sebastopol Fault and the differences between aquifer materials on either side of the fault along the Joe Rodota Trail.
- Distribution of shallow clay deposits which may inhibit recharge and locations of higher permeability shallow deposits along and surrounding Copeland Creek.
- Characterization of the transition from alluvial sediments to volcanic units along and around Copeland Creek.
- Distribution of higher salinity groundwater and boundaries with the Petaluma Valley Groundwater Basin to the south.

To meet these objectives, geophysical investigations were designed and data collected at locations across the Subbasin in July, August, and September 2025. The results of these investigations are discussed in this report. Airborne electromagnetic (AEM) data from California's Department of Water Resources (DWR) Statewide AEM Survey are included where they overlap our investigation area. A brief description of the AEM data results and interpretation is included in section 6.0 Discussion and Interpretation.

2.0 Introduction

The Subbasin encompasses approximately 80,000 acres in California's North Coast region, stretching about 22 miles in length and varying from 6 to 9 miles in width. It is framed by the Mendocino Range to the west and the Sonoma and Mayacamas Mountains to the east. Several cities are located in the Subbasin including Windsor, Cotati, Rohnert Park, Santa Rosa, and Sebastopol, as well as rural and agricultural lands (**Figure 1**). The area is characterized by a mix of urban development, agriculture (notably vineyards), and native vegetation. Major streams such as Mark West Creek, Santa Rosa Creek, and Laguna de Santa Rosa drain a watershed of roughly 251 square miles. The Subbasin is managed by the SRP GSA which coordinates with local agencies, water districts, county and state authorities.

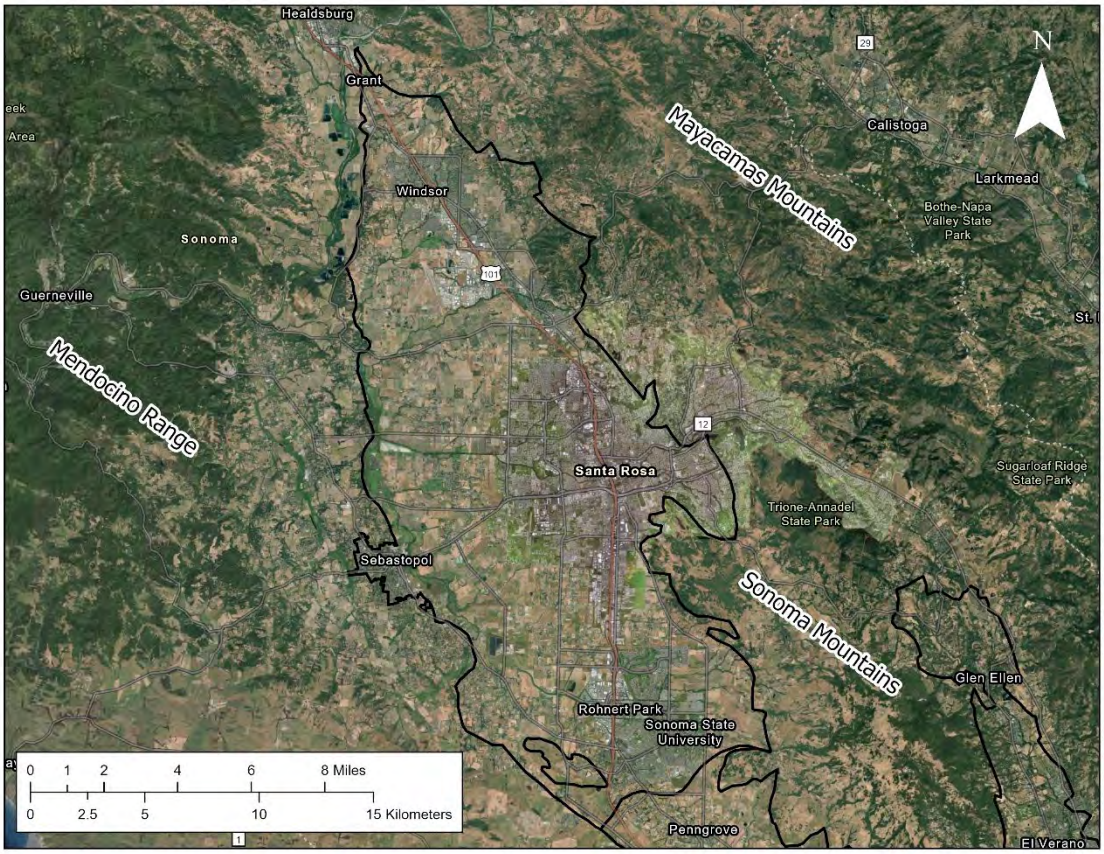


Figure 1: Santa Rosa Plain Groundwater Subbasin. The Subbasin is bounded to the east by the Sonoma and Mayacamas Mountains and to the west by the Mendocino Range.

Land use within the Subbasin has shifted over recent decades, with a notable increase in residential, commercial, and irrigated agricultural areas, and a corresponding reduction in native vegetation and open water. According to a 2012 survey (Sonoma County Water Agency [Sonoma Water], 2021), urban, residential, commercial, and industrial uses make up about 36 percent of the Subbasin, while native vegetation or water covers 35 percent, and irrigated and non-irrigated agriculture accounts for approximately 26 percent. Urban and residential development is concentrated in the main cities and towns, while the surrounding rural areas support a variety of agricultural activities and open space. Detailed vegetation mapping from 2023 (DWR, 2024) provides further insight into the distribution and types of land cover present in the Subbasin (**Figure 2**).

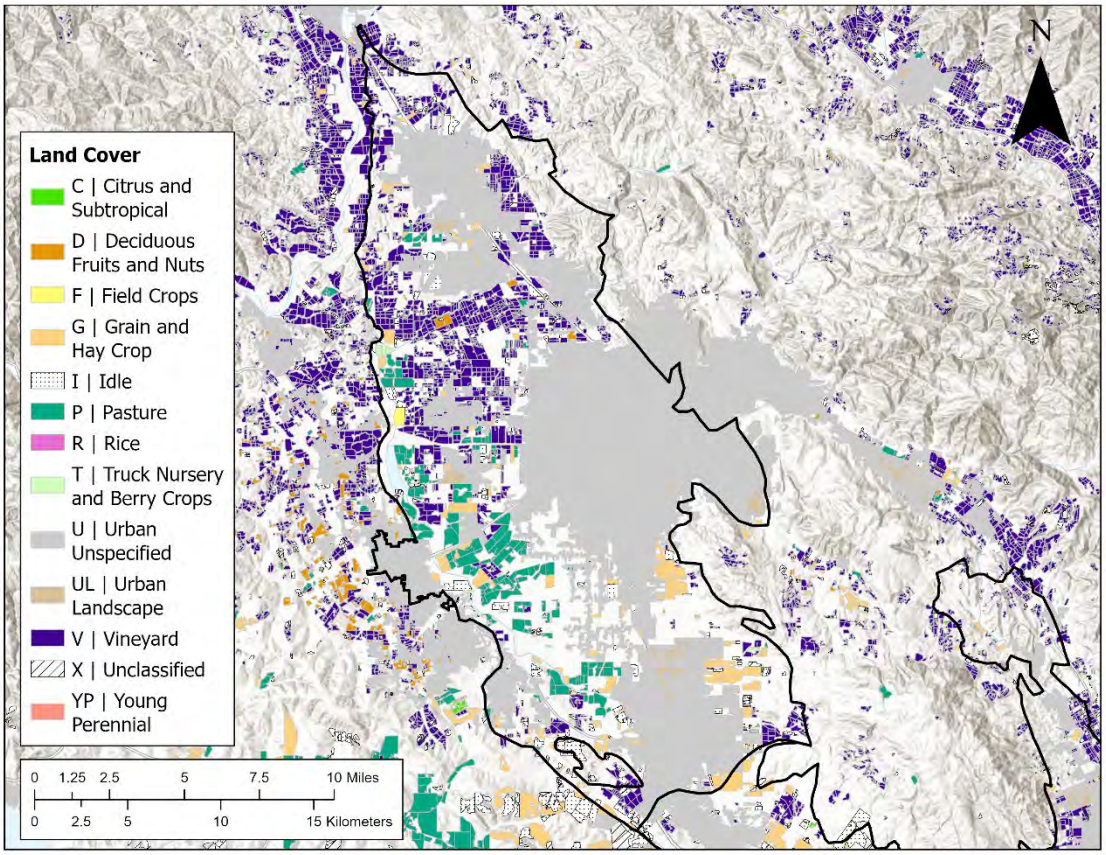


Figure 2: Land Use in Santa Rosa Groundwater Subbasin. Land cover from the 2023 Statewide Crop Mapping Geodatabase displayed (DWR, 2024). Note that much of the area is covered with vineyards.

The water supply for the Subbasin is derived from four primary sources: groundwater, imported surface water, local surface water, and recycled water (Sonoma Water, 2021). Historically, the region relied almost entirely on local groundwater and surface water, but the completion of the Santa Rosa Aqueduct in 1959 and subsequent infrastructure improvements led to the importation of Russian River water, which now serves as the primary source for urban areas and accounts for about 45 percent of the total water supply. Groundwater remains essential, particularly for agriculture, rural residences, and as a backup for municipal systems, providing about 35 percent of the Subbasin's water. Local surface water, sourced from streams and creeks, supplies a small portion, about 3 percent in 2020, while recycled water, treated to tertiary standards and used mainly for irrigation, now makes up roughly 20 percent of the supply. The region's agricultural sector, especially vineyards, has seen significant growth, increasing demand for both groundwater and recycled water. Urban groundwater use rose after the 1960s but is now largely supplemented by imported water. Many rural properties continue to rely on private wells, with an estimated 4,000 to 5,500 domestic wells in use. The SRP GSP emphasizes the need for efficient and conjunctive management of these diverse water sources to achieve long-term sustainability for the Subbasin.

Purpose

Section 3.1.8 of the SRP GSP identifies key data gaps and uncertainties in the current understanding of the Subbasin hydrogeology. The main challenges include limited high-quality subsurface data, including well lithology, aquifer tests, borehole geophysics and surface geophysics, which restricts knowledge of the lateral and vertical continuity and properties of aquifers and aquitards. There is a need for improved estimates of annual groundwater recharge and discharge, as well as more comprehensive three-dimensional monitoring networks, especially depth-dependent water-level and water-quality data from dedicated multi-depth monitoring wells. The role of faults in controlling groundwater flow and quality remains insufficiently understood and could be addressed through aquifer tests, geophysical surveys, and geochemical sampling. Better characterization of Subbasin boundary fluxes, including the direction and magnitude of groundwater movement across boundaries, is also needed. Additionally, improved understanding of recharge and discharge mechanisms, particularly the interconnection between streams and the shallow aquifer system and the effects of groundwater pumping on streamflow, is highlighted as a priority.

Key areas of focus for this investigation include assessing the influence of regional faults, particularly the Sebastopol Fault, clarifying basin boundary dynamics with the Petaluma Valley Basin to the south, and improving understanding of the recharge mechanisms and capacity of the shallow aquifer.

The sites for geophysical investigations described in this report were chosen in consultation with Sonoma Water after several meetings and field visits with Collier/Ramboll to discuss data gap objectives, target characteristics, site access, and minimizing interference with geophysical equipment from anthropogenic sources (i.e. power lines, mapped utilities, fencing).

Hydrogeological Setting

The information in this section is a summary based on information reported in the SRP GSP (Sonoma Water, 2021), except as noted below.

The Subbasin is situated within a northwest-trending structural depression in the North Coast Ranges of California. The Subbasin is bounded by the Mendocino Range to the west and the Sonoma and Mayacamas Mountains to the east, occupying a relatively flat valley floor between these uplands. The geological history of the region is marked by prolonged tectonic deformation, volcanic activity, and sea level changes, resulting in a complex subsurface architecture. The Subbasin is underlain at depth by Mesozoic Era basement rocks (Franciscan Complex, Coast Range Ophiolite, and Great Valley Sequence), which are overlain by a thick sequence of younger Cenozoic volcanic and sedimentary units. These include the Sonoma Volcanics, Petaluma Formation, Wilson Grove Formation, Glen Ellen Formation, and widespread Quaternary alluvial deposits. The valley's structural geometry is further shaped by two deep sedimentary troughs, the Windsor and Cotati troughs, separated by the Trenton Ridge Fault (**Figure 3**).

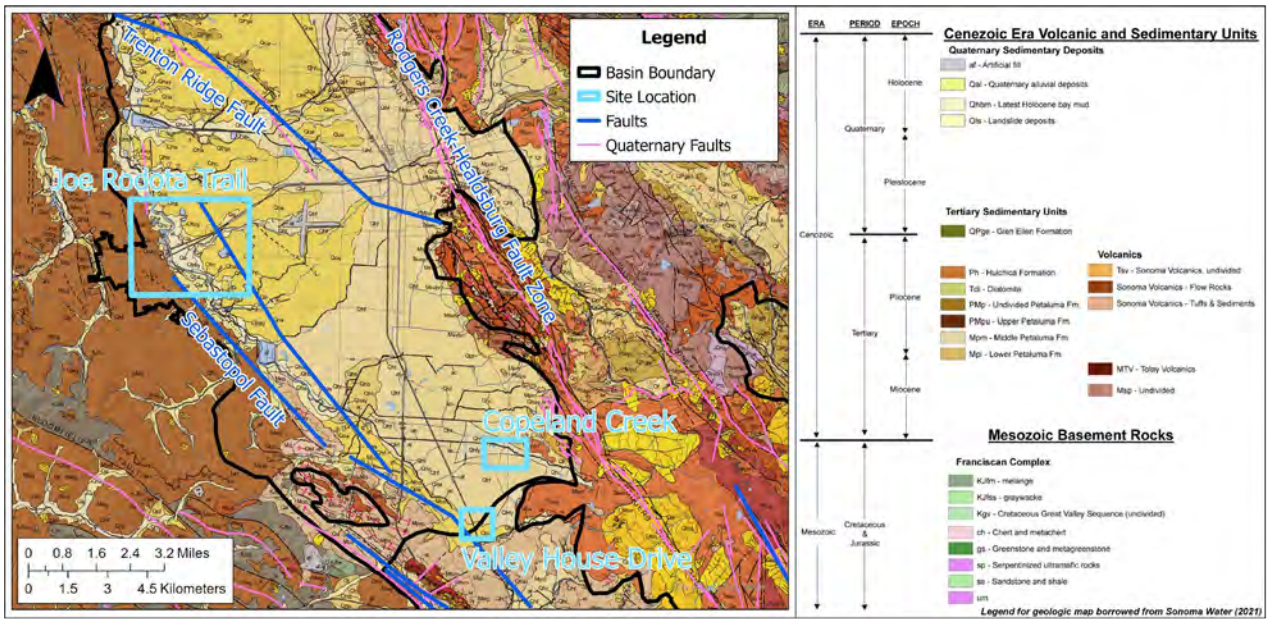


Figure 3: Geological map of the Santa Rosa area showing geophysical investigation areas. Geological mapping from Wagner and Gutierrez (2017), with a simplified legend from Sonoma Water (2021).

Groundwater resources are primarily hosted in the Cenozoic volcanic and sedimentary units. The Subbasin's aquifer system is conceptualized as two principal systems: a shallow aquifer system (generally from the water table to 150–200 feet below land surface) and a deep aquifer system (below about 200 feet). The shallow system is mainly composed of Quaternary alluvial deposits and the Glen Ellen Formation, with some local contributions from the Wilson Grove and Petaluma Formations. It is typically unconfined to semi-confined, with rapid recharge potential near streams and alluvial fans. The deep aquifer system includes the Wilson Grove Formation, Petaluma Formation, and Sonoma Volcanics, and is generally semi-confined to confined. These deeper units are more heterogeneous, with variable hydraulic properties and water quality. Discontinuous clay-rich aquitards, especially in the Glen Ellen and Petaluma Formations, provide partial hydraulic separation between the shallow and deep aquifer systems, though the degree of separation varies spatially. The Wilson Grove Formation, in particular, is noted for its high permeability and well yields, while the Petaluma Formation and Sonoma Volcanics are more variable in their water-bearing properties.

Faults play a significant role in the hydrogeology of the Subbasin. Major faults, including the Rodgers Creek-Healdsburg Fault Zone (east), Sebastopol Fault (west), Trenton Ridge Fault (central), and several unnamed faults, act as structural boundaries for geologic formations and influence groundwater movement. Faults can either enhance or impede groundwater flow: fractured zones may increase permeability and provide preferential flow paths, while fault gouge or juxtaposition of low-permeability units can create barriers. For example, the Rodgers Creek Fault appears to act as a barrier to groundwater flow and may also facilitate upflow or mixing of deep and shallow waters. The Sebastopol Fault appears to limit lateral groundwater movement to the east, and the Trenton Ridge Fault separates the two main sedimentary troughs. Some faults are associated with the emergence of thermal springs, indicating deep groundwater upwelling.

Recharge to the groundwater system is primarily from direct infiltration of precipitation and streamflow, with minor contributions from septic systems, leaking pipes, irrigation return flows, and frost protection applications. The shallow aquifer system receives most of this recharge, especially in areas with permeable soils and alluvial deposits. Recharge to the deep aquifer system is less well defined but is thought to occur via leakage from the shallow system and mountain-front recharge along valley margins. Discharge from the groundwater system occurs as baseflow to streams (gaining reaches), springs and seeps (notably from the Wilson Grove Formation and Sonoma Volcanics), underflow to neighboring basins, evapotranspiration by phreatophytes, and groundwater pumping. The spatial distribution of recharge and discharge is influenced by soil permeability, slope, geology, and the presence of faults and aquitards.

3.0 Field Work

Site Description

Three sites were selected in the Subbasin to address the data gaps identified in the SRP GSP (**Figure 4** and **Figure 5**. These locations are: (1) the Joe Rodota Trail, (2) sections of Copeland Creek and its adjacent floodplain on both sides of Petaluma Hill Road, and (3) an open parcel of land south of Valley House Drive where the boundary with the Petaluma Valley Basin is delineated.

Joe Rodota Trail

The Joe Rodota Trail is an 8.5-mile paved, off-road pathway linking Santa Rosa and Sebastopol. Geological mapping from the California Department of Conservation indicate that two northwest-southeast trending faults, the Sebastopol Fault and an unnamed fault, intersect the trail approximately perpendicularly (Clahan et al., 2003). The Sebastopol Fault is believed to be located near the town of Sebastopol, while the unnamed fault is thought to be further to the east (**Figure 5**). These mapping efforts place the unnamed fault with approximate accuracy, whereas the Sebastopol Fault's position is inferred; both are classified as normal faults and likely facilitate movement along major regional fault systems such as the Rodgers Creek-Healdsburg fault zone. Furthermore, the site sits northeast of the mapped contact where the Wilson Grove Formation terminates within the valley. Mapping this formation as it dips into the subsurface at the interface may yield valuable insights regarding the deeper aquifer structure of the Subbasin as the Wilson Grove Formation represents part of the deeper aquifer.

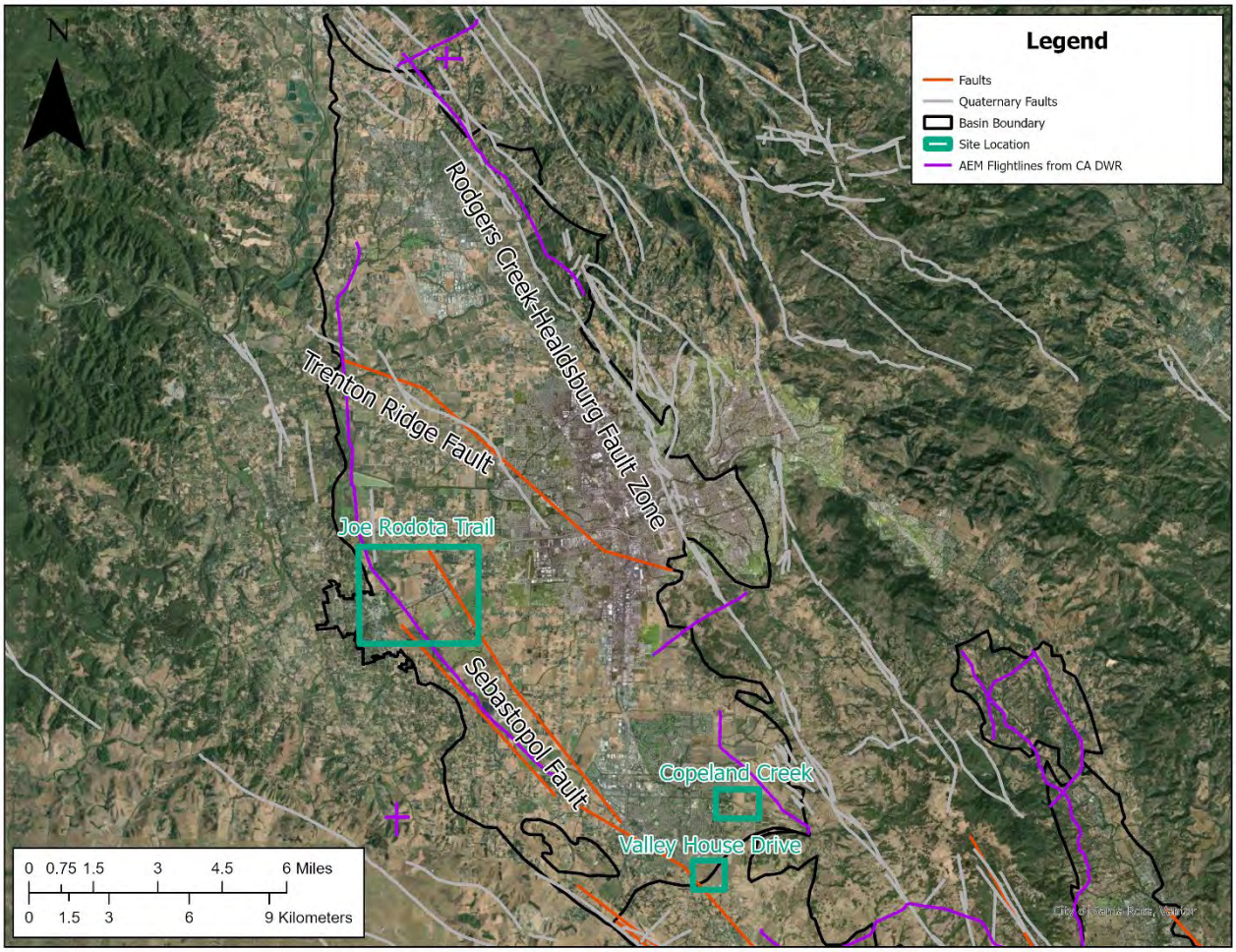


Figure 4: Locations of the three investigation sites.

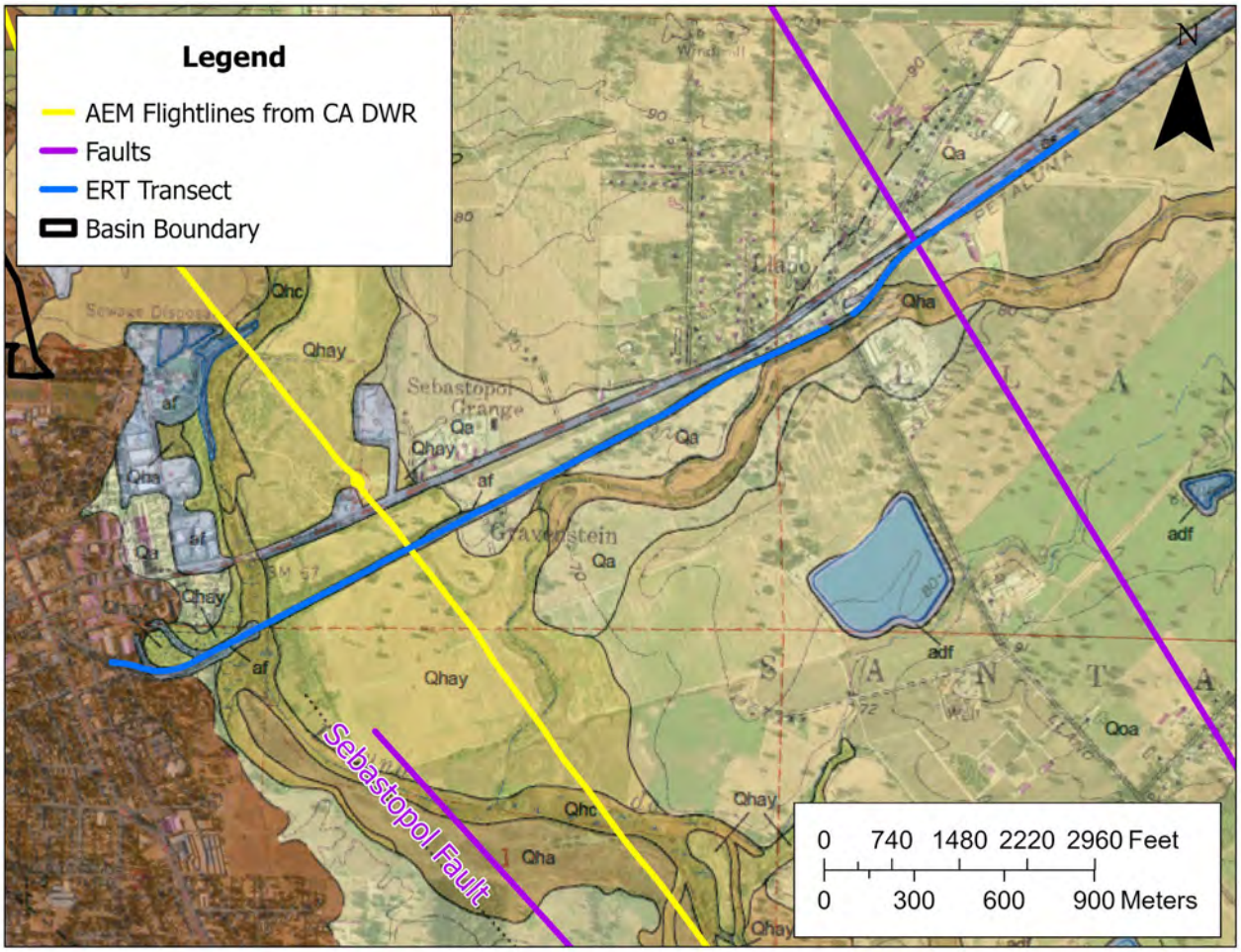


Figure 5: Location for ERT survey to capture variations across the faults east of Sebastopol. The Sebastopol and unnamed faults are represented by the purple lines, and Subbasin boundary by the black line. Geological units from Wagner and Gutierrez (2017), with a legend provided in Figure 3.

Copeland Creek

Copeland Creek is located in the southeastern part of the Subbasin, southwest of the Sonoma Mountains and east of Rohnert Park. It originates in the Sonoma Mountain range, which is primarily composed of the Sonoma Volcanics, and flows toward the City of Rohnert Park, passing through the Sonoma State University campus. As it makes its way downstream, the creek traverses areas with Sonoma Volcanic deposits, Holocene and more recent alluvial fan deposits, as well as modern stream channel materials during periods of active flow. To evaluate both the western boundary of the Sonoma Volcanics and the groundwater recharge potential along the creek, selected sections of Copeland Creek and its floodplain were chosen for detailed surveying (**Figure 6**).

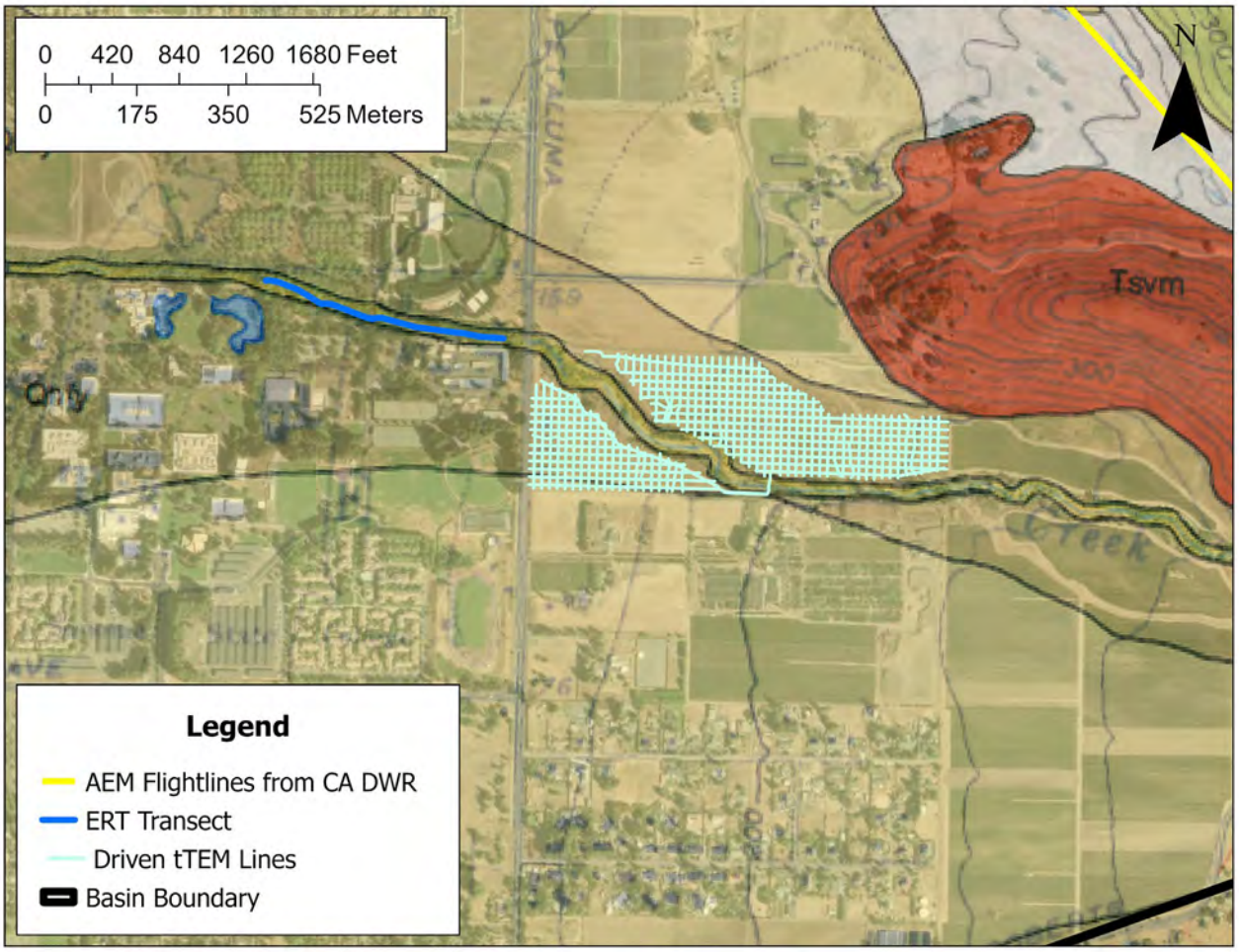


Figure 6: Location for ERT (blue) and tTEM (light teal) survey to evaluate recharge potential, characterize the shallow aquifer, and understand the extent of Sonoma Volcanics. Geological units from Wagner and Gutierrez (2017), with a legend provided in Figure 3.

Parcel South of Valley House Drive

The final site chosen for investigation within the Subbasin was an undeveloped parcel situated south of Valley House Drive, southeast of Rohnert Park. This location lies directly atop the mapped boundary separating the Subbasin from the southern Petaluma Valley Basin. The SRP GSP identifies a significant data gap concerning the characterization of basin boundary conditions, especially regarding the direction and magnitude of water fluxes across subbasin boundaries. Geologic mapping indicates that Pleistocene to Holocene alluvial fan deposits terminate immediately south of the site, transitioning to the Petaluma Formation, with the exception of Lichau Creek, cutting through the formation and trends southeast toward the Petaluma Valley Groundwater Basin. Investigations of subsurface conditions at the mapped boundary, to be contrasted with

surficial mapping, will enhance understanding of subbasin connectivity and influence between the subbasins (**Figure 7**).

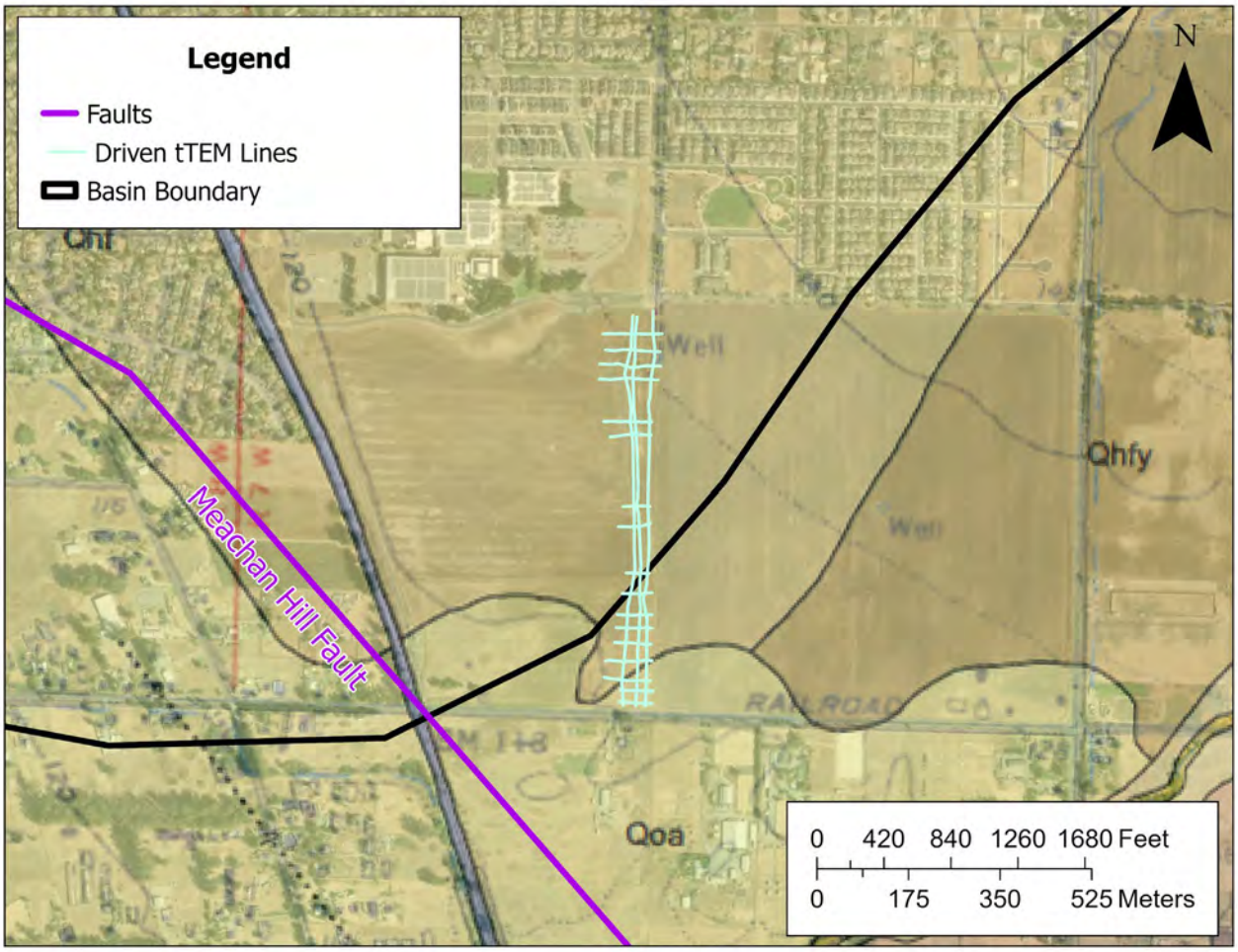


Figure 7: Location for tTEM survey to image variations across the boundary between Santa Rosa Plain Subbasin and Petaluma Valley Basin. The Meachan Hill Fault is represented by the purple line and southern Subbasin boundary by the thick black line. Geological units from Wagner and Gutierrez (2017), with a legend are provided in Figure 3.

Method Selection

The Collier/Ramboll team evaluated two geophysical techniques for subsurface investigations within the Subbasin: towed time-domain electromagnetics (tTEM) and electrical resistivity tomography (ERT). The ERT method was selected for sites where the presence of high-voltage transmission lines posed significant concerns, where operating an all-terrain vehicle (ATV) within the study area was not feasible, or when there was a focus on characterizing the deeper aspects of the site's hydrogeological framework. Conversely, the tTEM method was utilized in areas with minimal electromagnetic interference, where investigation of shallow subsurface features was

prioritized, assessment of recharge potential was required, or when three-dimensional imaging was necessary. For detailed explanations of the methodologies elected, please refer to the main portion of the report.

Survey Design and Acquisition

tTEM

The tTEM surveys were carried out in two parts and were performed at Valley House Drive on July 22nd and at Copeland Creek on September 29th.

Location maps of the tTEM survey paths for selected sites in the Subbasin are shown in **Figure 8**. At the Valley House Drive parcel, tTEM lines were planned in a 15 by 30 m grid with 15 m spacing between north-south lines and 30 m between east-west transects. At the Copeland Creek location, 15 by 15 m gridding was used across the site on both sides of the creek. This dense spacing allowed for detailed mapping of geological variations not only along individual survey lines but across the entire site, given its importance for recharge analysis. While the conceptual planning lines served as the initial survey path, it is important to note that the planning phase relied on a desktop study utilizing Google Earth and GIS software. However, once in the field, the operator exercises discretion regarding safe and effective towing of the system, which may lead to deviations from the planned lines.

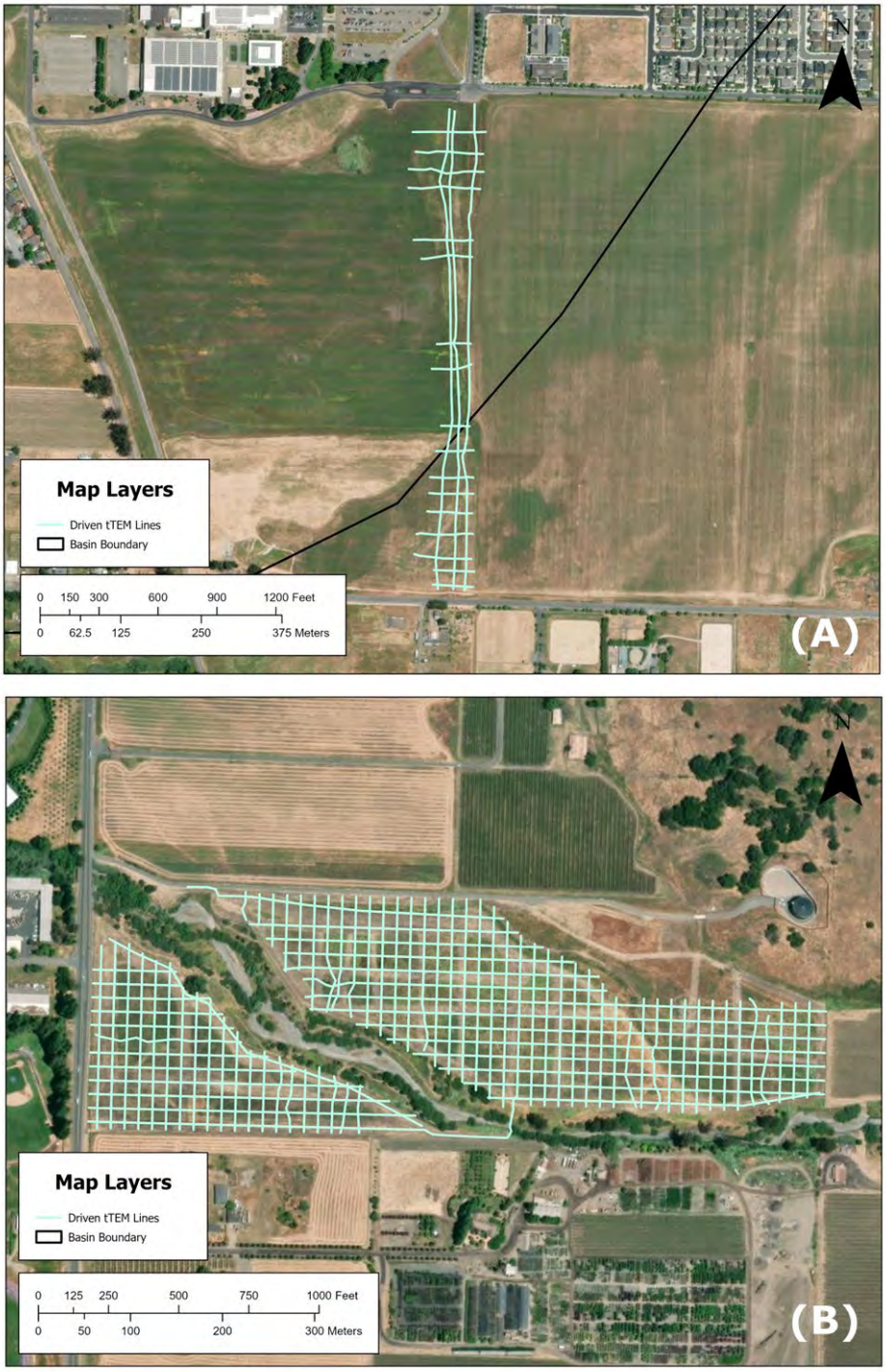


Figure 8: Completed tTEM lines for (A) Valley House Drive site and (B) Copeland Creek site.

ERT

ERT investigations at Joe Rodota Trail were conducted on July 21st, 22nd, and 25th. Electrodes were placed every 10 m for an active array length of 950 m (~3,117 ft). Where lines exceeded the active array length, a roll along manner was used to achieve the total line length The crew experienced a high volume of interactions with the public. **Figure 9** shows where the Joe Rodota Trail ERT lines were completed.

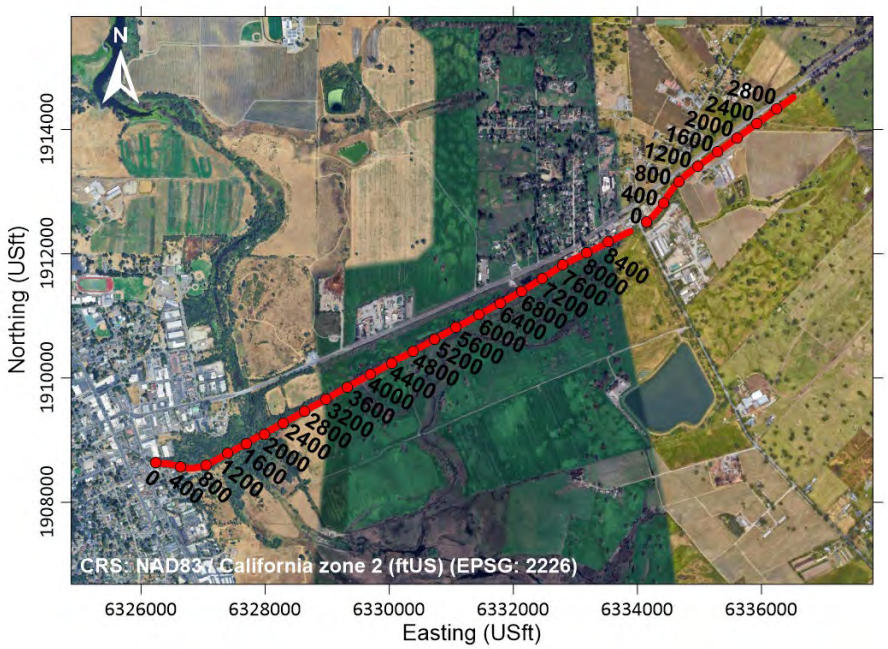


Figure 9: Joe Rodota Trail ERT lines (red) with intervals.

The Copeland Creek ERT survey was conducted on July 29th. Electrodes were placed every 5 m, for an array length of 475 m (~1,558 ft). The eastern extent of the Copeland Creek ERT line was limited due to private properties. **Figure 10** shows where the Copeland Creek ERT line was completed.

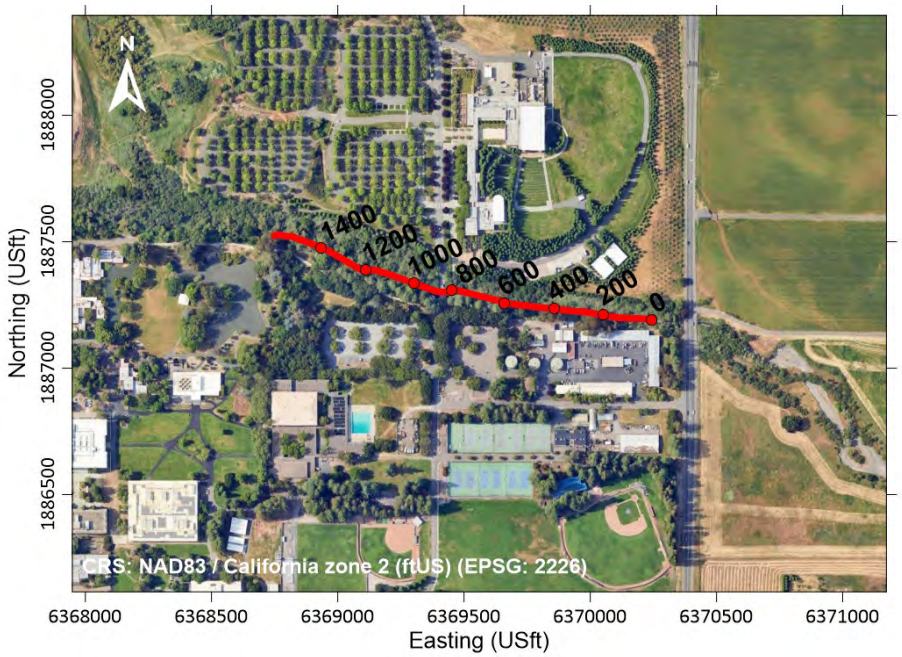


Figure 10: Copeland Creek ERT line (red) with intervals.

Instrumentation Issues

tTEM

No instrumental issues occurred during the tTEM survey.

ERT

No instrumental issues occurred during the ERT surveys.

Weather

tTEM

The weather remained stable during the two days tTEM acquisition was performed. The morning and afternoon were generally cloudy with occasional showers with temperatures ranging between the low 50s and high 60s Fahrenheit by the afternoons. Wind speeds between 0-5 mph were observed.

ERT

During data collection, the weather was cool and dry in the morning with sunny and warm temperatures by early afternoon. The ERT system was kept cool and within acceptable instrument temperature ranges throughout the project.

Quality Control During Survey

tTEM

The team assembled the tTEM system at staging locations at each respective site in the mornings of July 22nd and September 29th. During each start-up, the system was carefully inspected to ensure that all parts, including wires, bolts, and knots were intact and secure. When the system was fully up and running, the GPS and TEM transmitter and receiver were checked.

The data were quality control checked at the end of day and a simple data analysis was performed. The results demonstrated consistency and a good signal to noise ratio. No problems were found during the quality control checks of the data.

Short segments of tTEM lines (test lines) were repeated during the survey. The results of the repeated survey lines demonstrated high repeatability of the system and consistency of the inversion schemes.

ERT

Before collecting the ERT surveys, quality control measurements in the form of resistance checks were performed to ensure strong coupling between the electrodes and the ground surface. When an electrode was not within the acceptable contact resistance range (< 5 K Ohm), several tactics were used to improve the coupling. These tactics included saturating the electrode site with salt water, ensuring there was no corrosion at the contact points, and placing several electrodes at each takeout. If an acceptable resistance value could not be achieved, then that electrode was removed from the array during acquisition to prevent noise in the data.

4.0 Overview of tTEM Data and Data Inversion

This section provides an overview of the data and data inversion process for the tTEM surveys. The measured data are modelled to represent the electrical resistivities at different depths, which can then be interpreted as coarse- and fine-grained sediments to understand geology. The results are presented as plan-view maps and vertical cross sections. **Figure 11** shows a location map of the tTEM accepted averaged data for inversion/modeling. **Figure 12** shows a location map of the tTEM depth of investigation (DOI) across the sites. Additional details on the DOI are provided in Section Processing and Inversion in the main portion of the report.

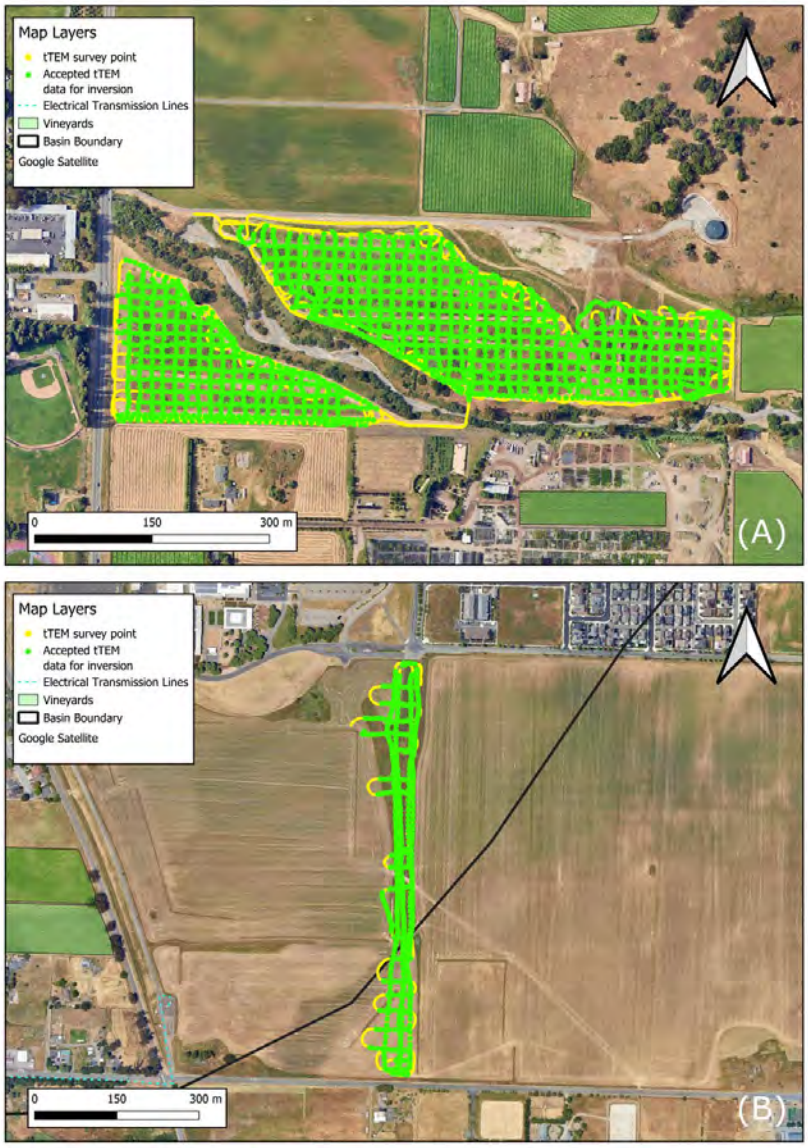


Figure 11: Location map of tTEM accepted average data for inversion at (A) Copeland Creek site and (B) Valley House Drive site.

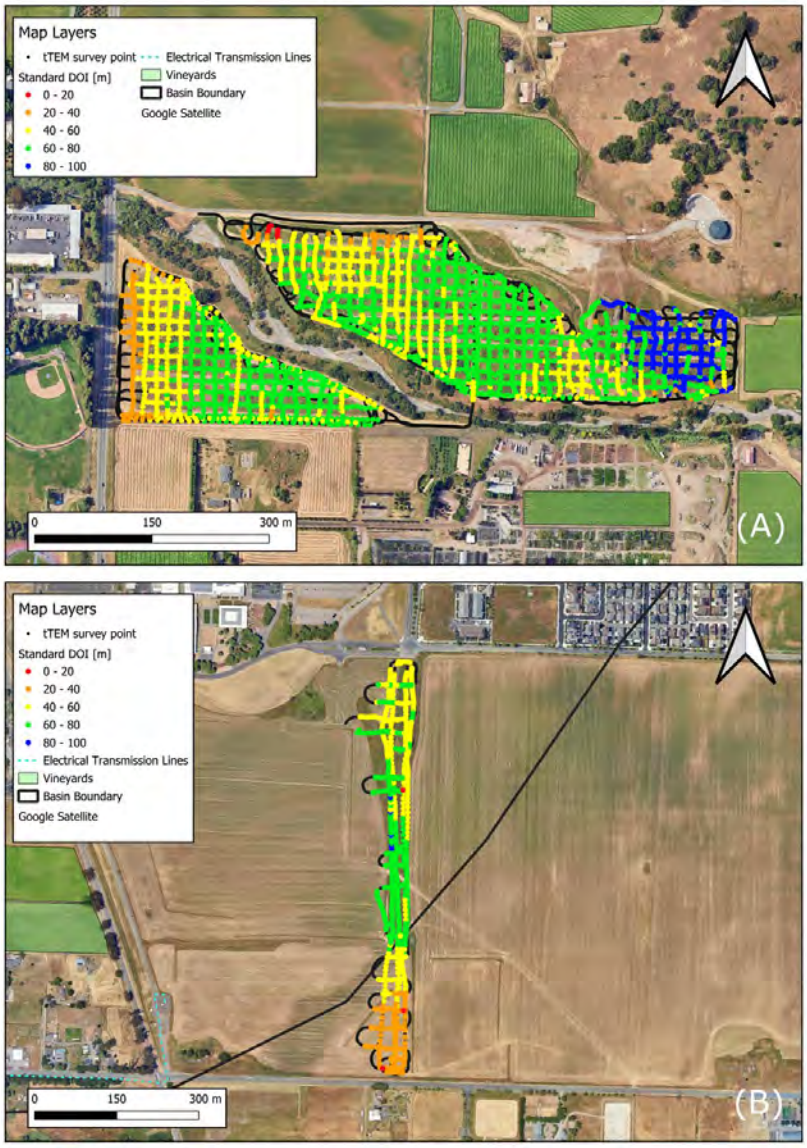


Figure 12: Location map of the tTEM depth of investigation (DOI) at (A) Copeland Creek site and (B) Valley House Drive site.

Figure 13 shows the residuals, or data fit, of the tTEM results for the survey. The data residual is a way to assess if the forward response of the resistivity model obtained from the inversion of the tTEM data fit the data within their standard deviations. If the residual was high (much larger than 1.0) meaning the data fit was poor, the forward response from the model would not match the measured response well. Poor data fit might be seen in areas with a lot of 3D structures or in areas with a high noise level. For the most part, the residual values were low (<= 1.0) meaning the data fit was good overall.

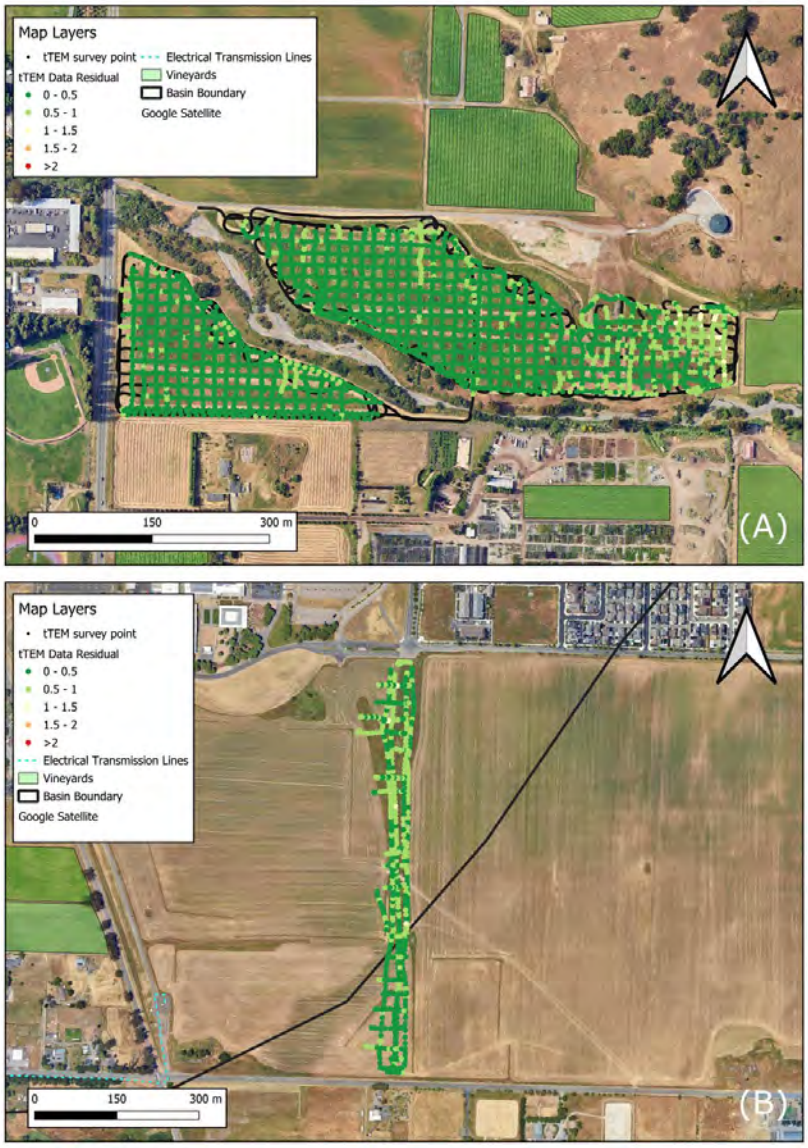


Figure 13: Location map of the tTEM residual at (A) Copeland Creek site and (B) Valley House Drive site.

Another useful measure in assessing the inversion results is to review the number of data points (**Figure 14**). This metric gives an indication of how many data points are left after data processing, for example, after removal of late-time noise and coupling. The more data points, the better the signal to noise ratio and the more reliable the inverted models, particularly at depth. Typically, a lower number of data points are noted in more highly resistive areas. While there is no defined minimum threshold for data points, inversions were only performed on soundings for which at least 3 data points were present in both the low and high moments (i.e., six total).

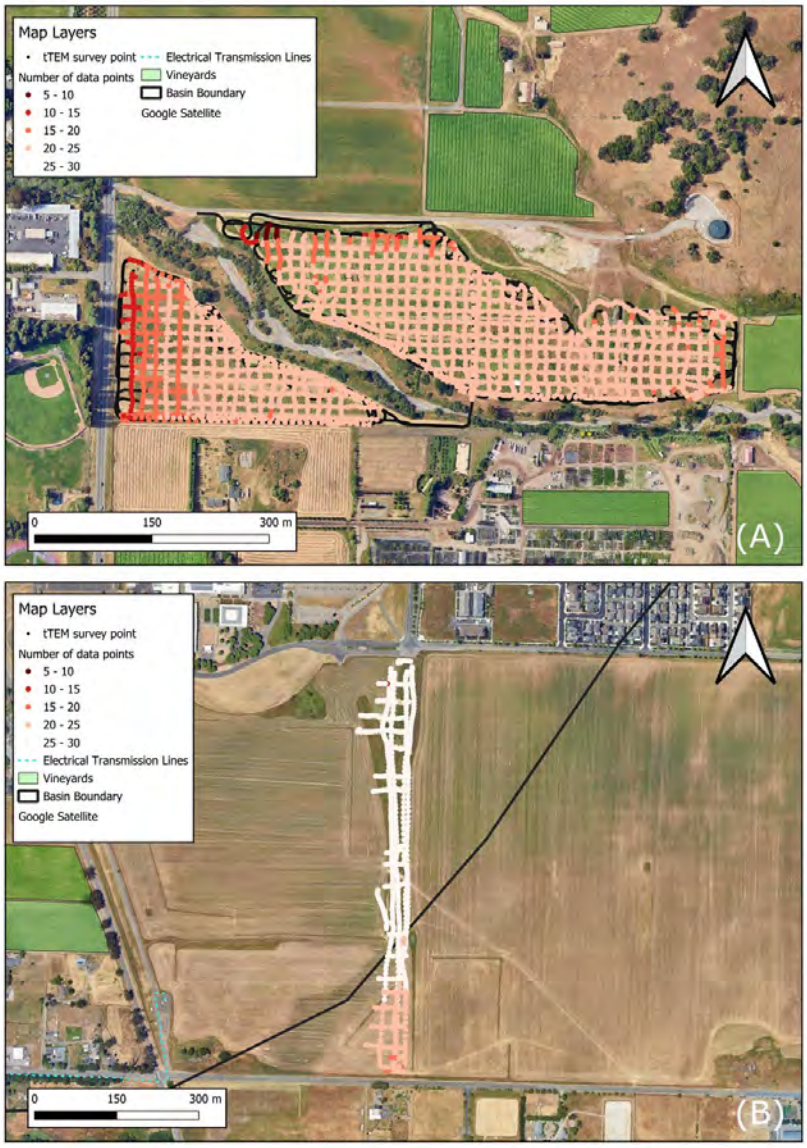


Figure 14: Location map of the number of data points used in inversion at (A) Copeland Creek site and (B) Valley House Drive site.

Appendix 1 presents mean resistivity plan-view maps at different depth intervals. Mean resistivity maps illustrate detailed structures and provide insight about variations across the surveyed area at each interval. Plan-view maps can be an especially useful tool where data are acquired in a dense grid, such that the plan-view results can be visualized as a continuous image.

Mean resistivity maps are presented as depth slices at various depths from the terrain. The following depth intervals have been applied. Figure 15 shows an example of a mean resistivity map at Copeland Creek for depth interval 65.6 to 82.0 feet (20 -25 m).

1. From 0 m to 10 m (0-33 ft) in depth intervals of 2 m (7 ft)
2. From 10 m to 40 m (33-131 ft) in depth intervals of 5 m (16 ft)
3. Below 40 m (131 ft) in depth intervals of 10 m (33 ft)

The tTEM vertical resolution is high in the shallow subsurface and decreases with depth as can be seen in Table 1. In the immediate near surface, the tTEM system can resolve features as thin as a meter (3.3 feet). With increasing depth, this resolution decreases, and thinner features cannot be resolved. A fine depth discretization has been chosen to enable illustration of the textural variations across the study area and hence avoid oversimplified representation of the geology. As mentioned above, the DOI depends on the variations in data quality, noise and geology and varies for each inverted model. Data below the determined depth of investigation have been removed, which may cause the appearance of missing data in the deepest intervals.

Layer Number	Thickness [m]	Thickness [ft]
1	1	3.3
2	1.1	3.6
3	1.2	3.9
4	1.3	4.3
5	1.4	4.6
6	1.5	49
7	1.7	5.6
8	1.8	5.9
9	2	6.6
10	.21	6.9
11	2.3	7.5
12	2.5	8.2
13	2.8	9.2
14	3	9.8
15	3.3	10.8
16	3.5	11.5
17	3.9	12.8
18	4.2	13.8
19	4.6	15.1
20	5	16.4
21	5.4	17.7
22	5.9	19.4
23	6.4	21.0
24	7	23.0
25	7.6	24.9
26	8.3	27.2
27	9	29.5
28	9.8	32.2
29	10.6	34.8
30	Until DOI	Until DOI

Table 1: tTEM resolution, measured in meters, for a 30 layer model.

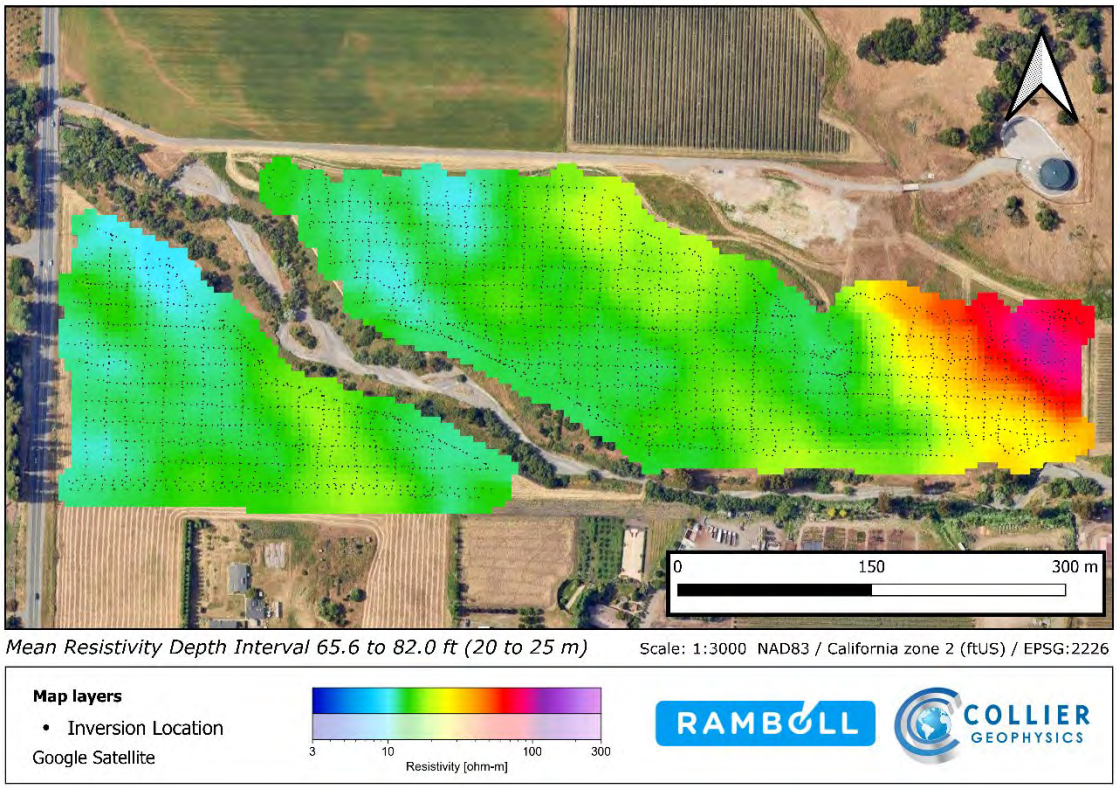


Figure 15: Sample mean resistivity map at Copeland Creek at depth intervals 20 to 25 m (65.6 to 82 ft).

Appendix 2 presents vertical sections displaying resistivity models along different lines across the surveyed areas. For each profile, 1D resistivity soundings were projected onto the profile within a 1-m (3.3 ft) distance. Consequently, models from different lines may overlap or show slight variations. Nonetheless, detailed structural variations are observed along each section. The resistivity models are faded below the DOI. The information below the DOI still may be useful, but interpretation of resistivity values below the DOI is cautioned. Each page of the appendix displays the resistivity of the subsurface along a profile, shown in the location map in the top-left of the page. Distances along the path and profile are included to correlate subsurface information with its geographical location. A regional map, shown in the top-right of the page, indicates the bounds of the location map. A legend is provided explaining layers on the location map. An example of a vertical section set of panels is shown in Figure 16**.**

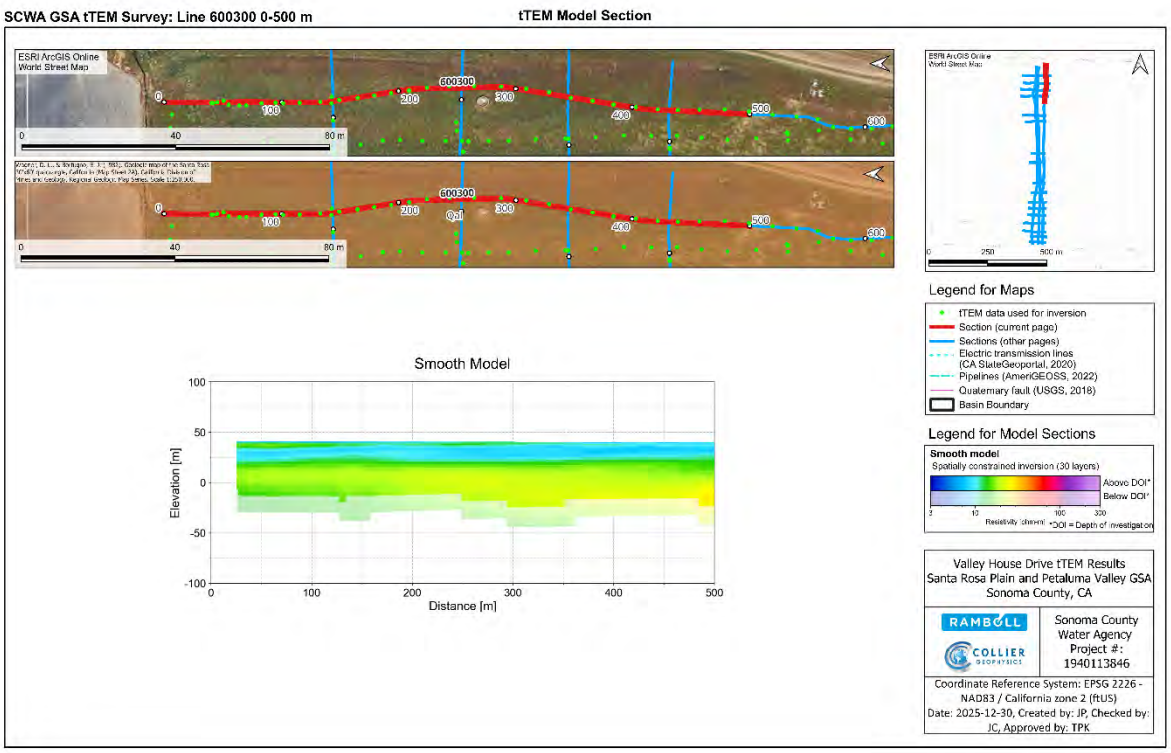


Figure 16: Example of vertical section set of panels.

5.0 Results and Interpretation

The results and interpretation of the geophysical investigations conducted at the three sites in the Subbasin are summarized in this section.

Joe Rodota Trail

The objective of the ERT investigation along the Joe Rodota Trail was to image the Sebastopol Fault and to characterize the differences between aquifer materials on either side of the fault.

The Joe Rodota Trail ERT results show high resistivity (50-250 Ohm-m) materials close to the surface in the west and dipping to -300 ft in elevation at 5,500 ft along the eastern end of the line. These resistivity values indicate coarser materials (**Figure 17**). This is consistent with the Wilson Grove formation, which is mostly massive marine sandstone and pebbly sandstone, that transition to continental deposits that are coarser grained. This layer of coarse material is overlain by a low resistivity (0-40 Ohm-m) layer of finer-grained material. This finer-grained layer is between 50 ft and -200 ft in elevation between the bridge and the steel pipe aqueduct. This finer grained material

dominates the eastern side of the line. There is a thin layer of mildly resistive (20-45 Ohm-m) material present at 0 ft in elevation east of the utility.

The Sebastopol Fault may be at the location of the bridge, inferred from the fact that the Wilson Grove Formation is deeper on one side (east) than the other (west), which could be a result of normal fault movement.

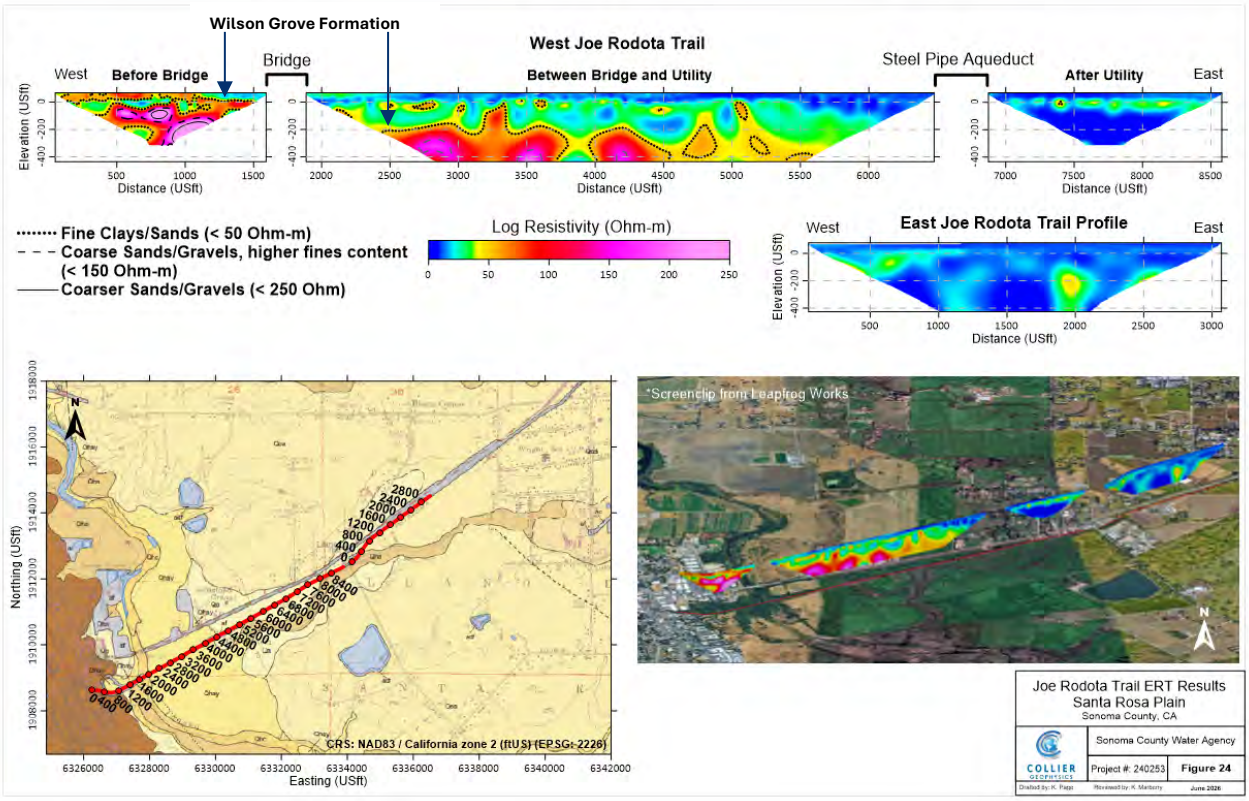


Figure 17: Joe Rodota Trail ERT Results Interpretation. Geological mapping from Wagner and Gutierrez (2017).

Copeland Creek

The objectives of the ERT and tTEM investigations at Copeland Creek were to identify the distribution of shallow clay deposits, which may inhibit recharge, and location of higher permeability shallow deposits, as well as to characterize the transition from alluvial sediments to volcanic units. ERT data were collected on the eastern side along the creek and tTEM data were collected west of the ERT data in the floodplain (Figure 6).

ERT – Eastern Area

The Copeland Creek ERT results show the profile has generally highly resistive (10-60 Ohm-m), lithology that extends down more than 100 feet below ground surface (**Figure 18**). A thin layer (~15ft) of very resistive (35-60 Ohm-m) material is present at the surface of the profile. Below this layer, at approximately 125 ft in elevation, there is evidence of a thin and discontinuous layer (~5-15 ft) of low resistivity (0-10 Ohm-m) fine-grained material. Large pockets of low resistivity (0-10 Ohm-m) fine-grained material are present below 0 ft in elevation. Based on those results, Copeland Creek presents a strong recharge potential based on high resistivity units being connected (~100ft thick), but requires avoiding or engineering through the near surface, thin fine-grained unit.

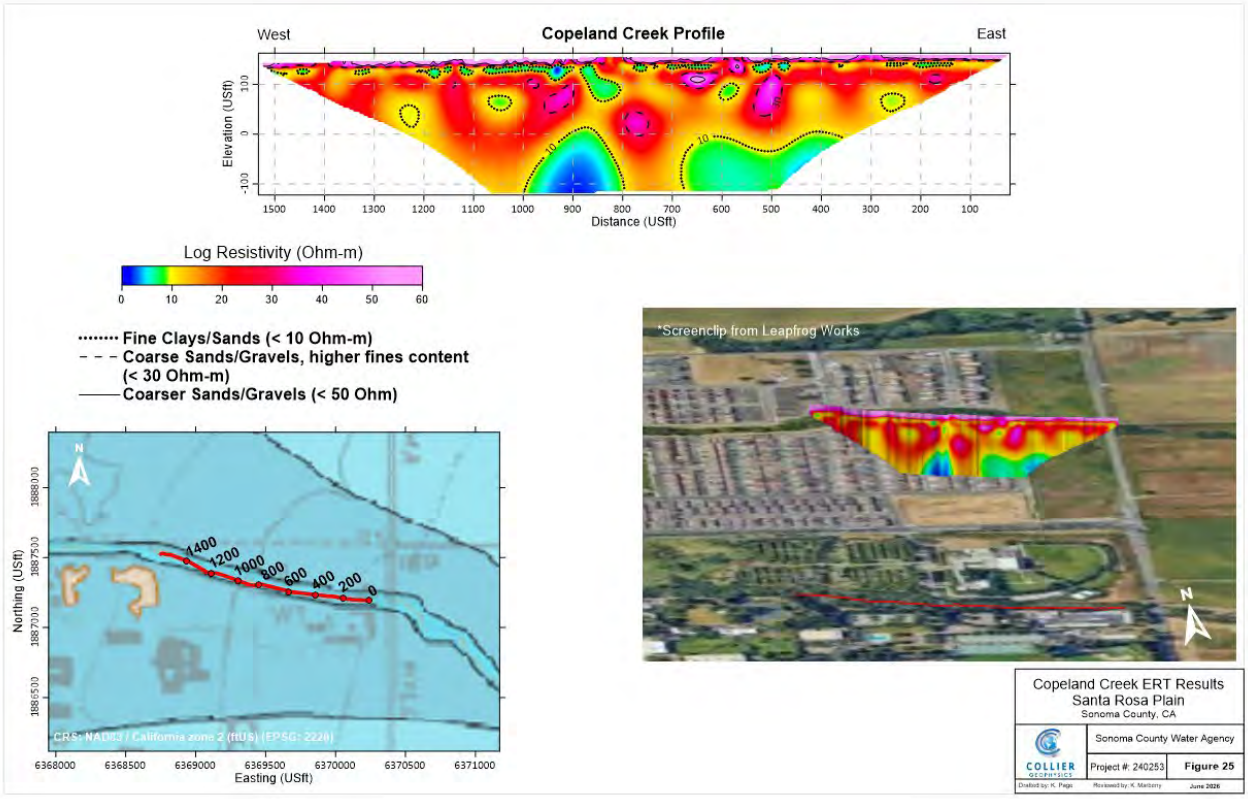


Figure 18: Copeland Creek ERT Results Interpretation. Geological mapping from Wagner and Gutierrez (2017).

tTEM – Western Area

The Copeland Creek tTEM results indicate layered geology of interchanging channel deposits and floodplain deposits, with high resistivities displaying a channel-like geometry suggestive of former tributaries in the area. **Figure 19** and **Figure 20** present two north-south transects located north and south of the creek, respectively. Both profiles reveal comparable resistivity distributions on either side of the creek, indicating a generally stratified geology. In each case, a conductive layer is situated between two medium-to-high resistivity layers before transitioning to another conductive feature at the DOI. Values in the two resistive units range from 10 to 45 Ohm-m, with higher

resistivities observed in the northern transect (**Figure 19**). The thickness of these resistive units varies between 12.5 and 25 meters (41 and 82 feet), with thinning noted towards the north in the northern transects. The initial conductor (<10 Ohm-m), identified at approximately 50 meters elevation, is consistently thin, about 6 meters (20 ft) thick across most of the site, but thins away from the creek towards the eastern and western boundaries. The second conductor, exhibiting similar resistivity characteristics, is found lower in the section between 12 to 25 meters elevation (40 to 82 ft) and is more pronounced in the northern areas. Although it is challenging to determine the exact thickness of this layer due to the limitations of the resistivity models before reaching DOI, it is estimated to be up to 30 meters (100 feet) thick.

While coarse materials are noted at the surface and are beneficial for a surface spreading recharge operation and are noted to be in connection with the shallow aquifer, if recharge is wanted in the deeper aquifer, this effort may be complicated by the fine-grained layers at around 15-20 m (50-65 ft) and below 40 m (130 ft), as illustrated in **Figure 21** and **Figure 22**.

The deeper coarse materials appear to be in contact with the deeper aquifer and the site presents opportunities for recharge but the tTEM results do not appear to suggest a direct connection to the surface. The closet connection with the near surface to the deeper aquifer is to the east/northeast of the site where sediments coming off the hill may act as “mountain front” recharge but this is not strongly supported. Additionally, there is the complication of volcanics present in this area, as further described below.

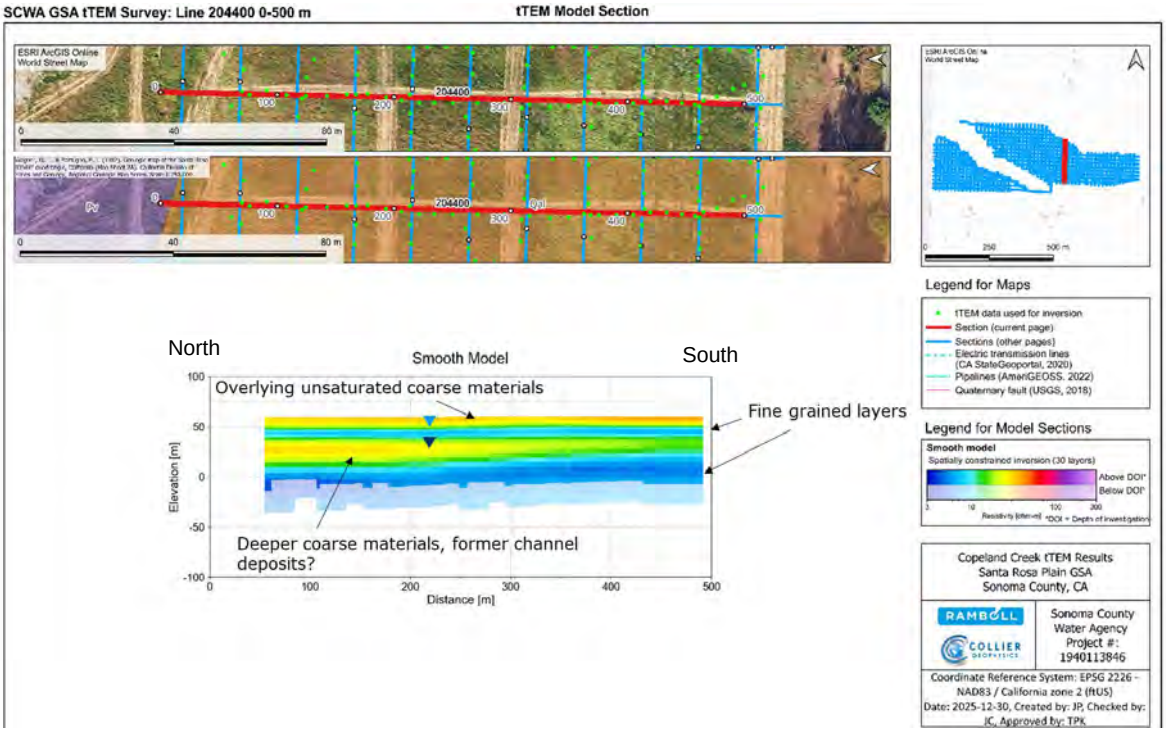


Figure 19: Copeland Creek interpreted tTEM. Profile: 205500 0-500 m.

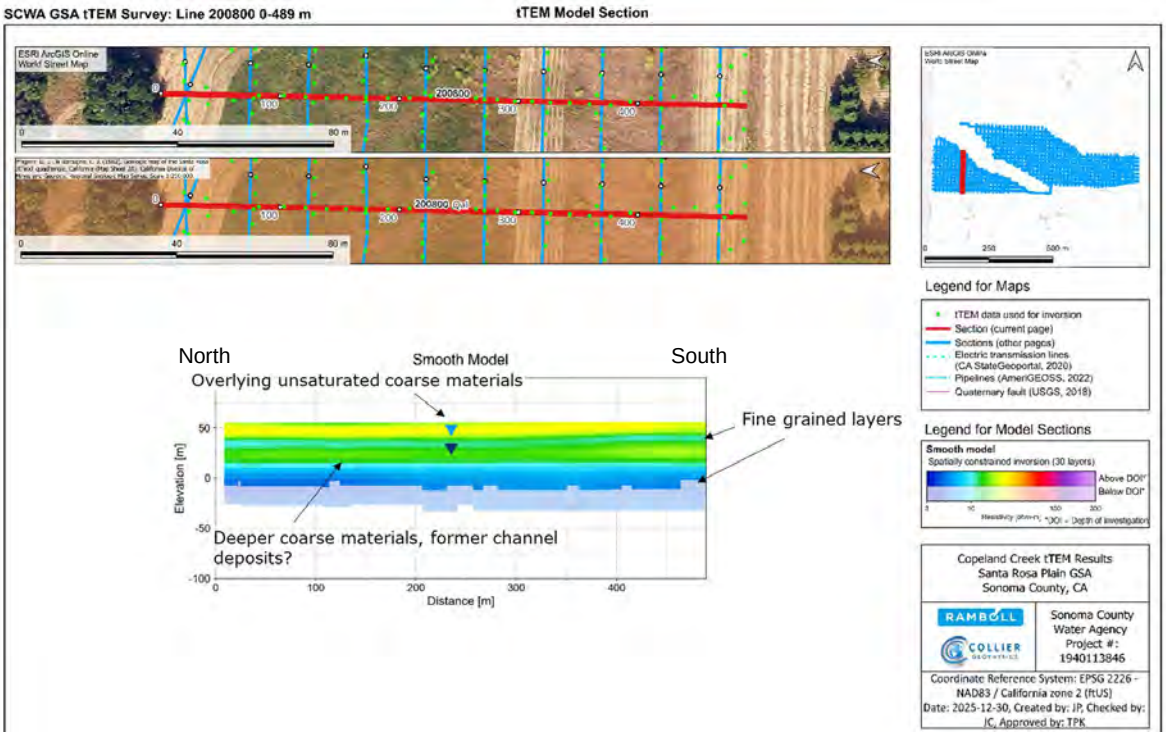


Figure 20: Copeland Creek interpreted tTEM results: Profile 300400 1800-2300 m.

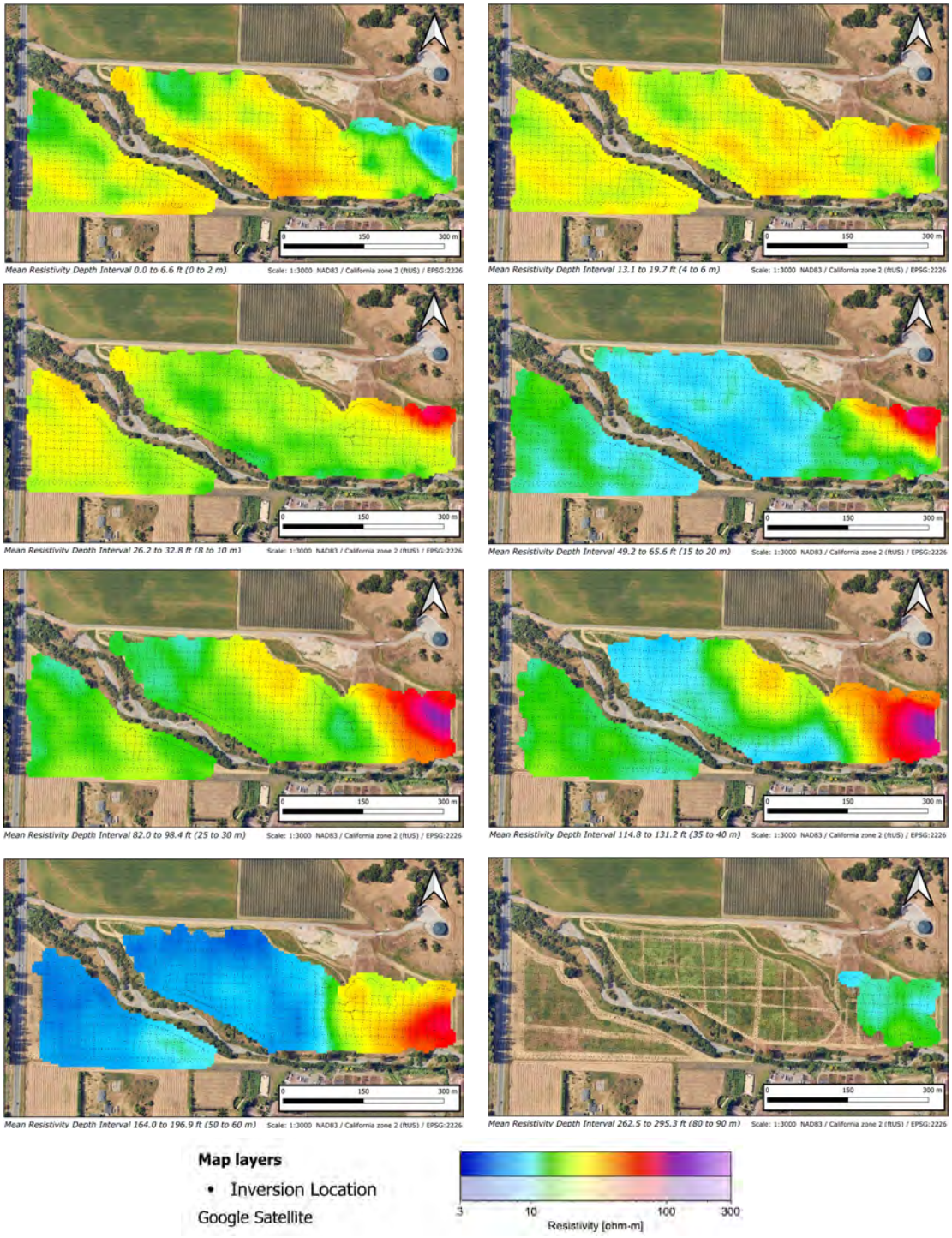


Figure 21: Mean Resistivity Maps at Copeland Creek

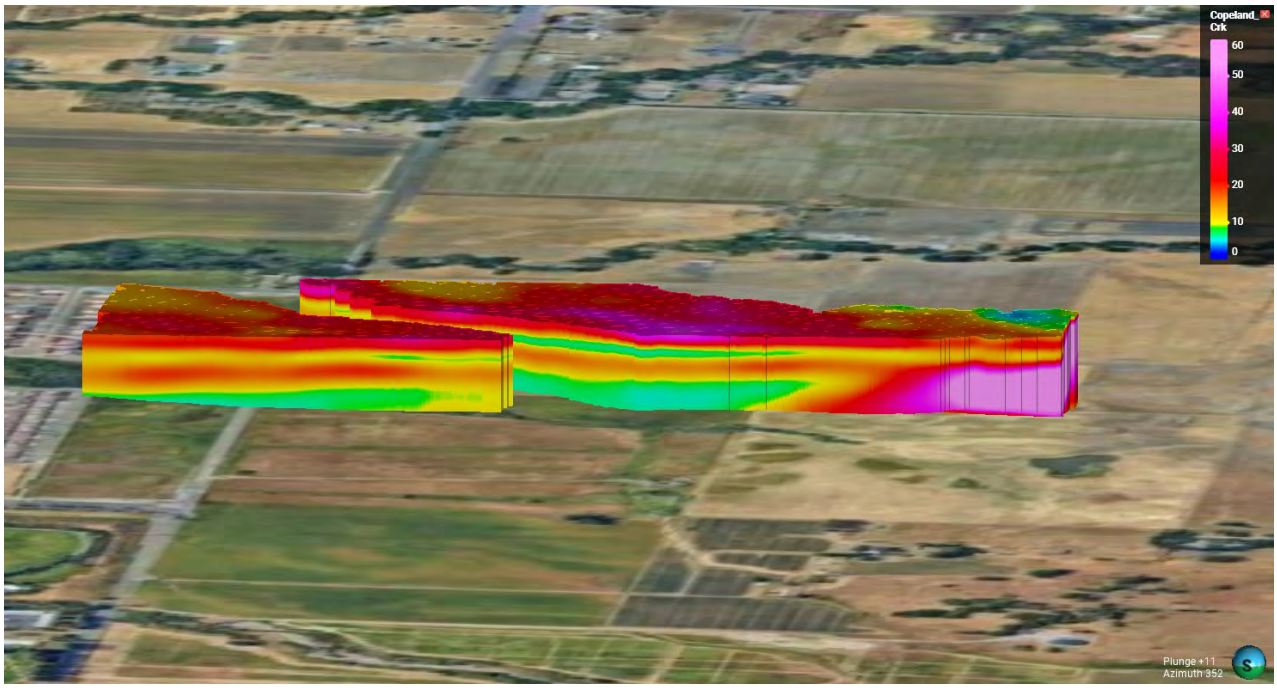


Figure 22 Leapfrog view of the 3D tTEM results at Copeland Creek

Figure 23 and **Figure 24** present north-to-south and west-to-east transects, respectively, within the eastern portion of the site south of the hills. These two eastern profiles highlight a significant contrast compared to the previous ones (**Figure 18, Figure 19,** and **Figure 20**). In both **Figure 23** and **Figure 24** profiles, a prominent resistive unit dominates most of the section, with resistivity values exceeding 60 Ohm-m and, at times, surpassing 100 Ohm-m. In the north-south oriented transect (**Figure 23**), the resistive layer appears higher in the section, situated beneath a thin conductor measuring about 1 to 2 meters (3.3 to 6.6 feet) thick, and the resistive layer itself has a thickness of 25 meters (82 feet) in the shallow subsurface. As it dips to the south, its thickness increases to as much as 45 meters (148 feet), but it becomes slightly thinner further to the south and west, remaining consistently present at approximately 25 meters (82 feet) in elevation. These high resistivity values represent the volcanics which are identified just south of where they are mapped in the local geological map. The volcanics appear to be competent closest to the hill but moving away from it, it is inferred a weathered surface exists and is in contact with creek deposits. In some sections, it appears that the creek deposits onlap onto the weathered volcanic materials. Below this resistive unit, roughly 5 meters (16 feet) below sea level, the previously identified thick conductive layer reappears and continues until most resistivity models reach their DOI.

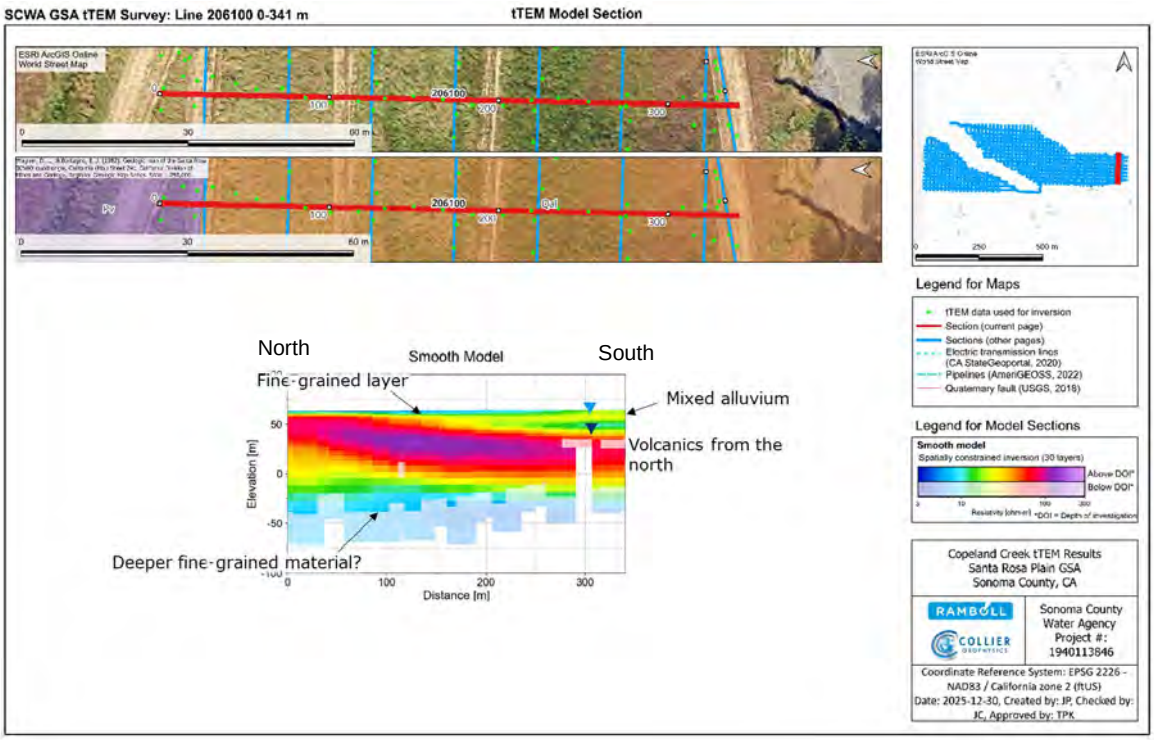


Figure 23: Copeland Creek interpreted tTEM results. Profile 206100 0-341 m.

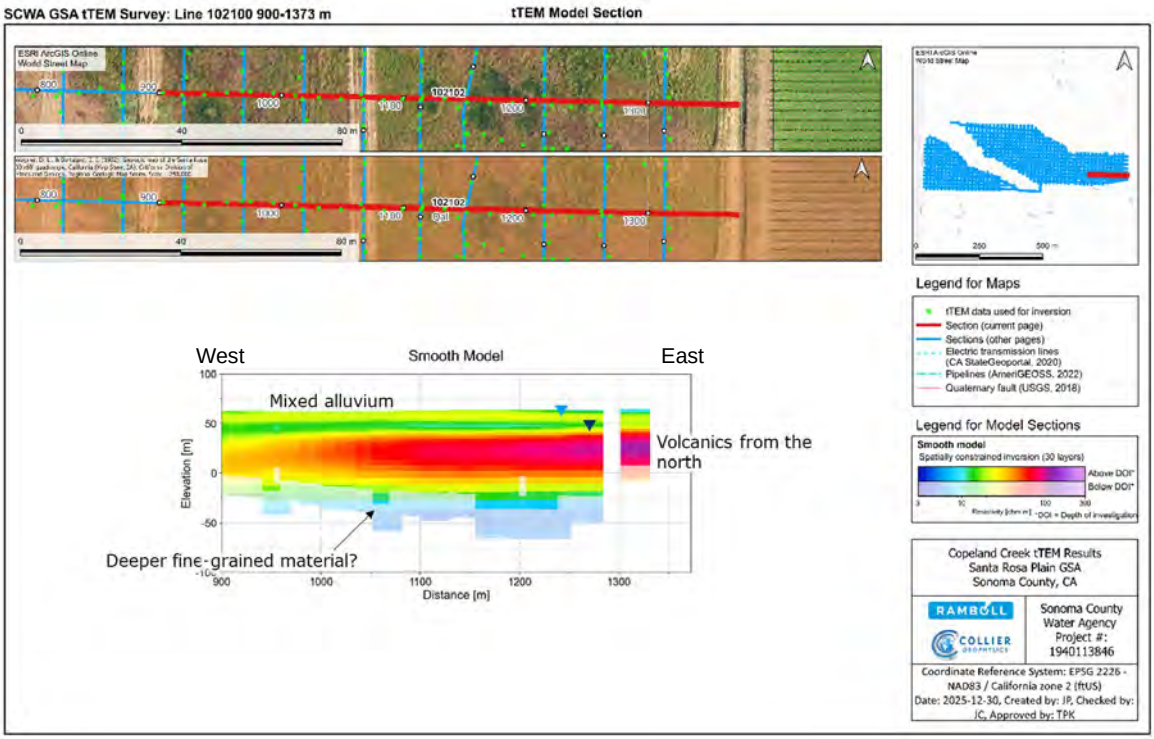


Figure 24: Copeland Creek interpreted tTEM results. Profile 102100 900-1373 m.

Valley House Drive

Valley House Drive tTEM results were evaluated to better understand basin boundary hydrogeology between the Subbasin and Petaluma Valley.

Similar results are observed throughout the site and illustrated in **Figure 25:**

- The near surface (uppermost 10 m [33 ft] with some variation in thickness across the area) is mainly fine-grained indicated by low resistivity values (less than 15 Ohm-m), with occasional coarser lenses.
- Around an elevation of 25 meters (82 feet), the range of resistivities increases, generally exceeding 20 Ohm-m and reaching up to 35 Ohm-m. This higher resistivity appears as a relatively uniform layer of coarse deposits aligning with aquifer material, which is about 30–35 meters (98–115 feet) thick, although, in regions with deeper DOI, this resistor layer can be up to 50 meters (164 feet) thick. This layer is consistently observed throughout the site and may taper toward the south; however, most resistivity models reach their DOI before a definitive conclusion can be made.
- Where the DOI extends below these coarse deposits, resistivity values drop below 20 Ohm-m, suggesting more fine-grained material or the presence of saline groundwater.

Crossing the basin boundary defined by Bulletin 118 shows no distinct geologic change; only a slight stratigraphic high is visible, dipping slightly north and south from the boundary. There is no resistivity evidence of a fault or separating stratigraphic unit, largely indicating geologic connectivity and absence of geologic barriers to groundwater flow between the basins, particularly in the deeper aquifer, though coverage was limited to mostly north-south transects.

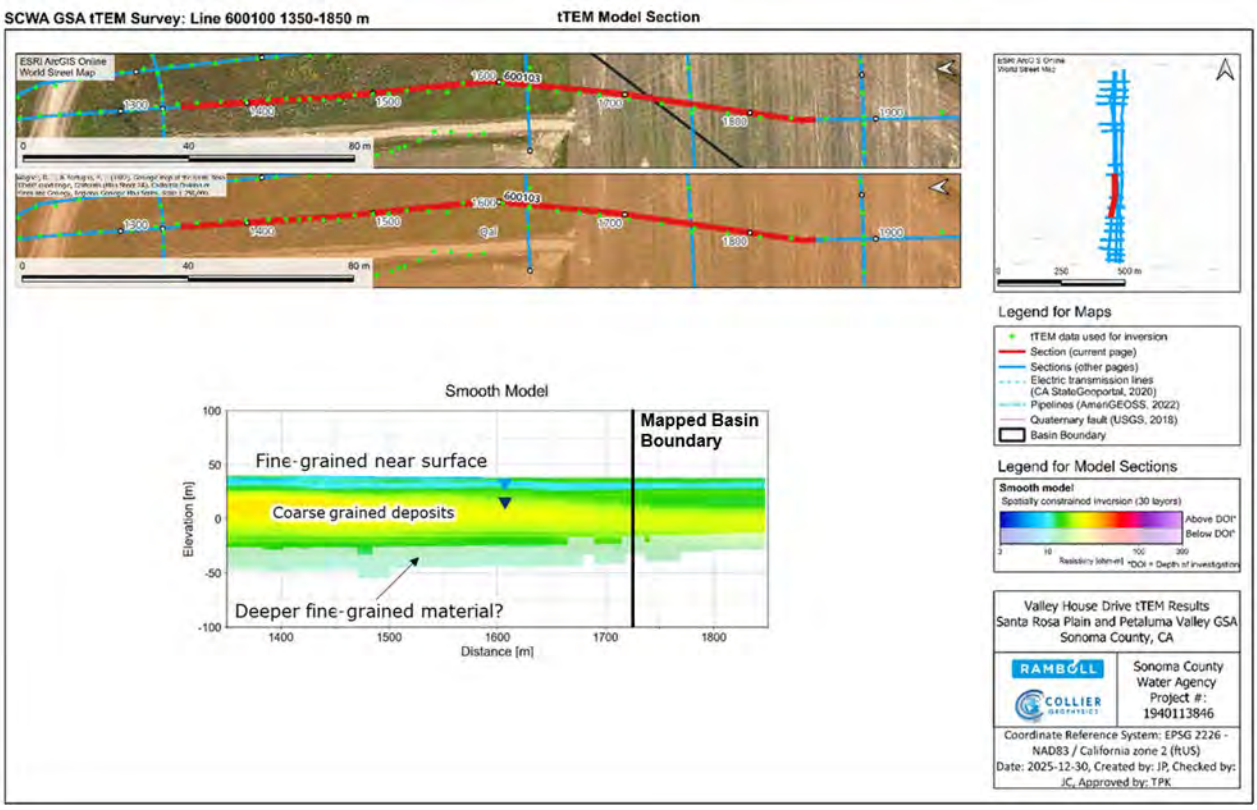


Figure 25: Valley House Drive interpreted tTEM results. Profile 600100 1350-1850 m.

Comparisons with Previously Collected Geophysical Data

Previously collected geophysical data in the Subbasin include AEM data from California's DWR Statewide AEM Survey from Survey Area 3 (see https://data.cnra.ca.gov/dataset/aem for more details).

AEM Survey: Joe Rodota Trail

Airborne electromagnetic (AEM) data from California's DWR Statewide AEM Survey cross perpendicularly to acquired ERT data and provide useful context for interpreting ERT results. **Figure 26** displays a Leapfrog view from the Joe Rodota Trail, where ERT and AEM findings are shown together. Though the surveys do not directly overlap, their results generally support each

other. At their approximate intersection, both indicate a thin conductive unit near surface for the first 200 ft below ground surface, transitioning to more resistive material at greater depths. ERT reaches its DOI around 400 ft bgs, while AEM extends further, continuing the trend and suggesting coarse materials deeper in the subsurface.

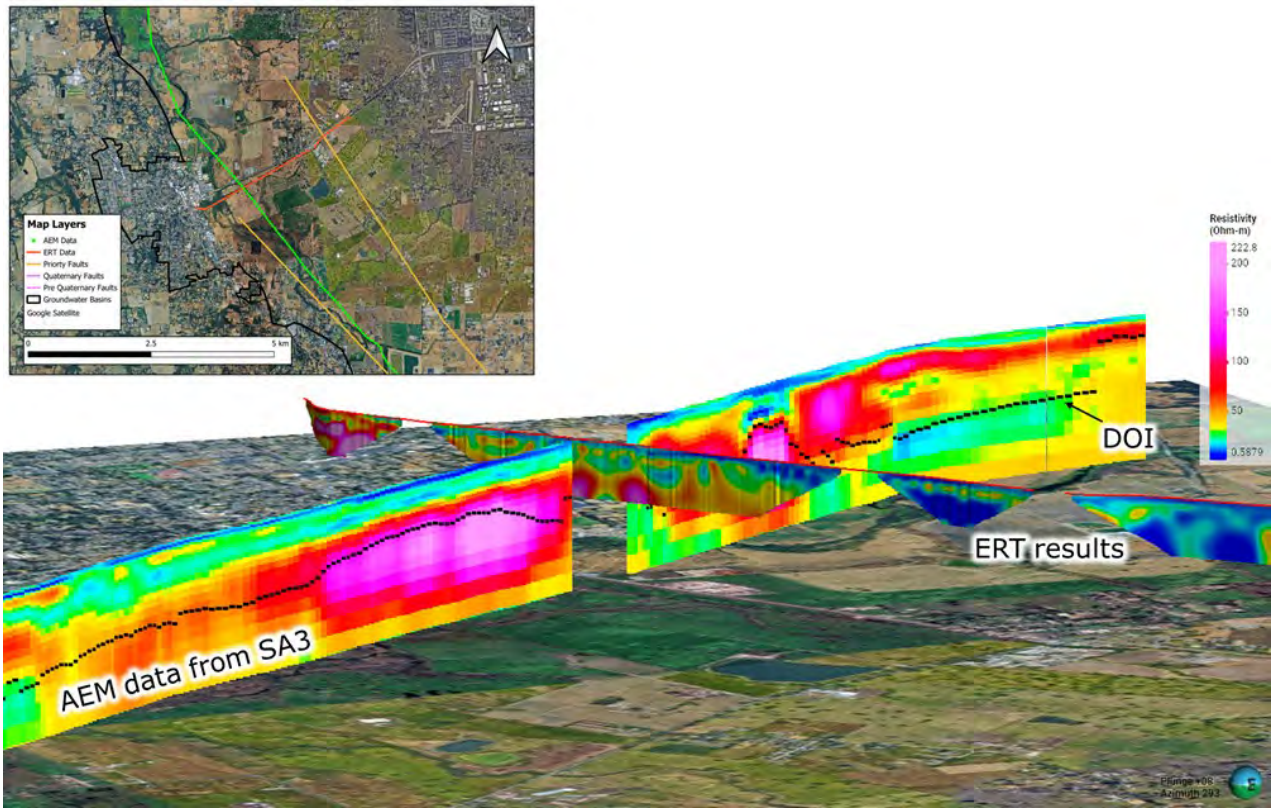


Figure 26: Leapfrog screenshot showing AEM data from DWR Survey Area 3 with ERT from Joe Rodota Trail survey. Black dots represent the DOI for the AEM data. ERT and AEM survey line locations are provided in the inset map at the top left.

AEM Survey: Copeland Creek

The AEM data do not directly overlap with either the ERT or tTEM surveyed locations, but are located just to the northeast of Copeland Creek. **Figure 27** presents a Leapfrog view of Copeland Creek showing all three datasets together, each with matching resistivity scales. While there is no direct survey overlap, resistivity trends align across the methods, and the AEM results may help explain the patterns observed in the ERT and tTEM data. The AEM models near land-based surveyed locations indicate extremely resistive subsurface conditions in the hills northeast of Copeland Creek, with resistivity decreasing toward the valley. These high-resistivity signatures in the AEM models are believed to correspond to the Sonoma Volcanics east of the site, where the

creek's headwaters begin. These formations likely constitute the parent materials being surveyed by the ERT and tTEM methods further downstream. It also appears in the easternmost tTEM results (**Figure 24**) that the Sonoma Volcanics dive to the west beneath the alluvial sediments.

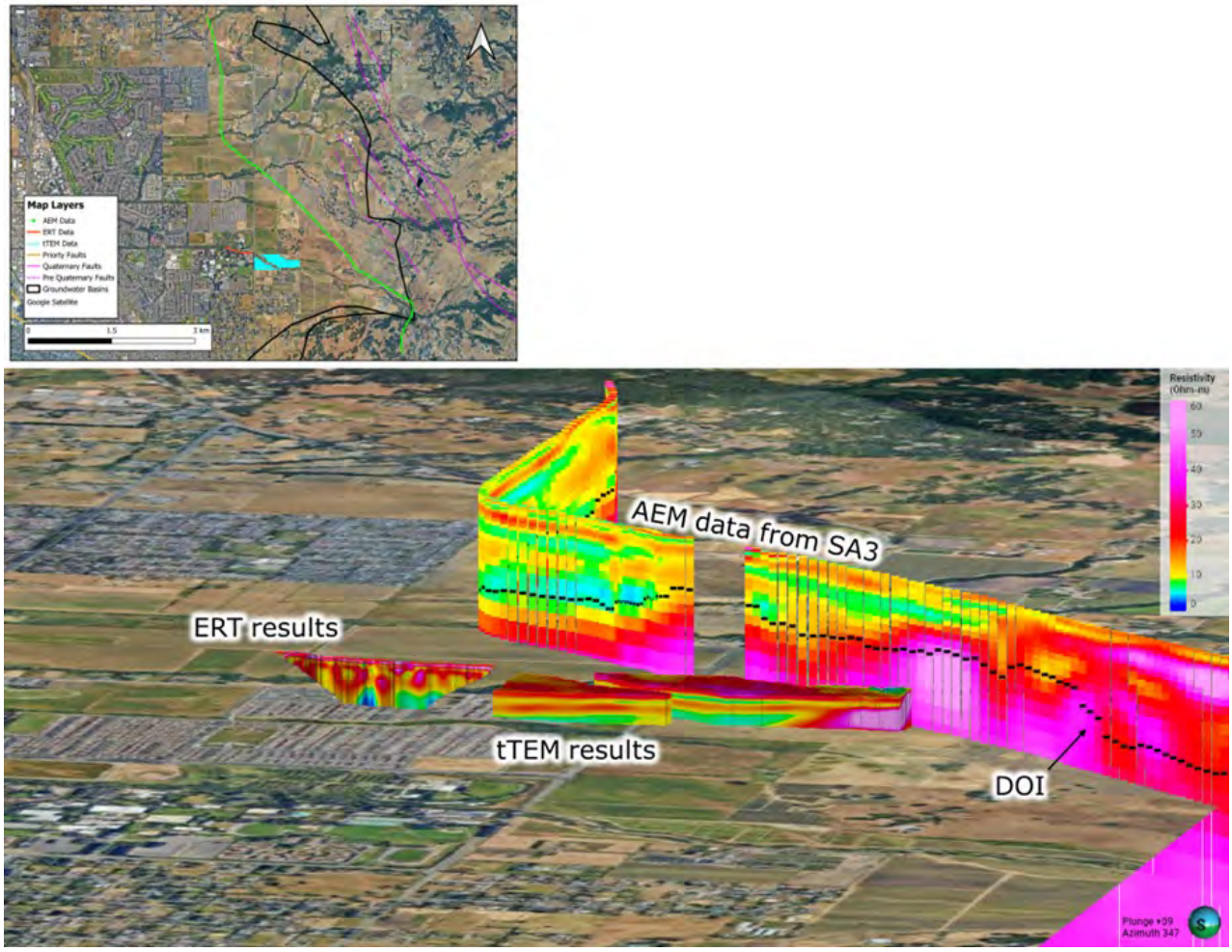


Figure 27: Leapfrog screenshot showing AEM data from Survey Area 3 with ERT and tTEM from Copeland Creek survey. Black dots represent the DOI for the AEM data. Map showing where the data are relative to one another is shown in the extent map to the top left.

6.0 Leapfrog Deliverables

The geophysical data collected as part of this work, as well as background/auxiliary data (i.e., cross-sections, geological maps, topography, mapped faults) were imported into a Leapfrog Works V2025.3 project (Figure 28). The full project was delivered to Sonoma Water as a Leapfrog Viewer (2025 Release) scene file.

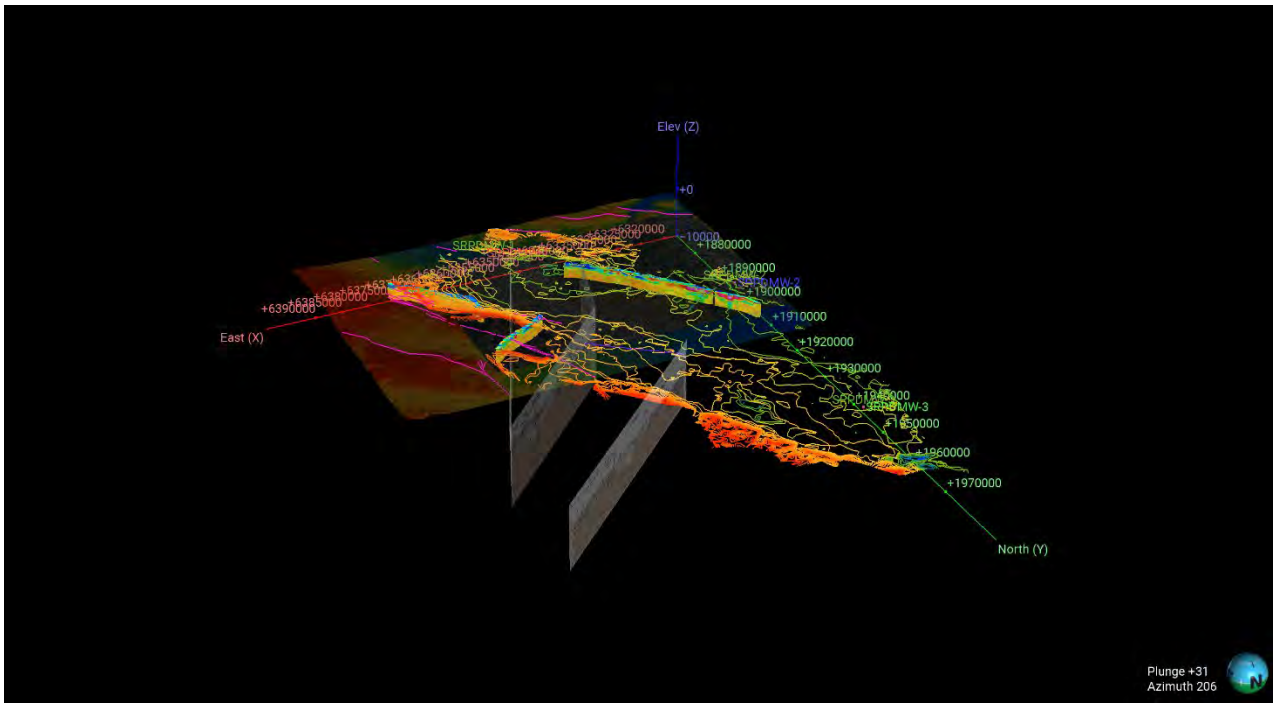


Figure 28: Leapfrog 3D perspective view of all data in Leapfrog Work project.

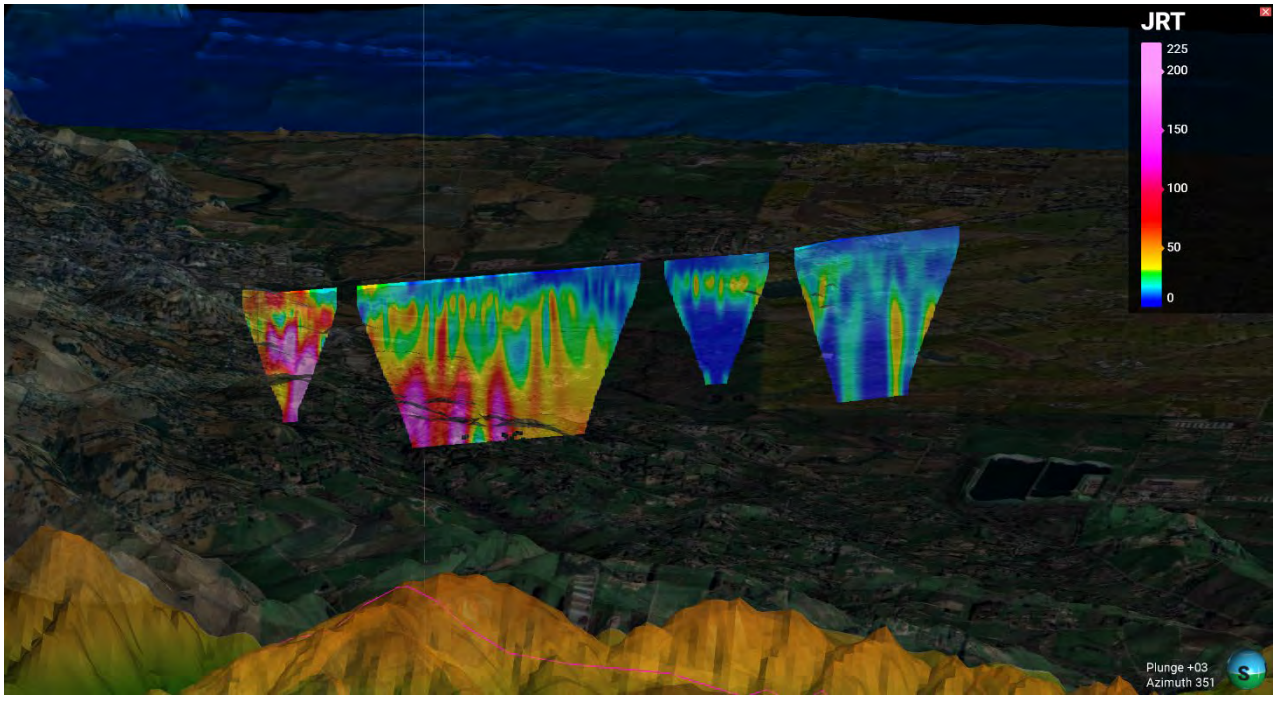


Figure 29: Leapfrog 3D perspective view of the Joe Rodota Trail ERT profiles. Pink lines are mapped faults.

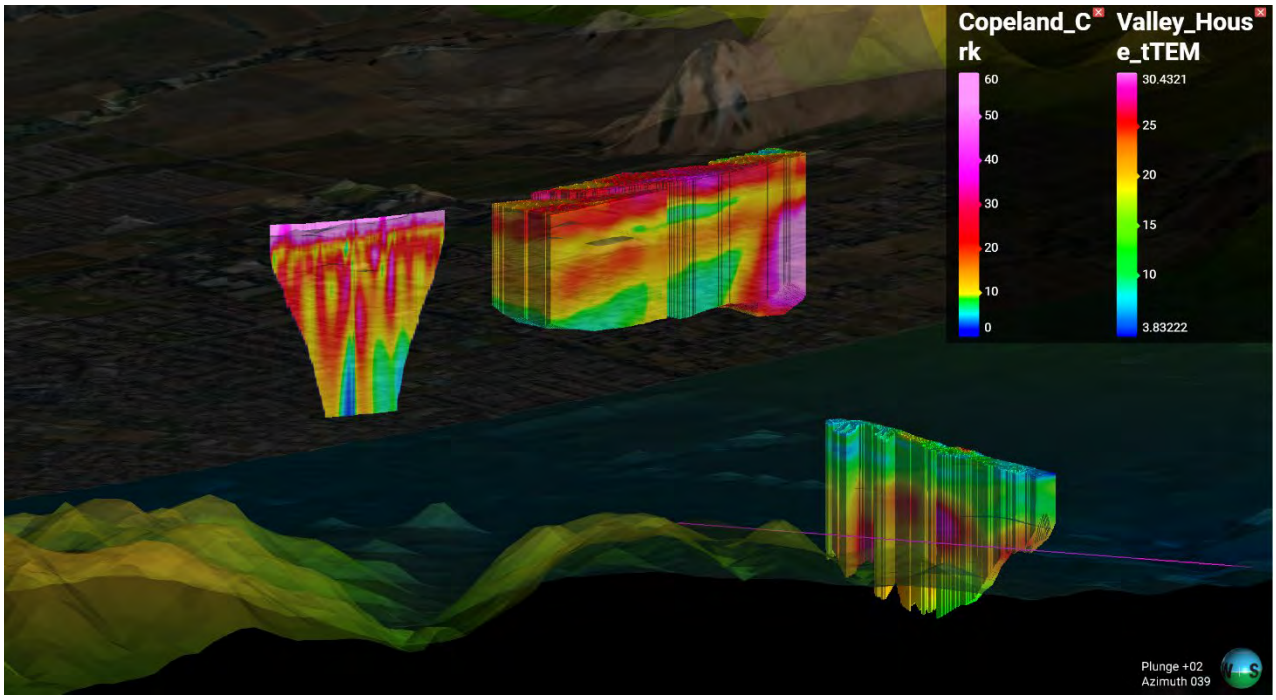


Figure 30: Leapfrog 3D perspective view of the Valley House Drive tTEM and Copeland Creek ERT profile and tTEM data. Pink lines are mapped faults.

7.0 Summary and Recommendations

Summary

The purpose of the geophysical investigations in the Subbasin was to collect data to assist in filling some of the SRP GSP gaps to support long-term sustainable groundwater management. The results of the geophysical surveys are summarized below by location specific objectives.

One objective was to image the Sebastopol Fault and the differences between aquifer materials on either side of the fault along the Joe Rodota Trail. While the ERT survey showed the variation in the aquifer materials, the mapped location of the fault was not surveyed by ERT. The survey results do show a significant elevation difference of the top of the Wilson Grove Formation over the gap in the survey, as might be expected in a down drop block in a normal fault, but this is not conclusive

Another set of objectives was met by performing tTEM and ERT investigations along Copeland Creek to characterize the transition from alluvial sediments to volcanic units, image distribution of shallow clay deposits that may inhibit recharge, and identify locations of higher permeability shallow deposits. The results indicate a strong recharge potential below the near surface, fine-grained unit. The results reveal a layered geology of interchanging channel deposits and floodplain deposits, with high resistivities displaying a channel-like geometry suggestive of former tributaries in the area.

While coarse materials noted at the surface that appear to be in connection with the shallow aquifer may support surface spreading recharge operation, recharge to the deeper aquifer may be complicated by the fine-grained layers identified at around 15-20 m (50-65 ft) and below 40 m (130 ft).

The deeper coarse materials appear to be in contact with the deeper aquifer, but the tTEM results do not appear to suggest a direct connection to the surface. The closet connection with the near surface to the deeper aquifer is to the east/northeast of the site where sediments coming off the hill may act as “mountain front” recharge but the potential for this would require further characterization.

At the Valley House Drive site, objectives were to identify the distribution of higher salinity groundwater and basin boundaries to the south. The tTEM results showed the near surface appears to be dominated by a fine-grained layer that is semicontinuous with smaller lenses of coarser material. Beneath the coarse-grained units, as the resistivity models approach their DOI, it is suggested that deeper fine-grained materials or saline groundwater may exist. A significant subsurface geologic signature defining the Petaluma Valley and Santa Rosa Plain boundary was not identified; only a slight stratigraphic high was imaged. The tTEM data collection was limited to a narrow right-of-way and may have given more detail with a larger survey footprint expanding east and west.

Recommendations

Results of the geophysical surveys provide continuous electrical resistivity properties along the survey lines, that in conjunction with nearby lithology data, can be used jointly to compare to and modify as appropriate the existing hydrogeologic conceptual model and groundwater flow model.

Additional geophysical surveys could be considered to further refine the conceptual model, and provide additional information, including:

- Survey south of the Joe Rodota Trailhead to potentially image the mapped location of the Sebastopol Fault.
- An additional ERT survey to the east at Copeland Creek to confirm consistency in the thickness of the sand and gravel unit and variability of clay content in the upper 100 feet. A more extensive survey at the Valley House Drive site to better identify the basin boundary. While current tTEM lines suggest a slight stratigraphic high acting as a groundwater divide, surveying the entire property would provide more context. Using both tTEM and ERT transects is recommended for accurate 3D mapping and deeper imaging.

8.0 References

California Department of Water Resources, 2024. *PROVISIONAL - 2023 Statewide Crop Mapping Geodatabase [Data set]*. California Natural Resources Agency Open Data Portal. https://data.cnra.ca.gov/dataset/6c3d65e3-35bb-49e1-a51e-49d5a2cf09a9/resource/4e17ca38-

268e-4bf5-bbc5-09636d44ed60/download/i15_crop_mapping_2023_provisional_20241127.gdb.zip

Clahan, K. B., Bezore, S. P., Koehler, R. D., & Witter, R. C., 2003. *Geologic map of the Cotati 7.5' quadrangle, Sonoma County, California: A digital database (Version 1.0).* Digital database by M. T. Mascorro & E. W. Ford. California Geological Survey, California Department of Conservation.

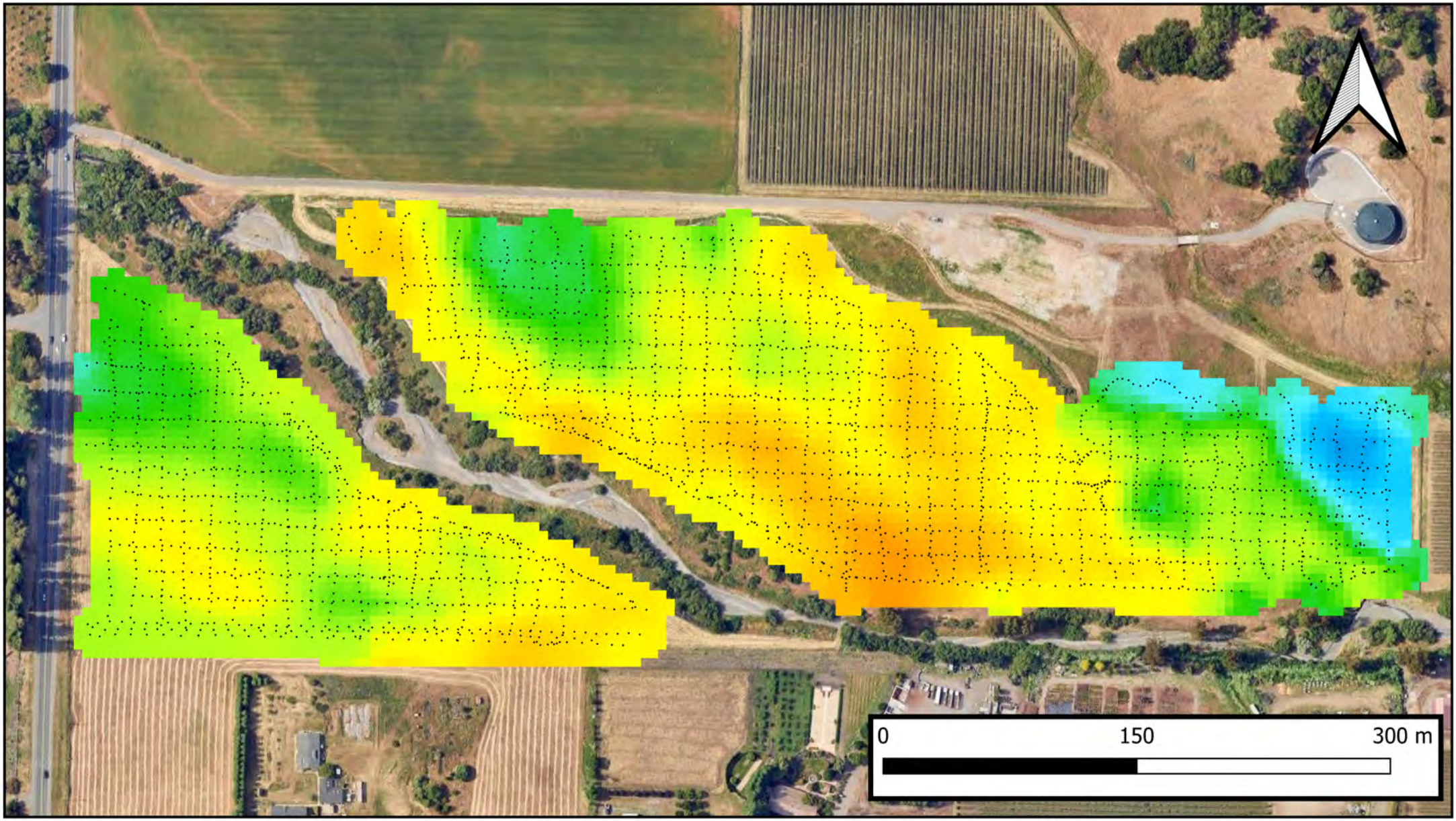
Sonoma County Water Agency (Sonoma Water), 2021. *Groundwater Sustainability Plan Santa Rosa Plain Groundwater Subbasin*, December. https://santarosaplaingroundwater.org/gsp/

Wagner, D. L., and C. I. Gutierrez, 2017. *Geologic map of the Napa and Bodega Bay 30' x 60' Quadrangles, California* [Map, scale 1:100,000]. California Department of Conservation.

Appendix 1
Mean Resistivity Maps

Appendix 1 contains a series of mean resistivity maps, showing horizontal resistivity slices over specific depth intervals. The resistivity elevation maps show the mean resistivity for each 1D model over the specified interval. The resistivity depth interval maps show the mean resistivity along the driven lines with respect to depth below the ground surface (bgs). The series starts out with the depth interval of 0 to 10 m (0 to 32 ft) bgs at 2-meter (6.5 ft) intervals, thereafter intervals of 10 to 40 m (32 to 131 ft) at 5-meter (16 ft) intervals, and finally 40 to 110 m (131 to 360 ft) bgs at 10-meter (32 ft) intervals. Where resistivity models reach their respective DOI early on, data is no longer present on the map.

For all maps, the resistivity is shown with the standard color scale, where blue colors represent resistivity under 10 Ohm-m, green colors from 10-20 Ohm-m, yellow colors from 20 – 30 Ohm-m, orange colors from 30 – 50 Ohm-m red colors from 50 – 90 Ohm-m and purple colors over 90 Ohm-m.



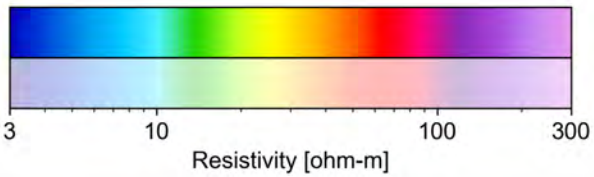
Mean Resistivity Depth Interval 0.0 to 6.6 ft (0 to 2 m)

Scale: 1:3000 NAD83 / California zone 2 (ftUS) / EPSG:2226

Map layers

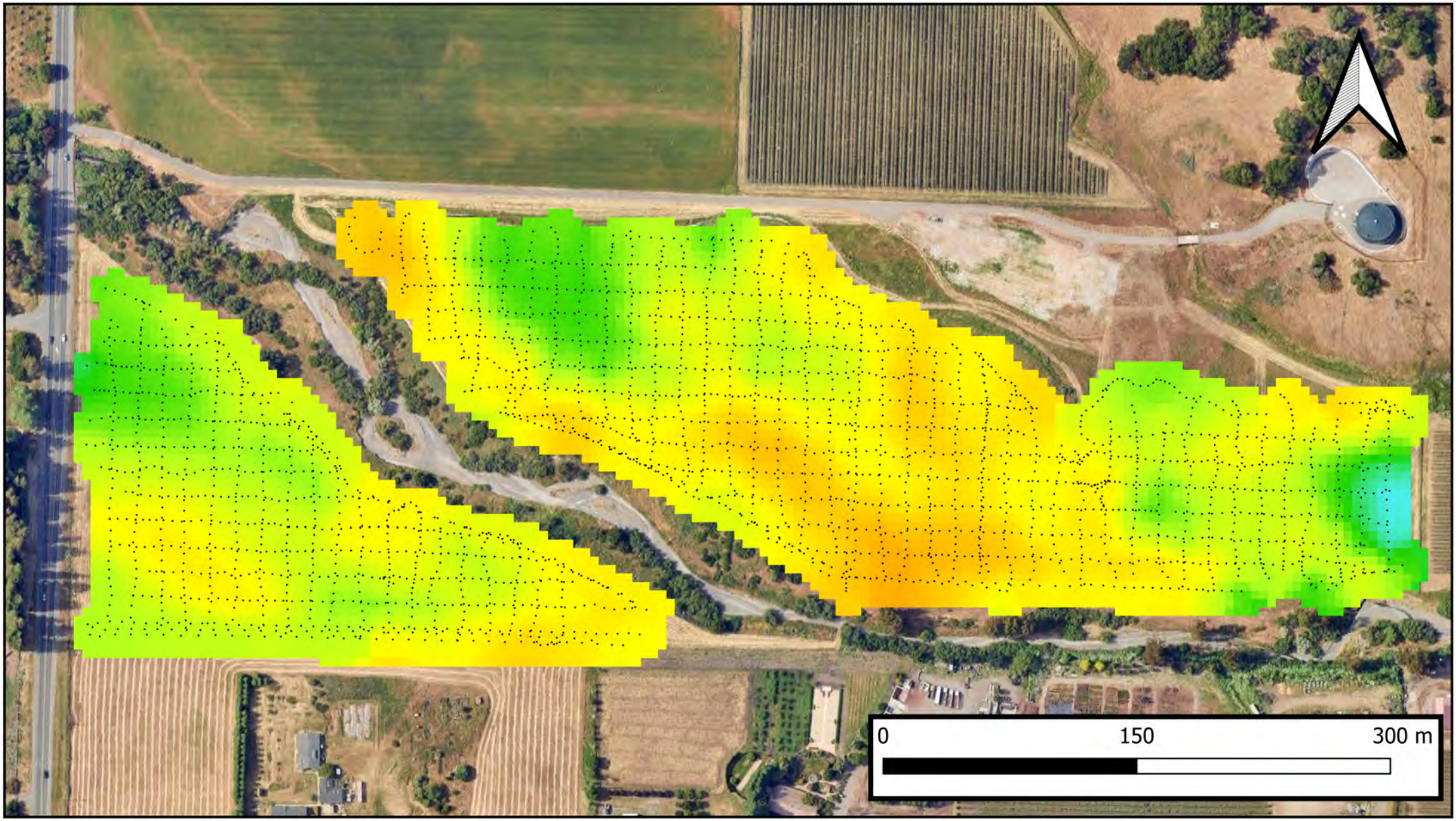
- Inversion Location

Google Satellite



RAMBOLL

COLLIER GEOPHYSICS



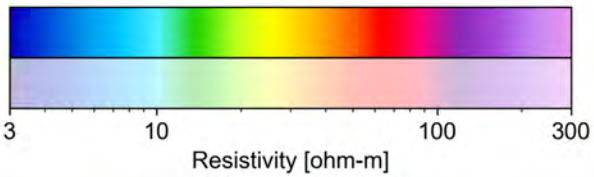
Mean Resistivity Depth Interval 6.6 to 13.1 ft (2 to 4 m)

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Map layers

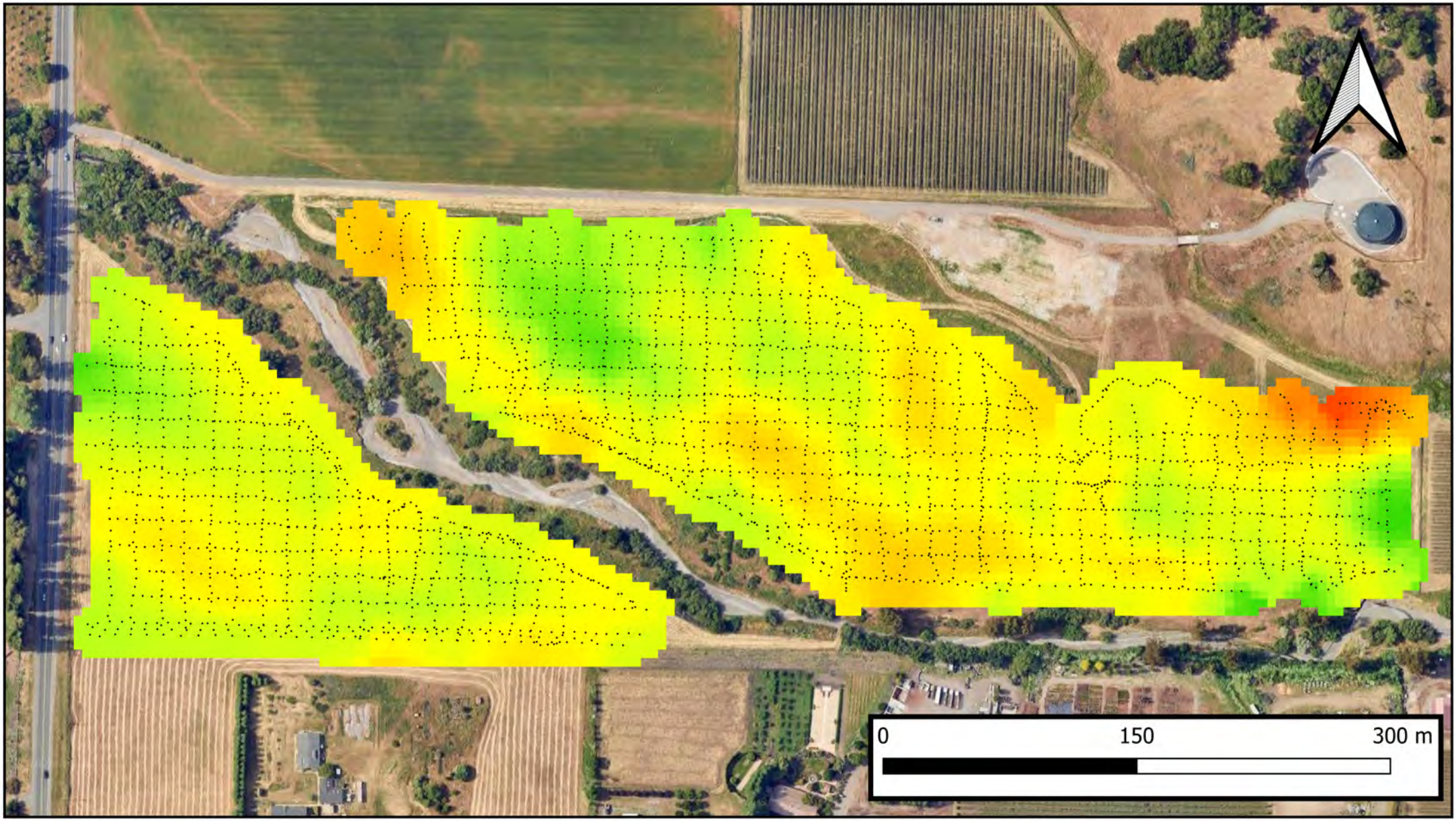
- Inversion Location

Google Satellite



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COLLIER GEOPHYSICS



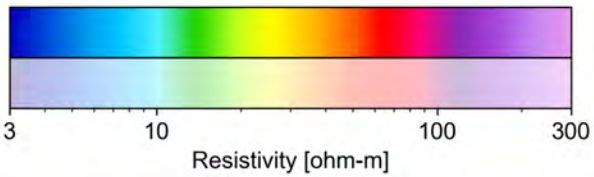
Mean Resistivity Depth Interval 13.1 to 19.7 ft (4 to 6 m)

Scale: 1:3000 NAD83 / California zone 2 (ftUS) / EPSG:2226

Map layers

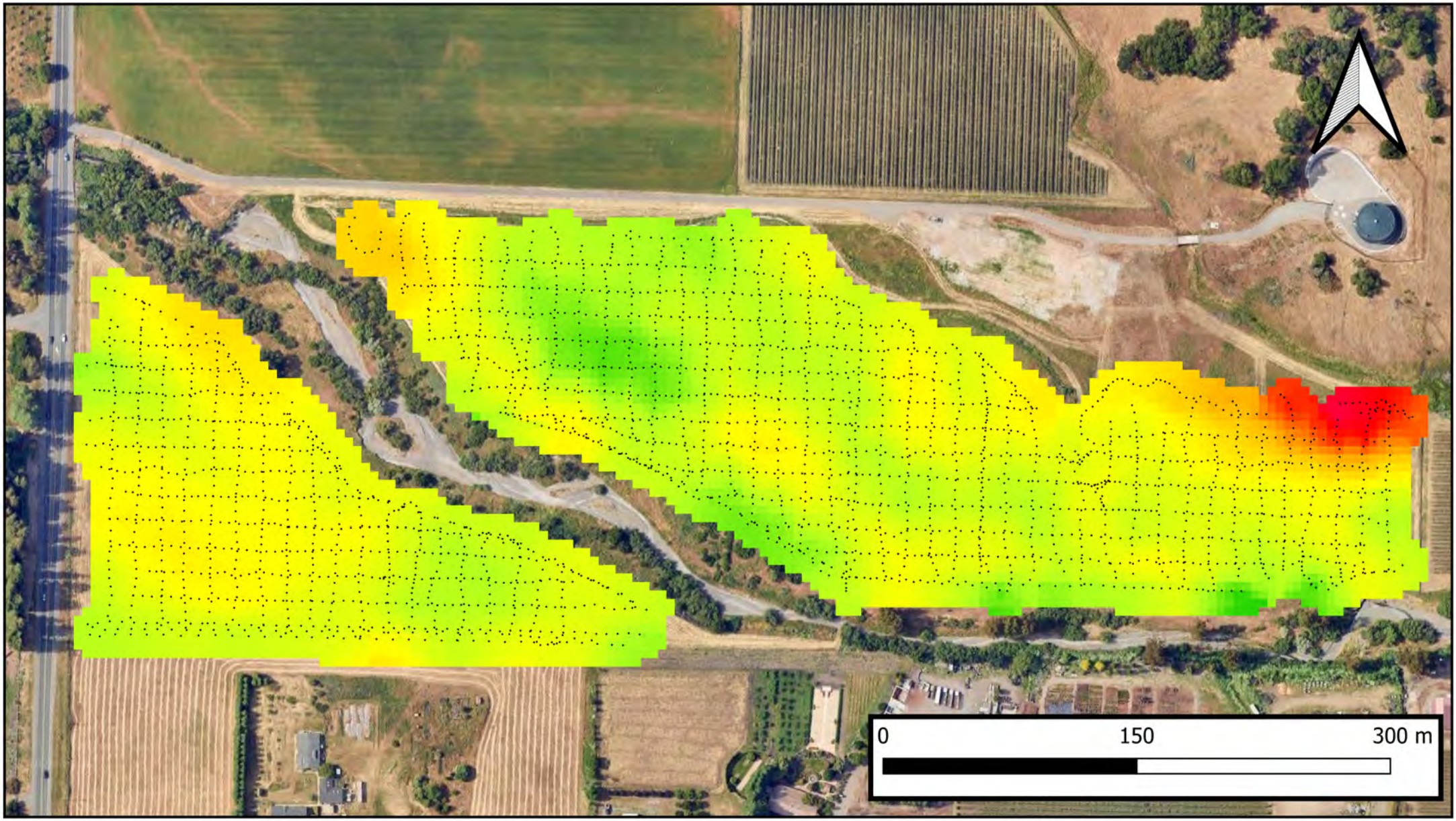
- Inversion Location

Google Satellite



RAMBOLL

COLLIER GEOPHYSICS



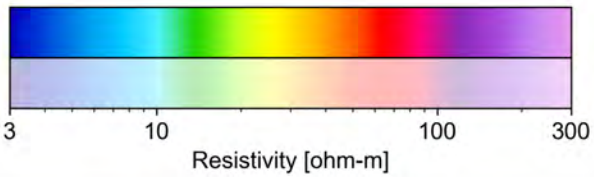
Mean Resistivity Depth Interval 19.7 to 26.2 ft (6 to 8 m)

Scale: 1:3000 NAD83 / California zone 2 (ftUS) / EPSG:2226

Map layers

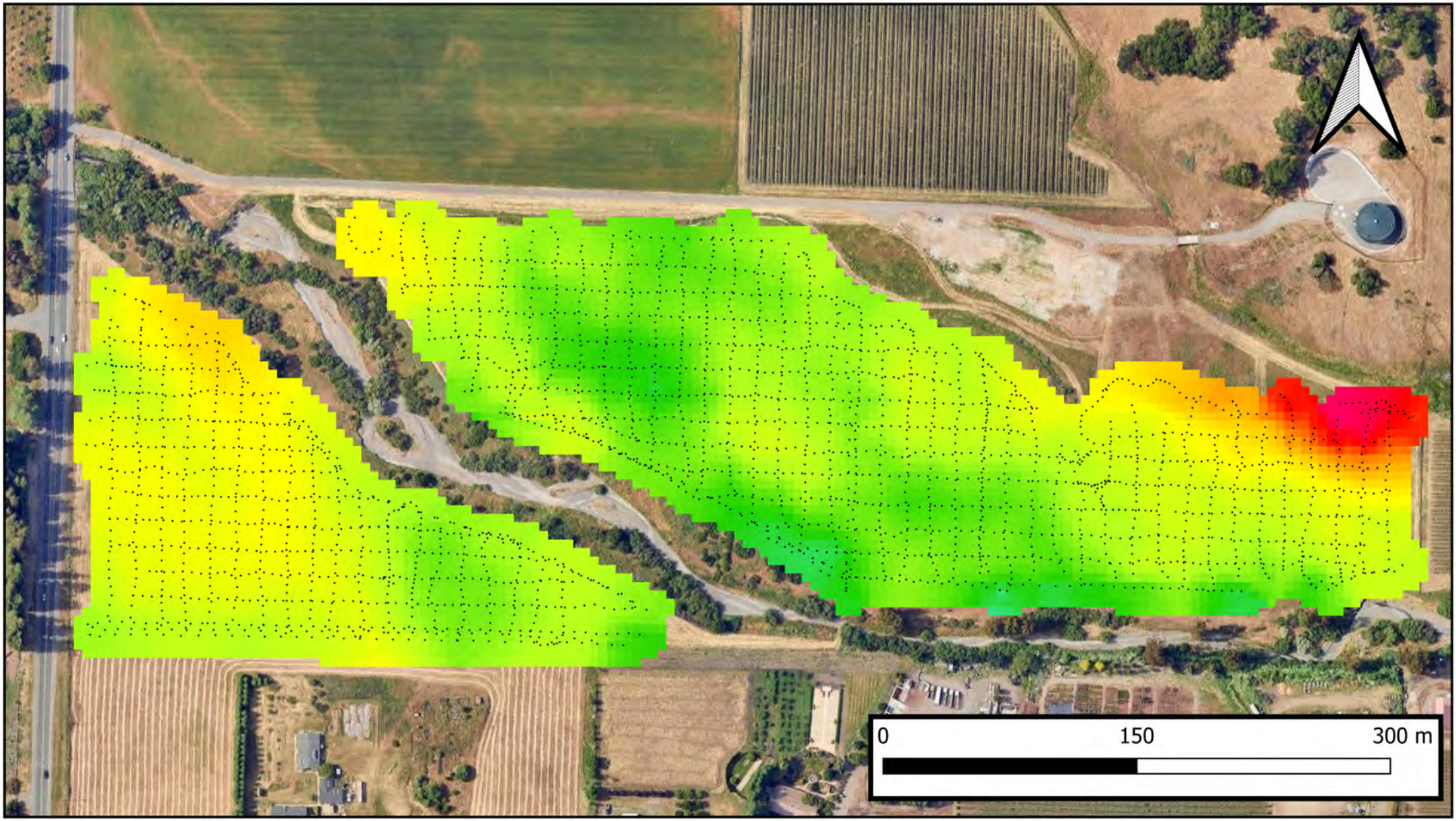
- Inversion Location

Google Satellite



RAMBOLL

COLLIER GEOPHYSICS



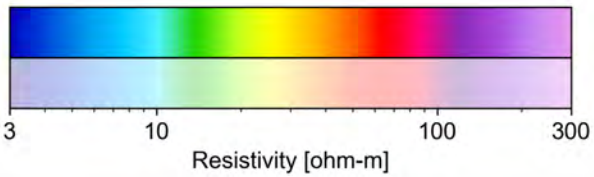
Mean Resistivity Depth Interval 26.2 to 32.8 ft (8 to 10 m)

Scale: 1:3000 NAD83 / California zone 2 (ftUS) / EPSG:2226

Map layers

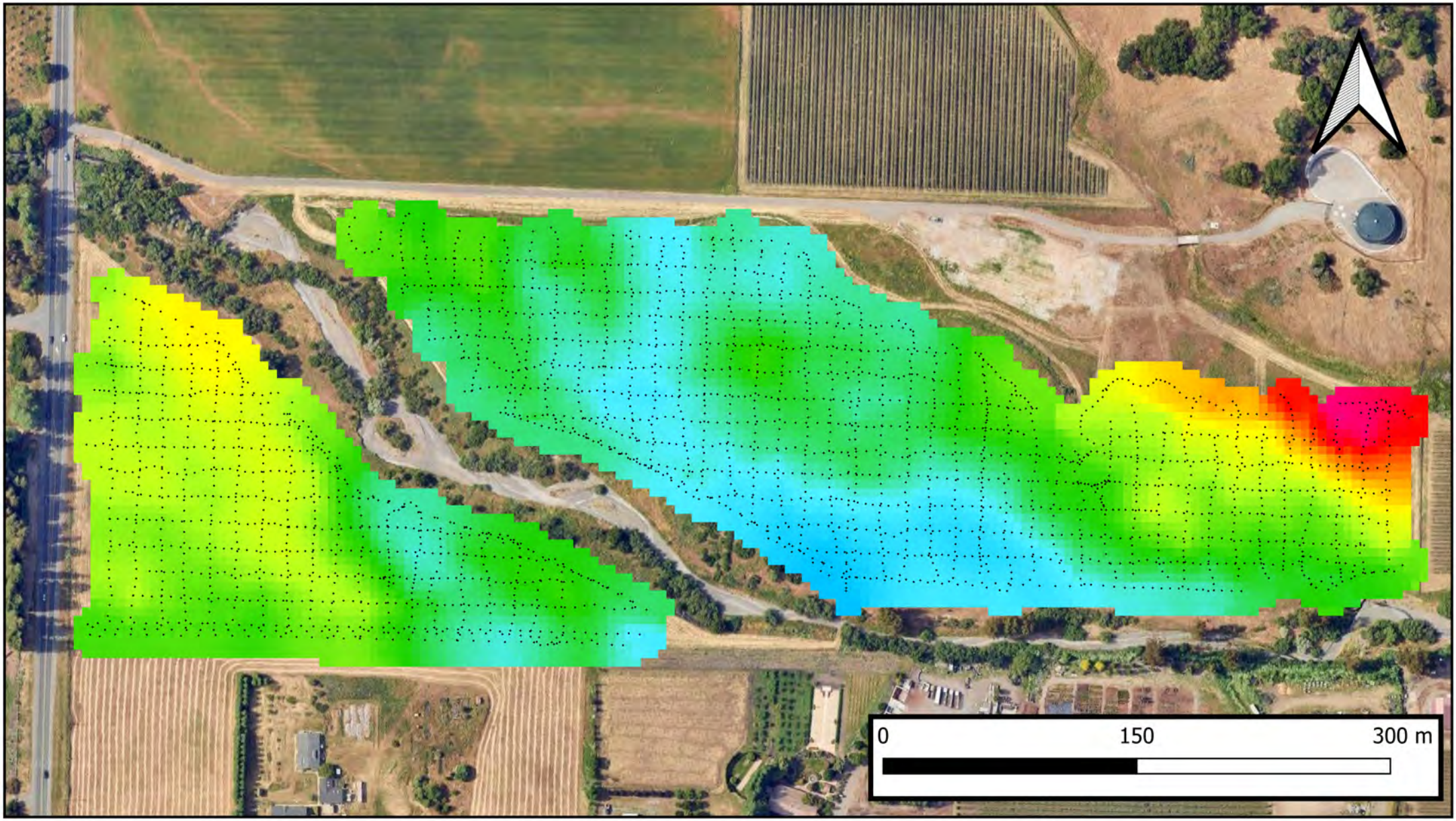
- Inversion Location

Google Satellite



RAMBOLL

COLLIER GEOPHYSICS



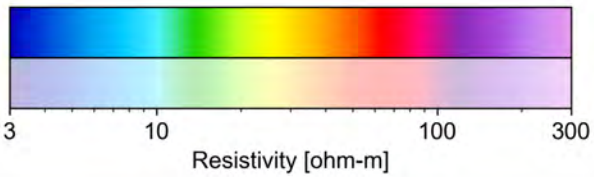
Mean Resistivity Depth Interval 32.8 to 49.2 ft (10 to 15 m)

Scale: 1:3000 NAD83 / California zone 2 (ftUS) / EPSG:2226

Map layers

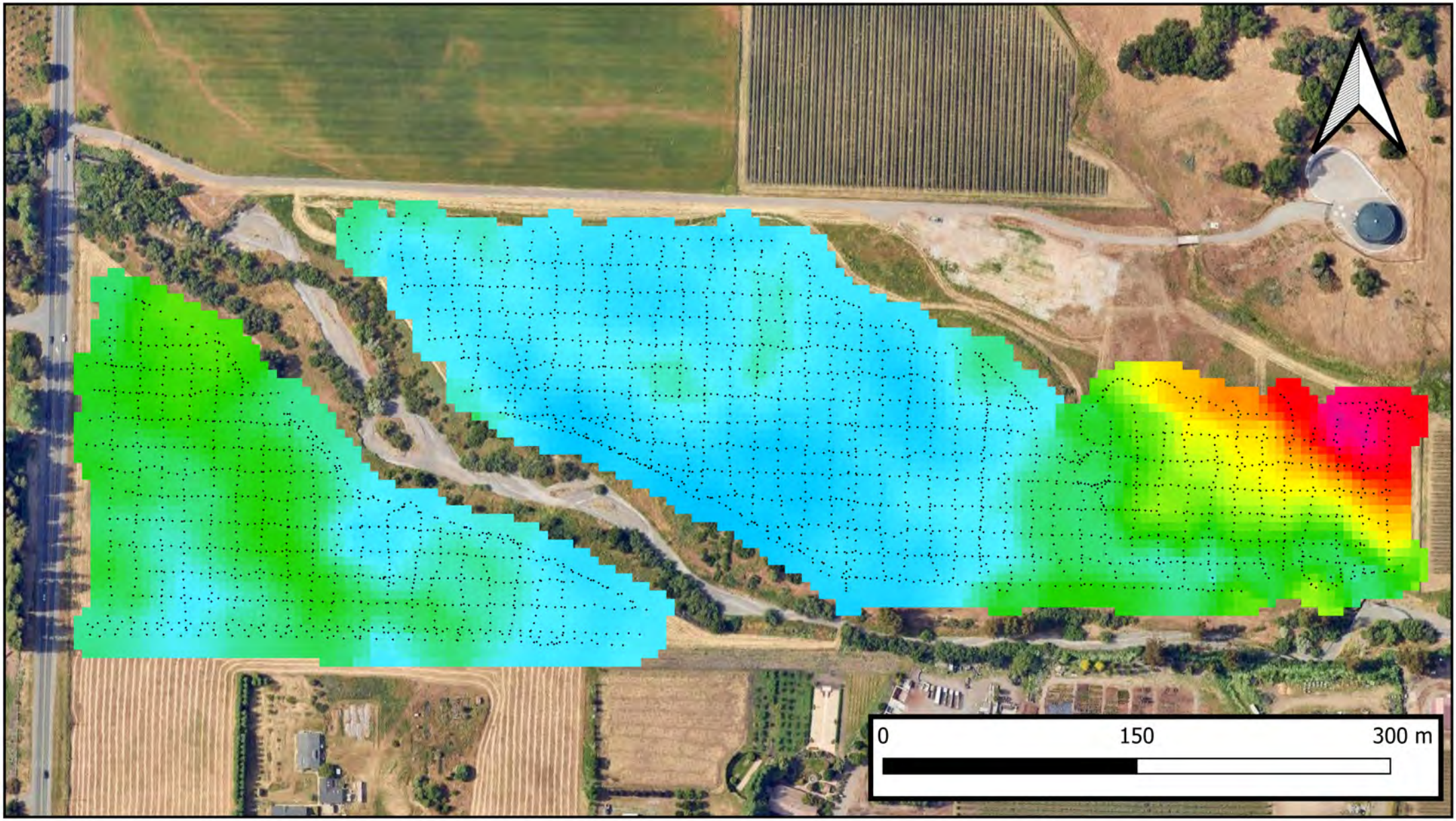
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Google Satellite



RAMBOLL

COLLIER GEOPHYSICS



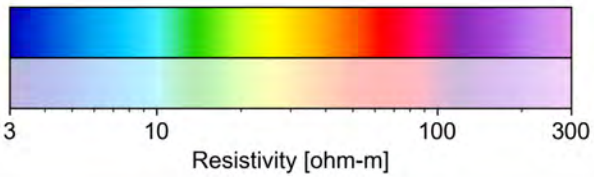
Mean Resistivity Depth Interval 49.2 to 65.6 ft (15 to 20 m)

Scale: 1:3000 NAD83 / California zone 2 (ftUS) / EPSG:2226

Map layers

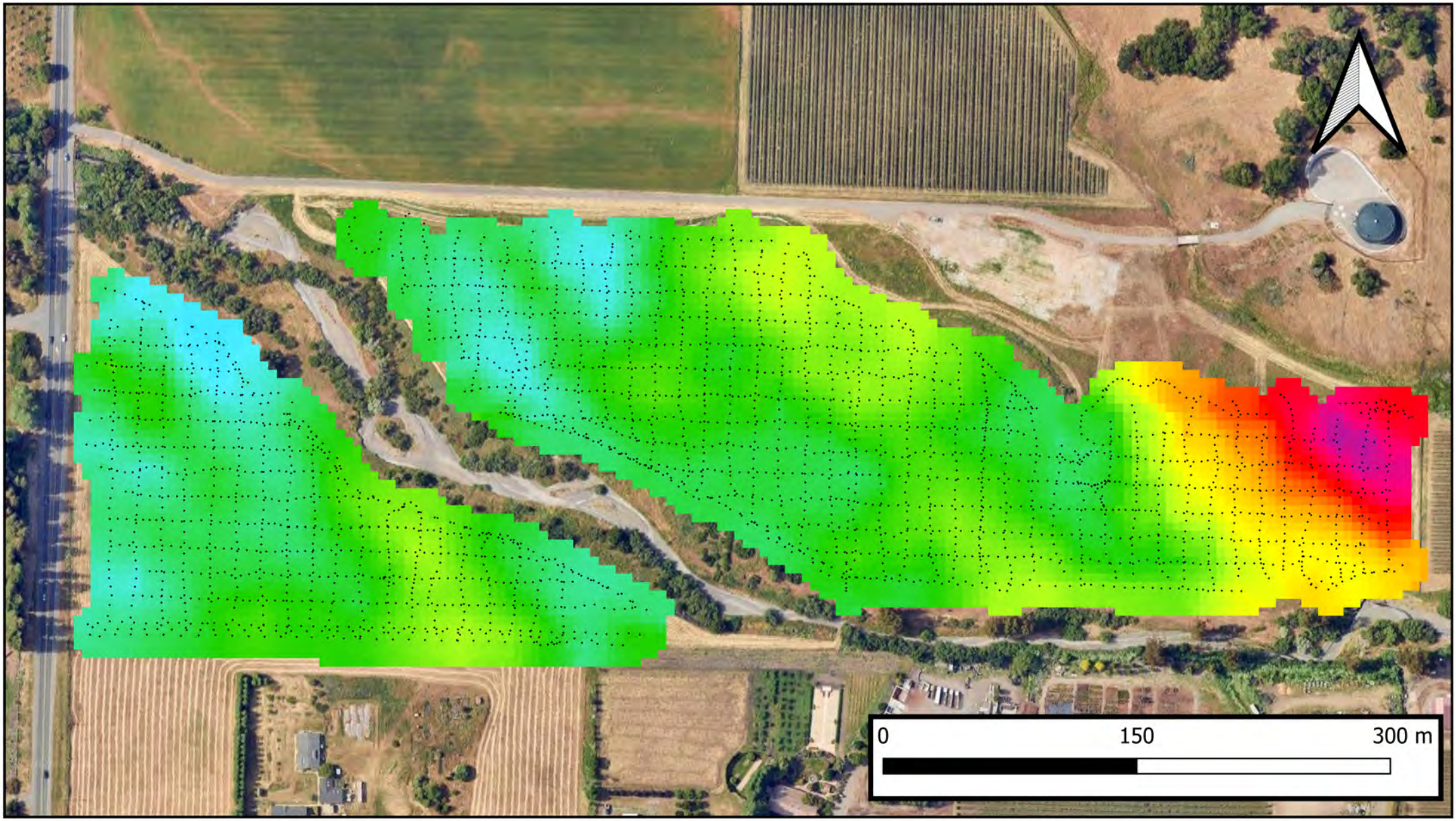
- Inversion Location

Google Satellite



RAMBOLL

COLLIER GEOPHYSICS



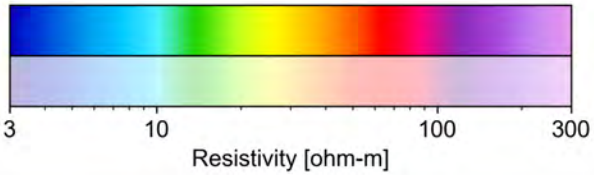
Mean Resistivity Depth Interval 65.6 to 82.0 ft (20 to 25 m)

Scale: 1:3000 NAD83 / California zone 2 (ftUS) / EPSG:2226

Map layers

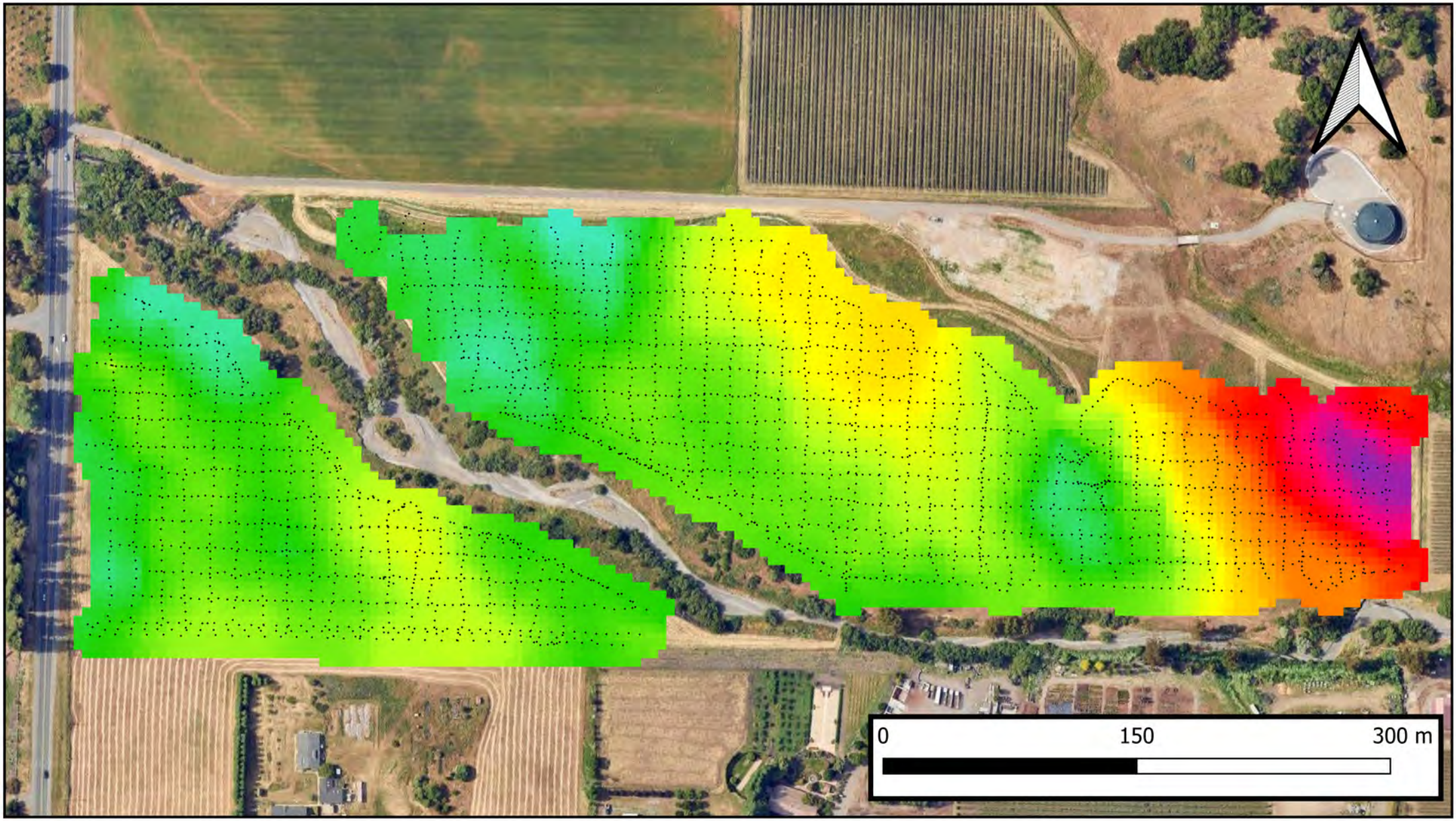
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Google Satellite



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COLLIER GEOPHYSICS



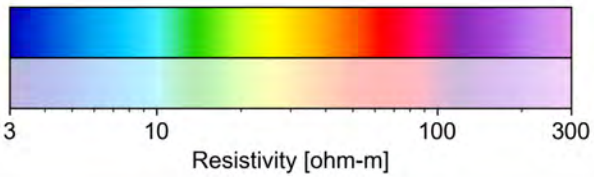
Mean Resistivity Depth Interval 82.0 to 98.4 ft (25 to 30 m)

Scale: 1:3000 NAD83 / California zone 2 (ftUS) / EPSG:2226

Map layers

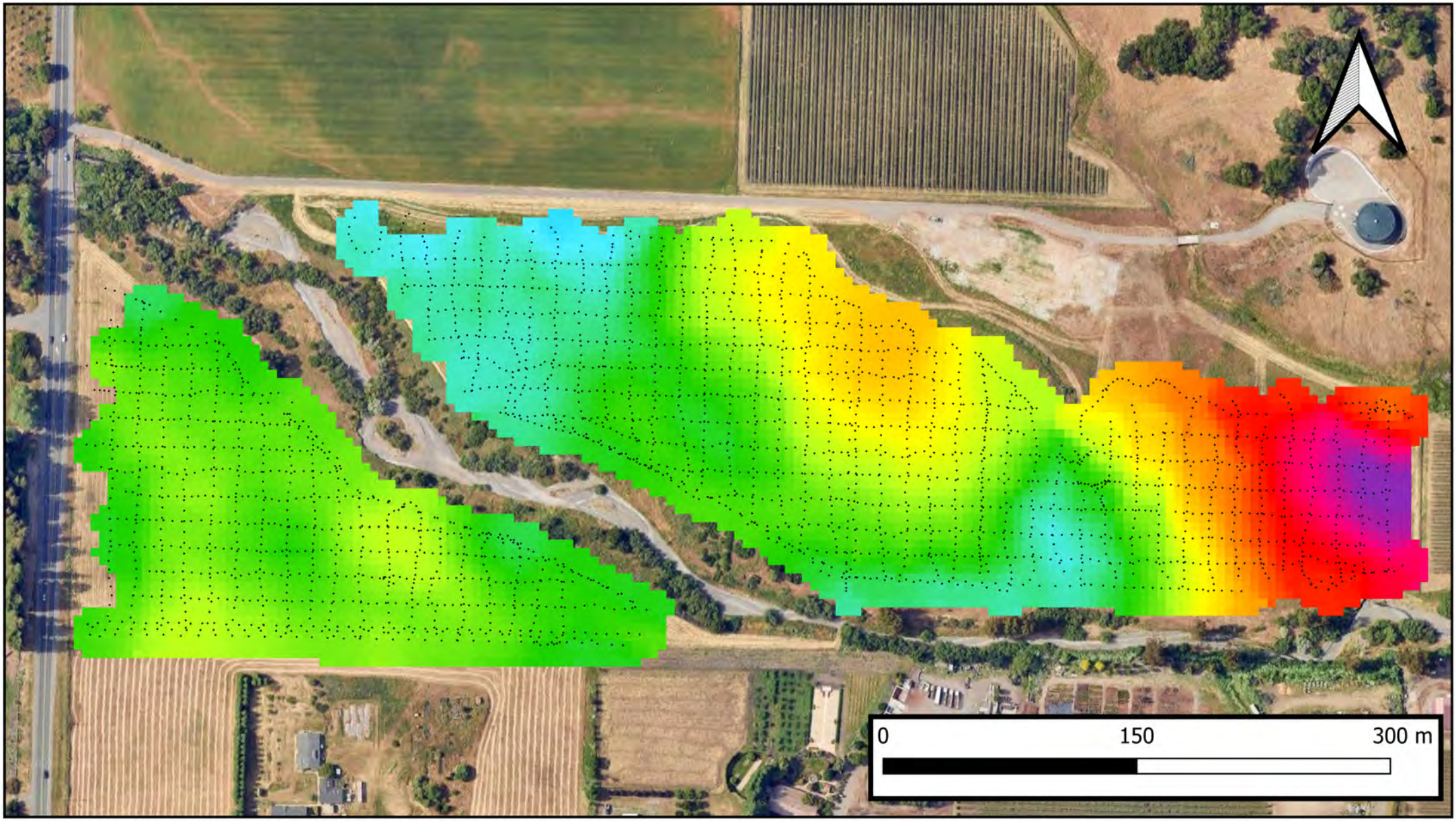
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Google Satellite



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COLLIER GEOPHYSICS



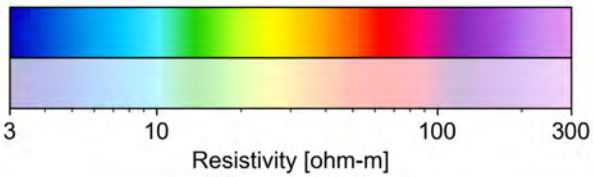
Mean Resistivity Depth Interval 98.4 to 114.8 ft (30 to 35 m)

Scale: 1:3000 NAD83 / California zone 2 (ftUS) / EPSG:2226

Map layers

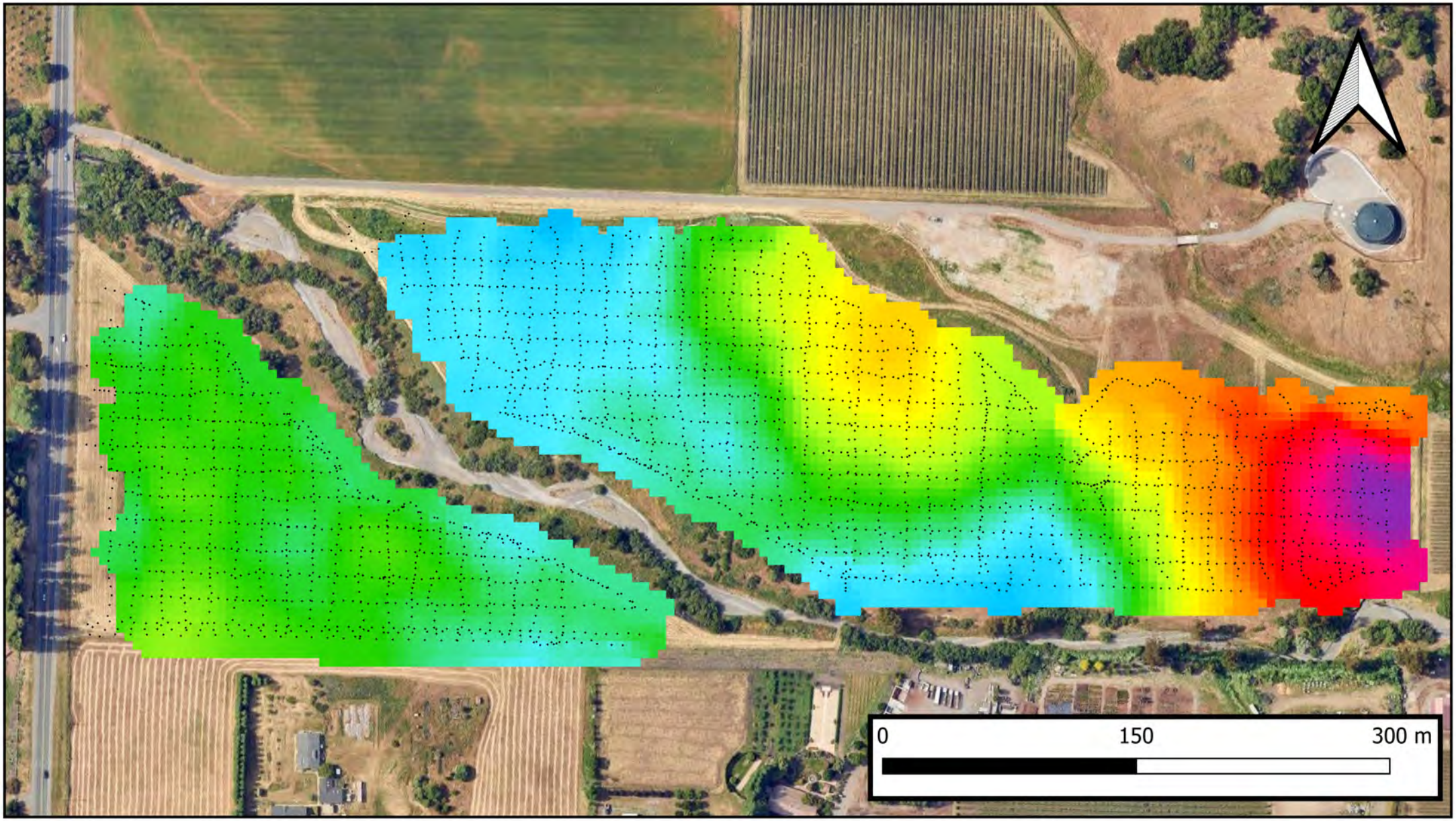
- Inversion Location

Google Satellite



RAMBOLL

COLLIER GEOPHYSICS



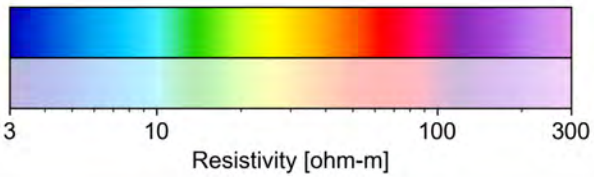
Mean Resistivity Depth Interval 114.8 to 131.2 ft (35 to 40 m)

Scale: 1:3000 NAD83 / California zone 2 (ftUS) / EPSG:2226

Map layers

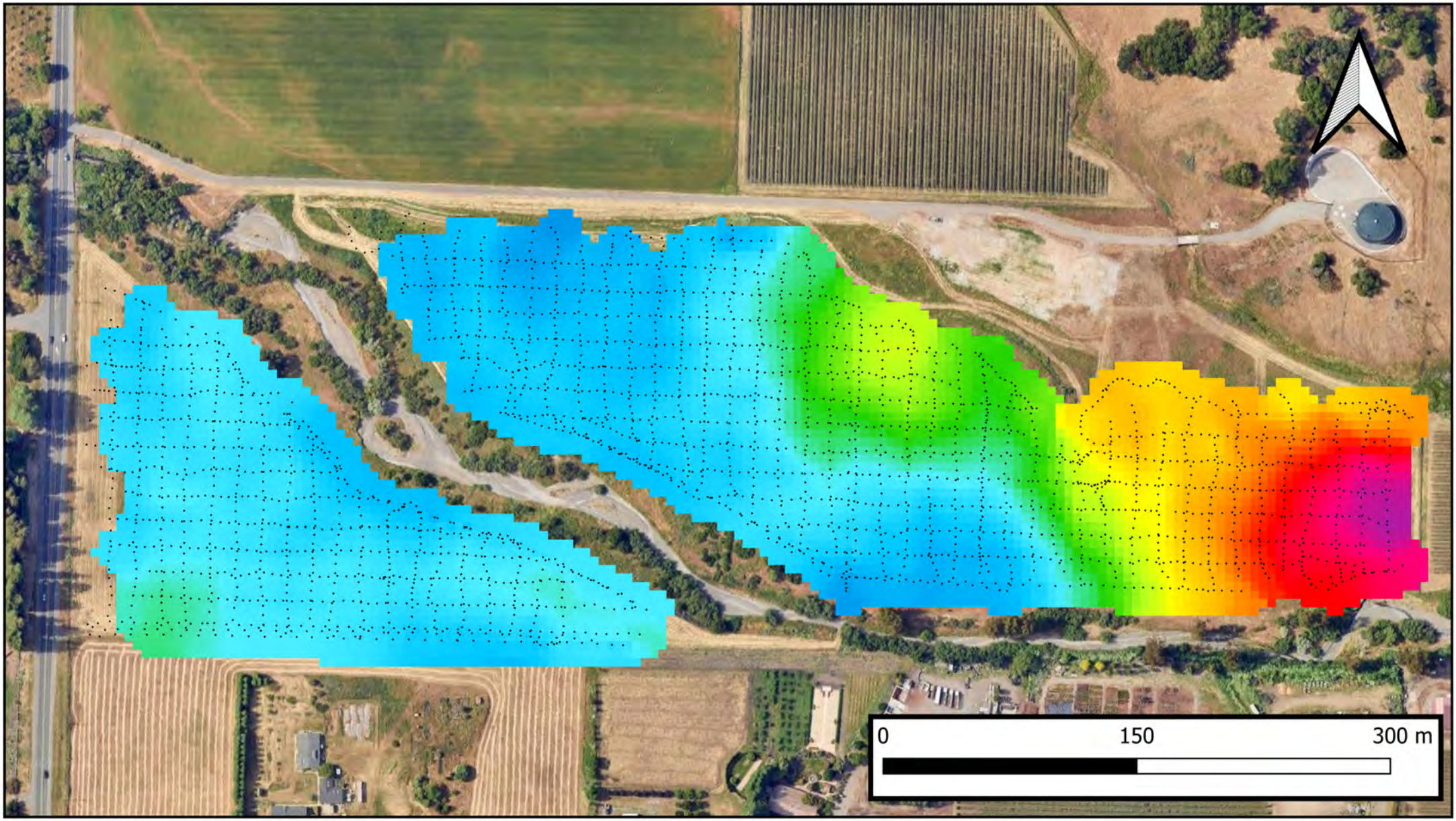
- Inversion Location

Google Satellite



RAMBOLL

COLLIER GEOPHYSICS



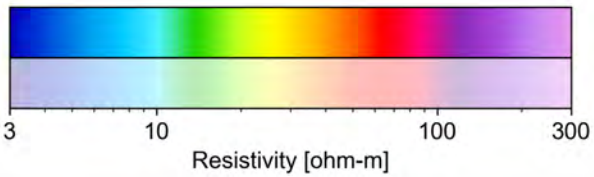
Mean Resistivity Depth Interval 131.2 to 164.0 ft (40 to 50 m)

Scale: 1:3000 NAD83 / California zone 2 (ftUS) / EPSG:2226

Map layers

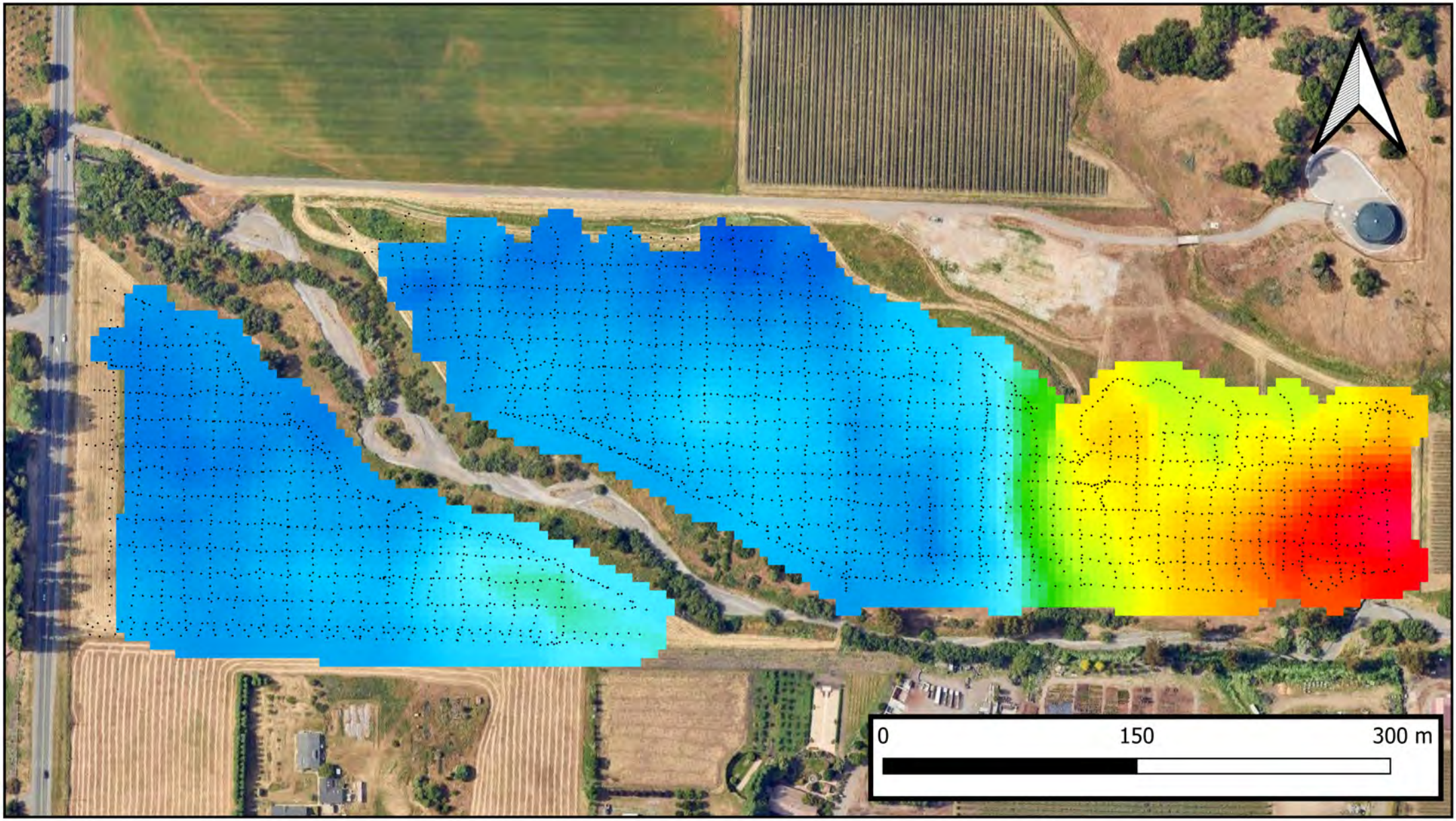
- Inversion Location

Google Satellite



RAMBOLL

COLLIER GEOPHYSICS



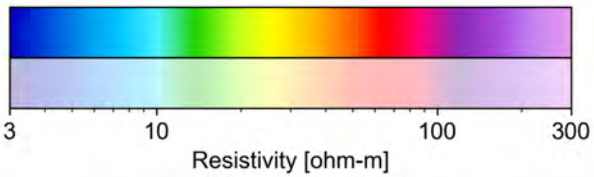
Mean Resistivity Depth Interval 164.0 to 196.9 ft (50 to 60 m)

Scale: 1:3000 NAD83 / California zone 2 (ftUS) / EPSG:2226

Map layers

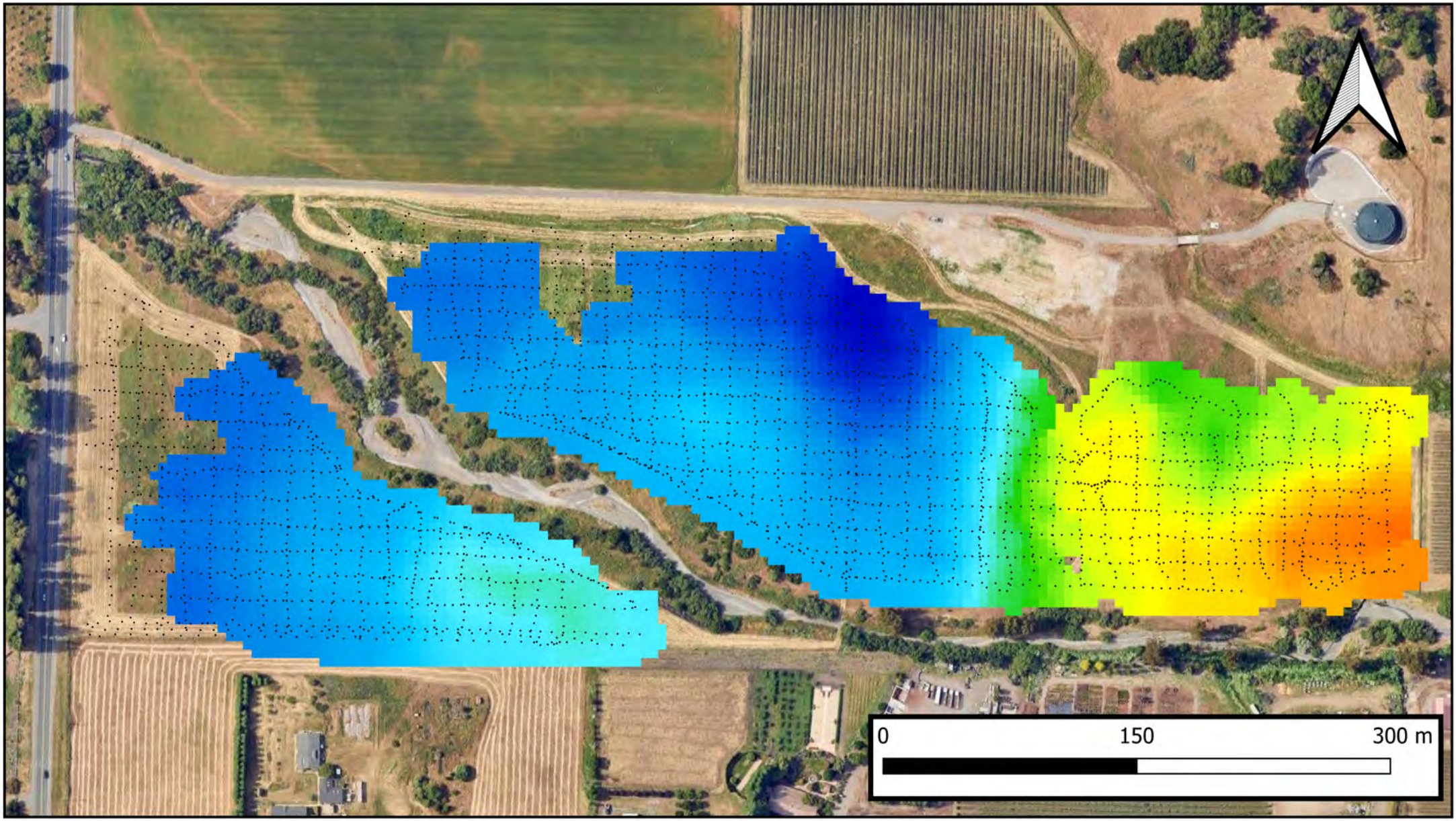
- Inversion Location

Google Satellite



RAMBOLL

COLLIER GEOPHYSICS



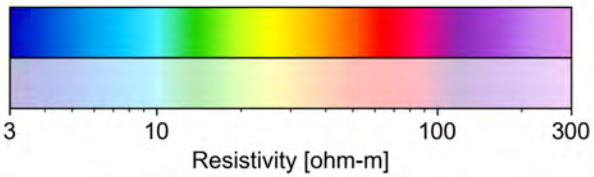
Mean Resistivity Depth Interval 196.9 to 229.7 ft (60 to 70 m)

Scale: 1:3000 NAD83 / California zone 2 (ftUS) / EPSG:2226

Map layers

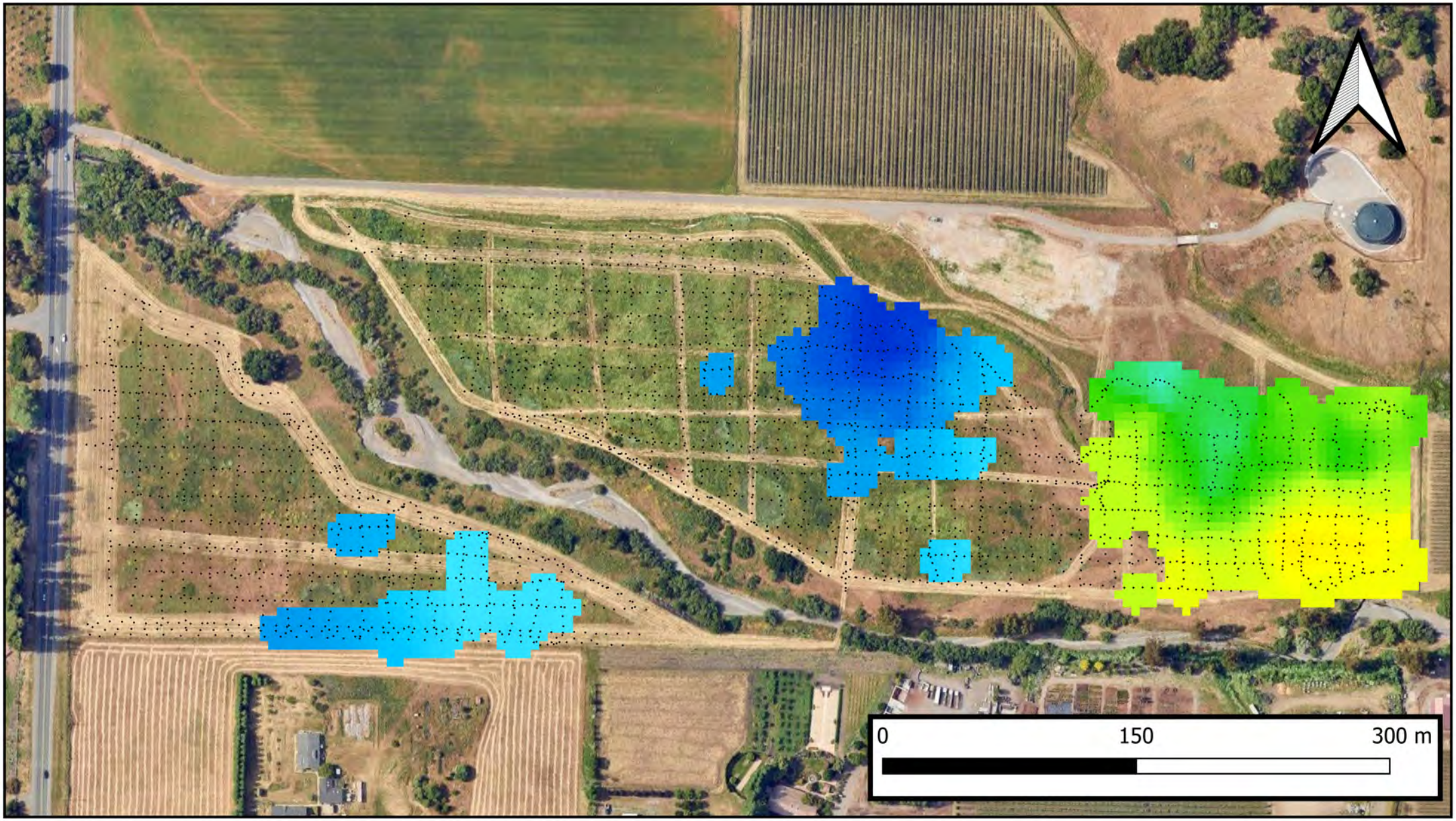
- Inversion Location

Google Satellite



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COLLIER GEOPHYSICS



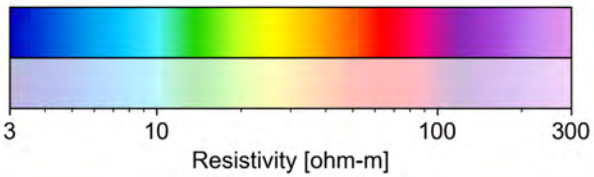
Mean Resistivity Depth Interval 229.7 to 262.5 ft (70 to 80 m)

Scale: 1:3000 NAD83 / California zone 2 (ftUS) / EPSG:2226

Map layers

- Inversion Location

Google Satellite



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COLLIER GEOPHYSICS



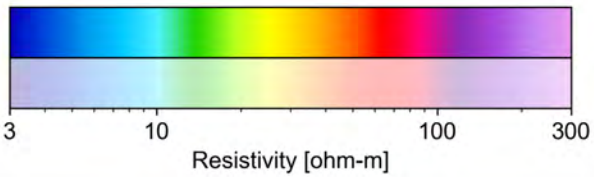
Mean Resistivity Depth Interval 262.5 to 295.3 ft (80 to 90 m)

Scale: 1:3000 NAD83 / California zone 2 (ftUS) / EPSG:2226

Map layers

- Inversion Location

Google Satellite



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COLLIER GEOPHYSICS

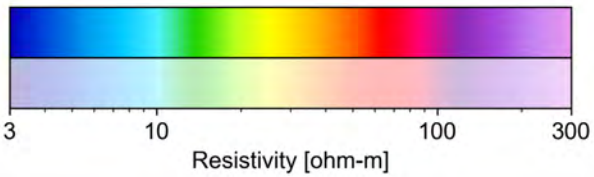


Mean Resistivity Depth Interval 295.3 to 328.1 ft (90 to 100 m) Scale: 1:3000 NAD83 / California zone 2 (ftUS) / EPSG:2226

Map layers

- Inversion Location

Google Satellite



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COLLIER GEOPHYSICS

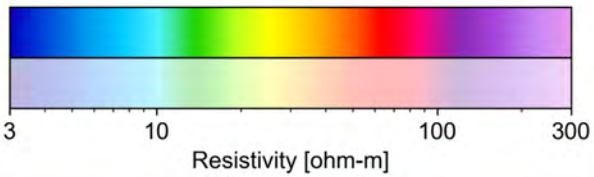


Mean Resistivity Depth Interval 328.1 to 360.9 ft (100 to 110 m) Scale: 1:3000 NAD83 / California zone 2 (ftUS) / EPSG:2226

Map layers

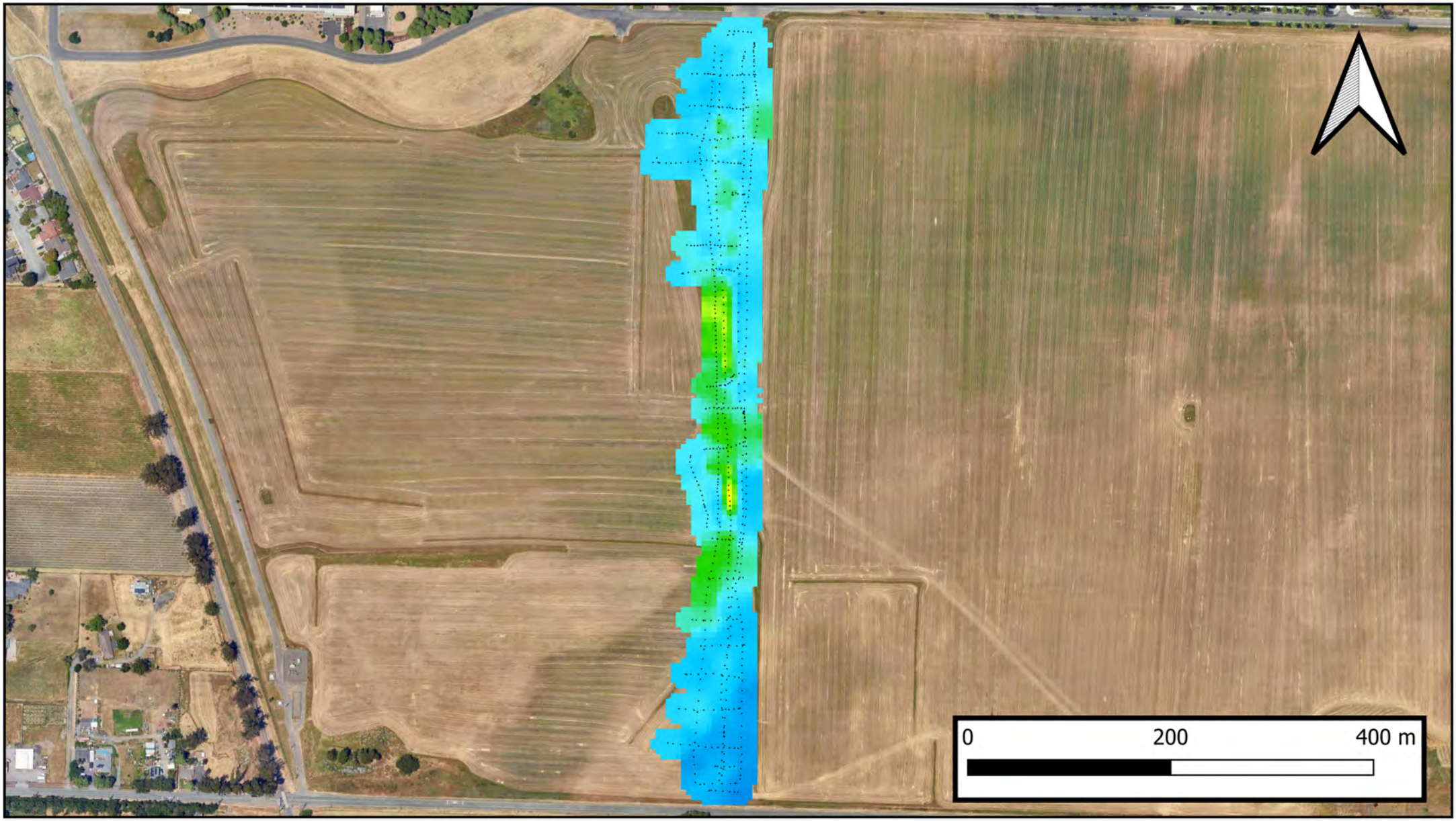
- Inversion Location

Google Satellite



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COLLIER GEOPHYSICS



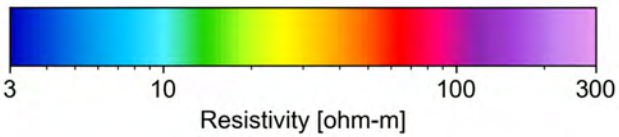
Mean Resistivity Depth Interval 0.0 to 6.6 ft (0 to 2 m)

Scale: 1:5000 NAD83 / California zone 2 (ftUS) / EPSG:2226

Map layers

- Inversion Location

Google Satellite



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COLLIER GEOPHYSICS



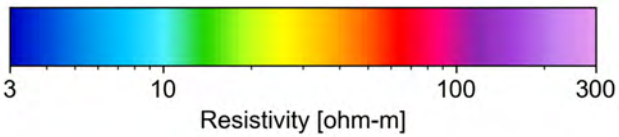
Mean Resistivity Depth Interval 6.6 to 13.1 ft (2 to 4 m)

Scale: 1:5000 NAD83 / California zone 2 (ftUS) / EPSG:2226

Map layers

- Inversion Location

Google Satellite



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COLLIER GEOPHYSICS



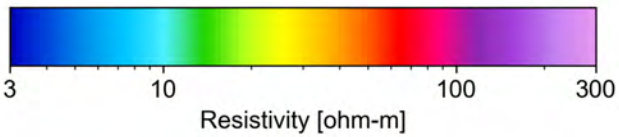
Mean Resistivity Depth Interval 13.1 to 19.7 ft (4 to 6 m)

Scale: 1:5000 NAD83 / California zone 2 (ftUS) / EPSG:2226

Map layers

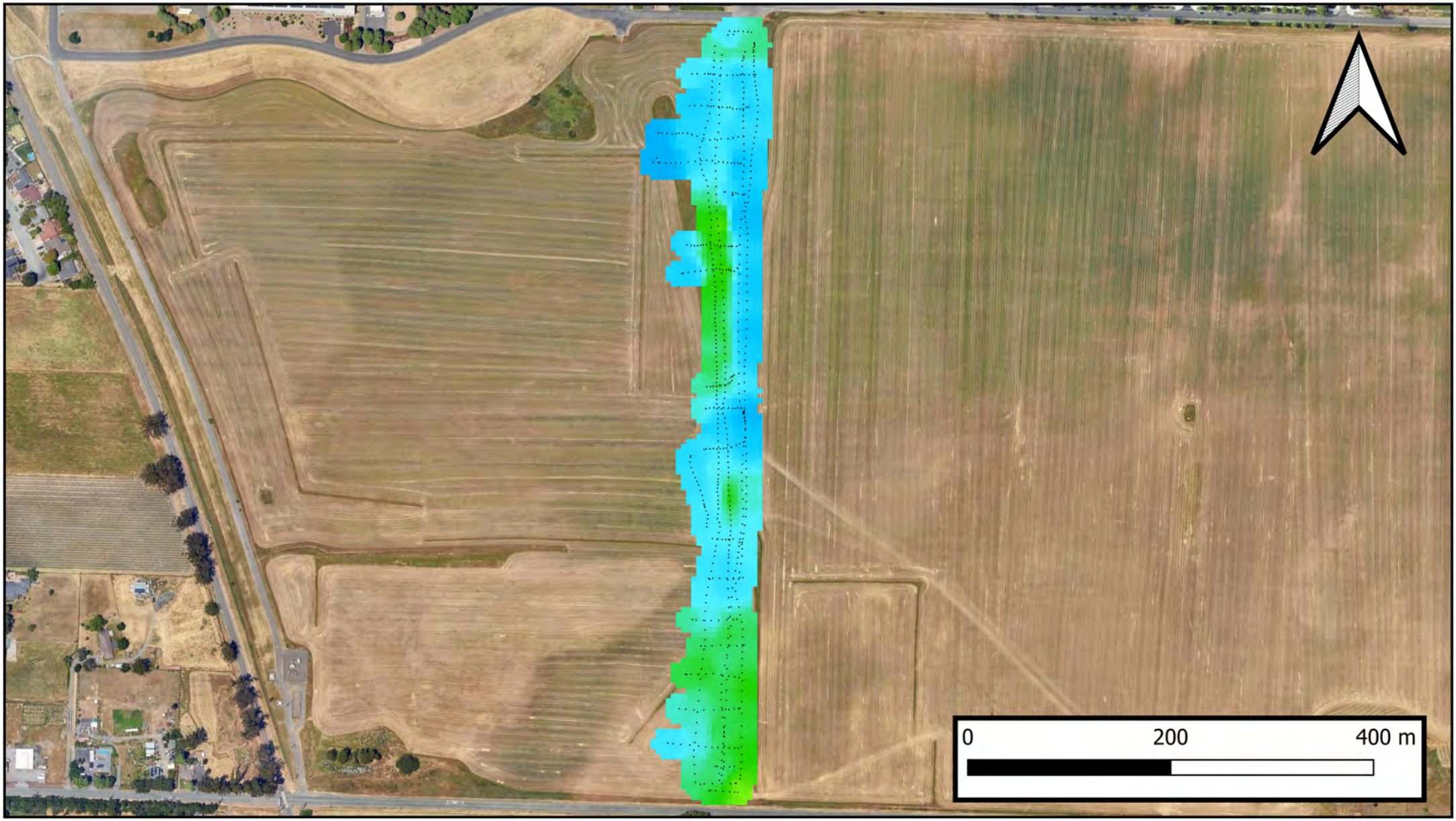
- Inversion Location

Google Satellite



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COLLIER GEOPHYSICS



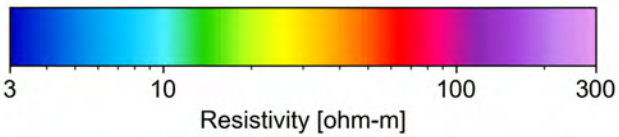
Mean Resistivity Depth Interval 19.7 to 26.2 ft (6 to 8 m)

Scale: 1:5000 NAD83 / California zone 2 (ftUS) / EPSG:2226

Map layers

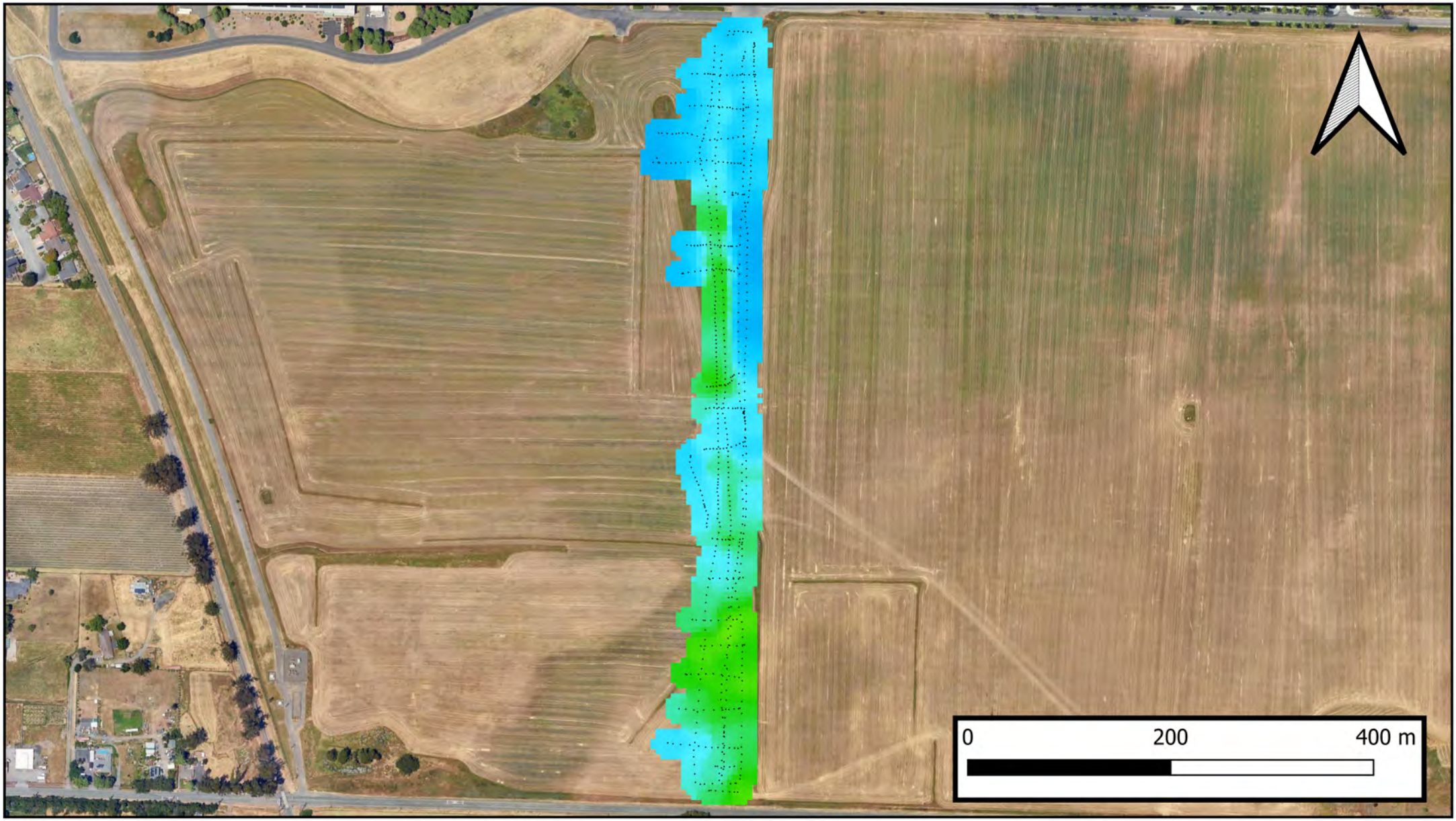
- Inversion Location

Google Satellite



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COLLIER GEOPHYSICS



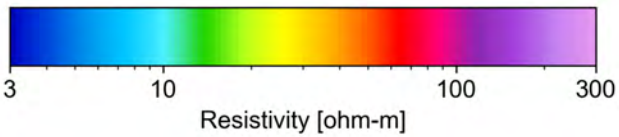
Mean Resistivity Depth Interval 26.2 to 32.8 ft (8 to 10 m)

Scale: 1:5000 NAD83 / California zone 2 (ftUS) / EPSG:2226

Map layers

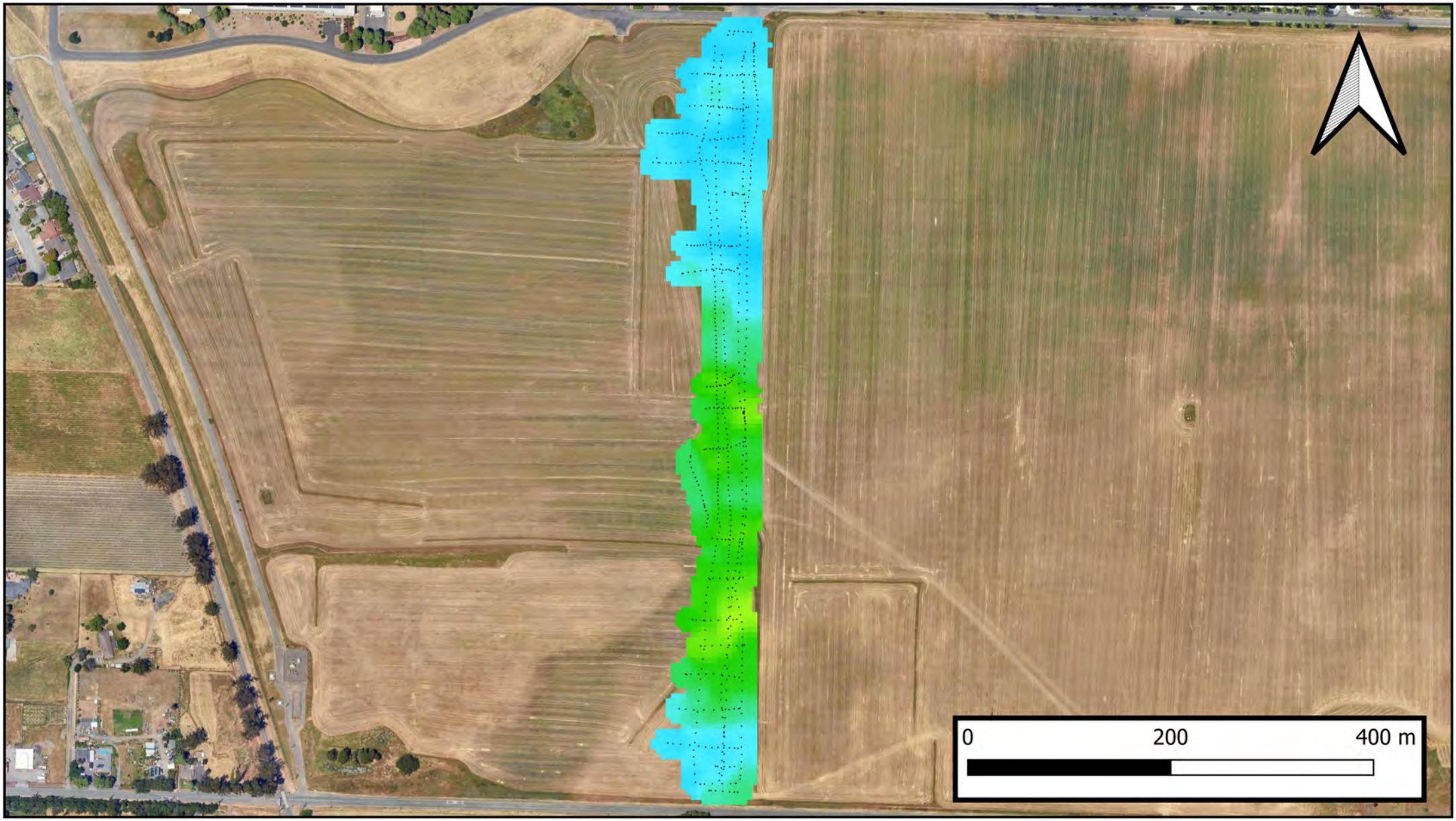
- Inversion Location

Google Satellite



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COLLIER GEOPHYSICS



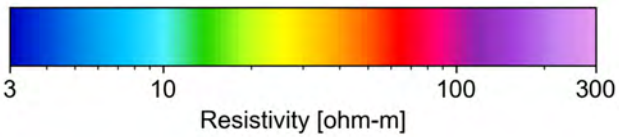
Mean Resistivity Depth Interval 32.8 to 49.2 ft (10 to 15 m)

Scale: 1:5000 NAD83 / California zone 2 (ftUS) / EPSG:2226

Map layers

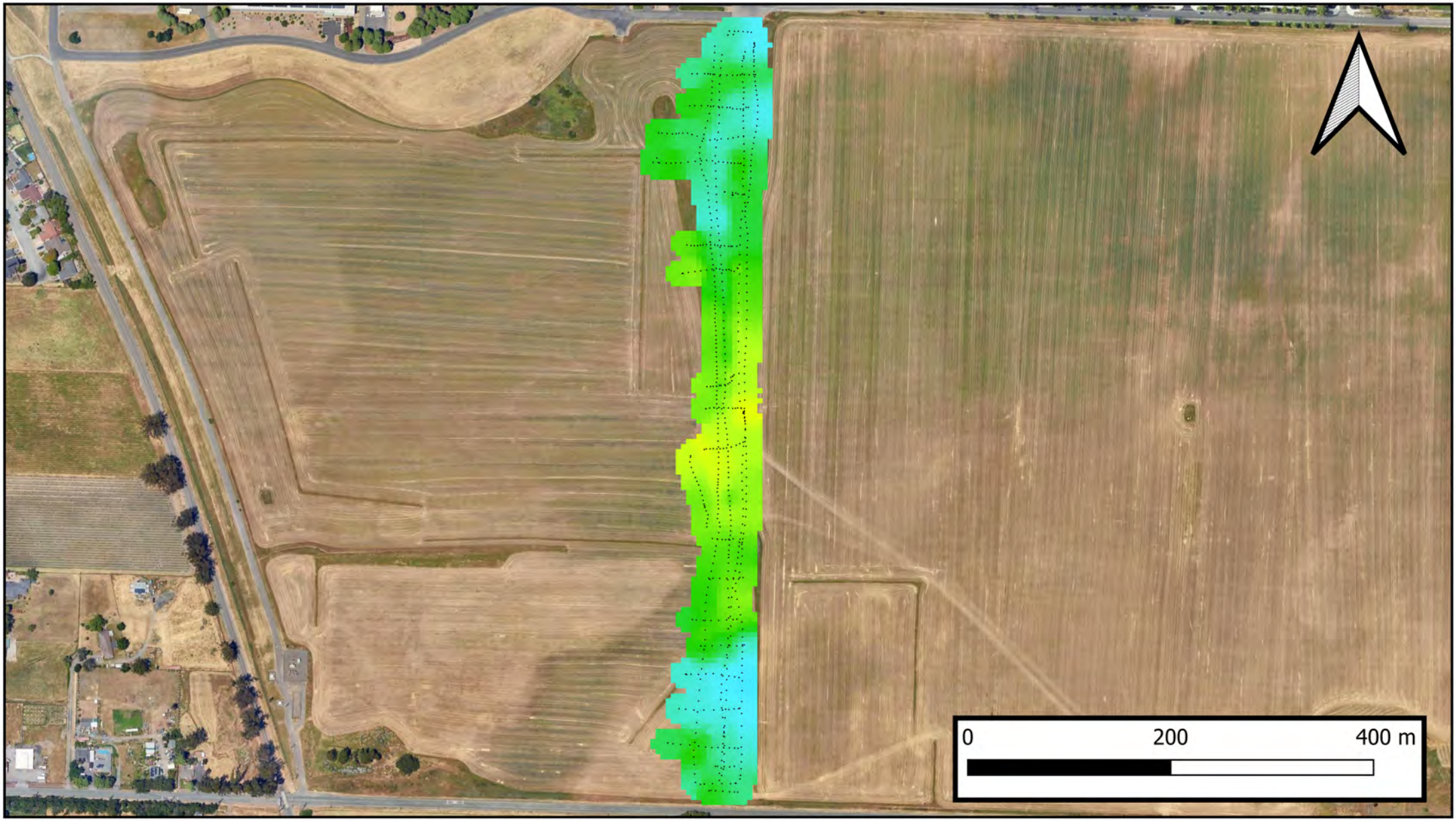
- Inversion Location

Google Satellite



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COLLIER GEOPHYSICS



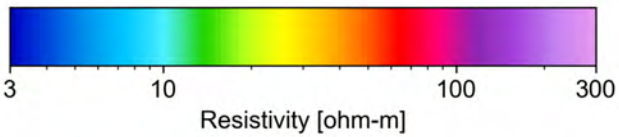
Mean Resistivity Depth Interval 49.2 to 65.6 ft (15 to 20 m)

Scale: 1:5000 NAD83 / California zone 2 (ftUS) / EPSG:2226

Map layers

- Inversion Location

Google Satellite



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COLLIER GEOPHYSICS



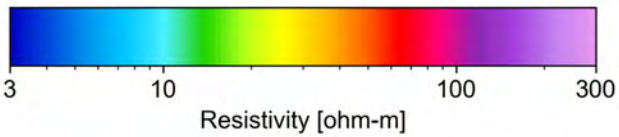
Mean Resistivity Depth Interval 65.6 to 82.0 ft (20 to 25 m)

Scale: 1:5000 NAD83 / California zone 2 (ftUS) / EPSG:2226

Map layers

- Inversion Location

Google Satellite



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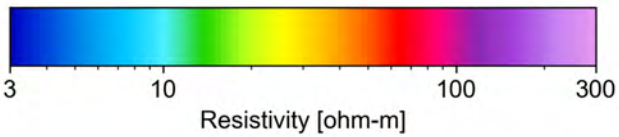
Mean Resistivity Depth Interval 82.0 to 98.4 ft (25 to 30 m)

Scale: 1:5000 NAD83 / California zone 2 (ftUS) / EPSG:2226

Map layers

- Inversion Location

Google Satellite



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COLLIER GEOPHYSICS



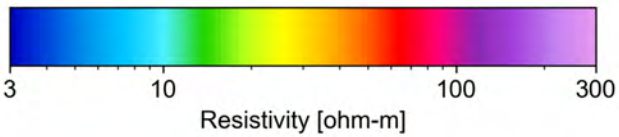
Mean Resistivity Depth Interval 98.4 to 114.8 ft (30 to 35 m)

Scale: 1:5000 NAD83 / California zone 2 (ftUS) / EPSG:2226

Map layers

- Inversion Location

Google Satellite



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COLLIER GEOPHYSICS



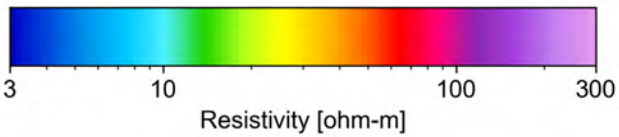
Mean Resistivity Depth Interval 114.8 to 131.2 ft (35 to 40 m)

Scale: 1:5000 NAD83 / California zone 2 (ftUS) / EPSG:2226

Map layers

- Inversion Location

Google Satellite



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COLLIER GEOPHYSICS



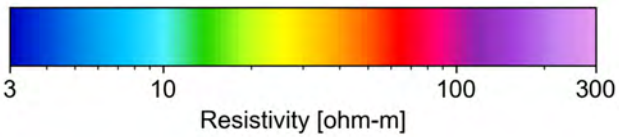
Mean Resistivity Depth Interval 131.2 to 164.0 ft (40 to 50 m)

Scale: 1:5000 NAD83 / California zone 2 (ftUS) / EPSG:2226

Map layers

- Inversion Location

Google Satellite



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COLLIER GEOPHYSICS



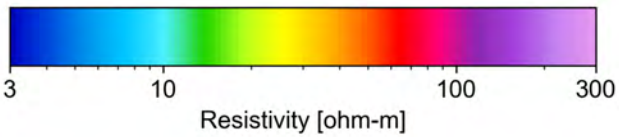
Mean Resistivity Depth Interval 164.0 to 196.9 ft (50 to 60 m)

Scale: 1:5000 NAD83 / California zone 2 (ftUS) / EPSG:2226

Map layers

- Inversion Location

Google Satellite



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COLLIER GEOPHYSICS



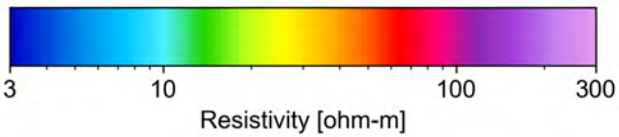
Mean Resistivity Depth Interval 196.9 to 229.7 ft (60 to 70 m)

Scale: 1:5000 NAD83 / California zone 2 (ftUS) / EPSG:2226

Map layers

- Inversion Location

Google Satellite



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COLLIER GEOPHYSICS



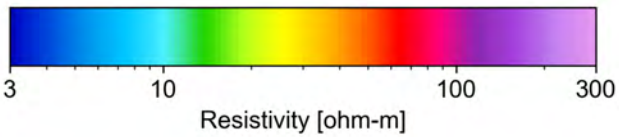
Mean Resistivity Depth Interval 229.7 to 262.5 ft (70 to 80 m)

Scale: 1:5000 NAD83 / California zone 2 (ftUS) / EPSG:2226

Map layers

- Inversion Location

Google Satellite



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COLLIER GEOPHYSICS



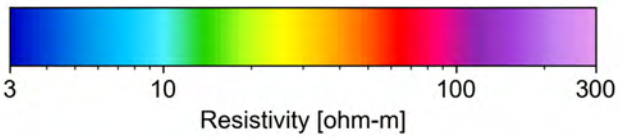
Mean Resistivity Depth Interval 262.5 to 295.3 ft (80 to 90 m)

Scale: 1:5000 NAD83 / California zone 2 (ftUS) / EPSG:2226

Map layers

- Inversion Location

Google Satellite



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APPENDIX 2

Resistivity Vertical Sections

Appendix 2 contains a detailed map and vertical profiles showing tTEM survey results along each driven line. The layout of each page, with circled numbers indicating each panel, is shown in Figure 1. The top of each page features the resulting tTEM profile (Panel 1, numbered in Figure 1), while a plan-view map, inset overview map, and legends are shown on the bottom of the page (Panels 2-4, numbered in Figure 1). Below is a description of the contents of each panel.

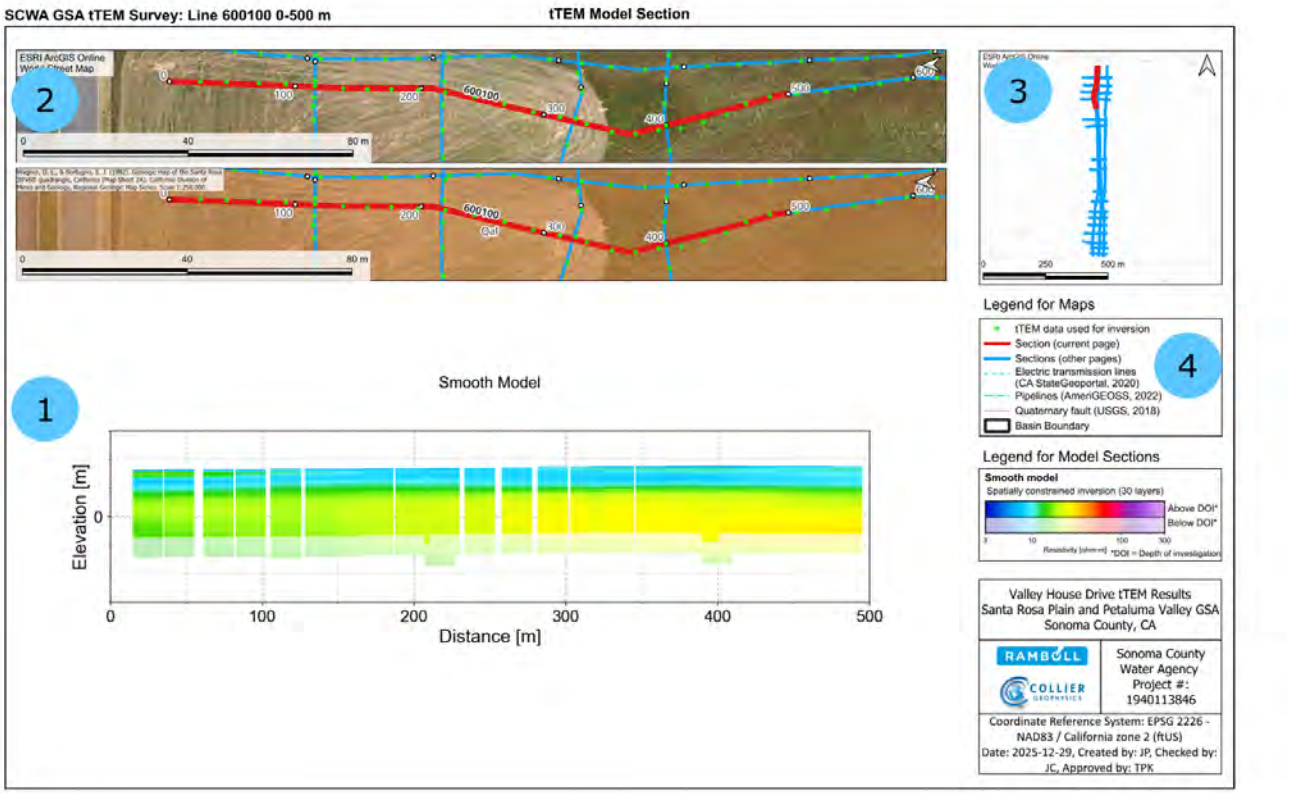


Figure 1 Layout of results in Appendix 2.

At the center of each page below the profile and in the plan-view maps, the profile line number and distance interval along which data are displayed is indicated to the left and to the right, respectively.

Panel 1 shows the smooth resistivity model results. The distance along the profile (x-axis) corresponds to the meter marks shown on the plan-view map. Each vertical bar of resistivity corresponds to a green dot at the same distance in Panels 2; gaps in the profiles correspond to gaps in the green dots shown in Panels 2.

Panel 2 displays the locations where tTEM data were used for inversion (green dots), the profile line along which all data are projected in the profile views, and the meter marks along the profile line, which correspond to the x-axis in the profile views. The background map shows the satellite imagery, geographical features, and infrastructure, including built up areas, roads, and power lines (light blue

dashed lines), which can disturb the tTEM signal. The other driven lines, including line numbers, that cross the section are shown on this map.

Panel 3 shows an inset map with all profile lines in the survey area. The red line highlights the profile line for the current page.

Panel 4 contains the legend for the Panels 1 and 2. Electric transmission lines (California State GeoPortal) were publicly available and mapped to understand their interference with the tTEM results

The resistivity is scaled with highest resistivities being purple in color, transitioning through red, orange, yellow and green to blue, which represent the lowest resistivities. The resistivity below the depth of investigation (DOI) is muted in color; color scales for data above and below the DOI are shown in the legend.

DATA REFERENCES

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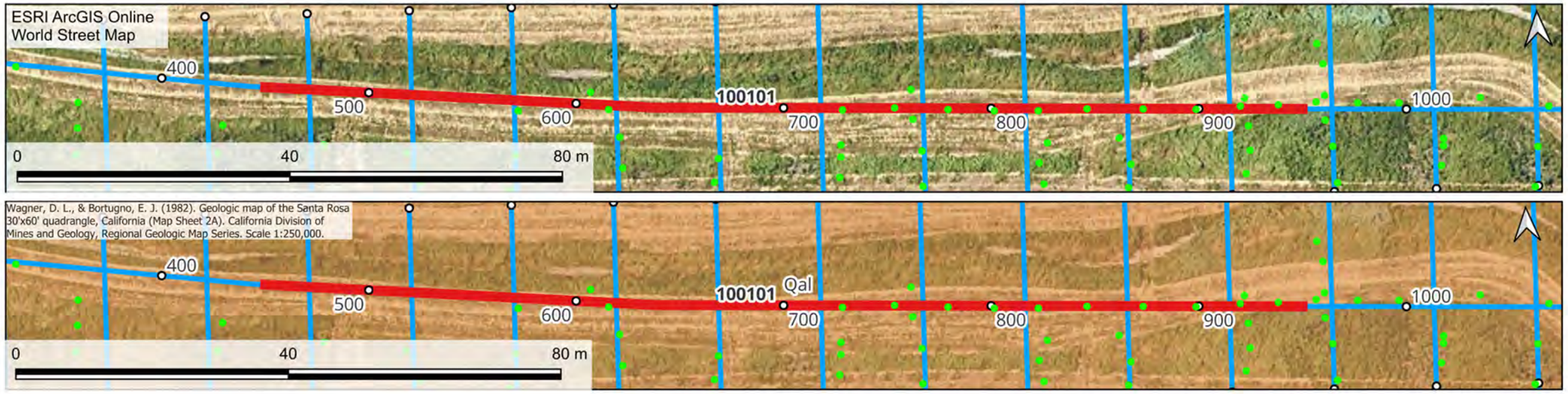
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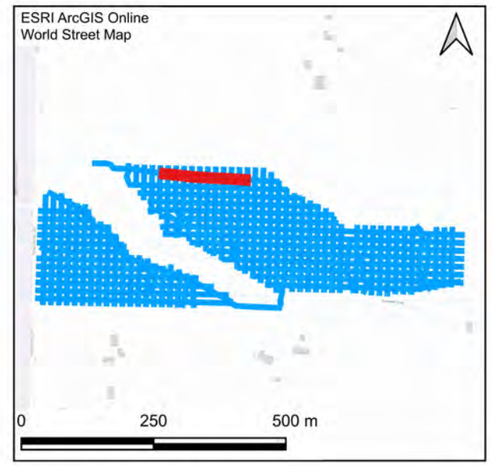
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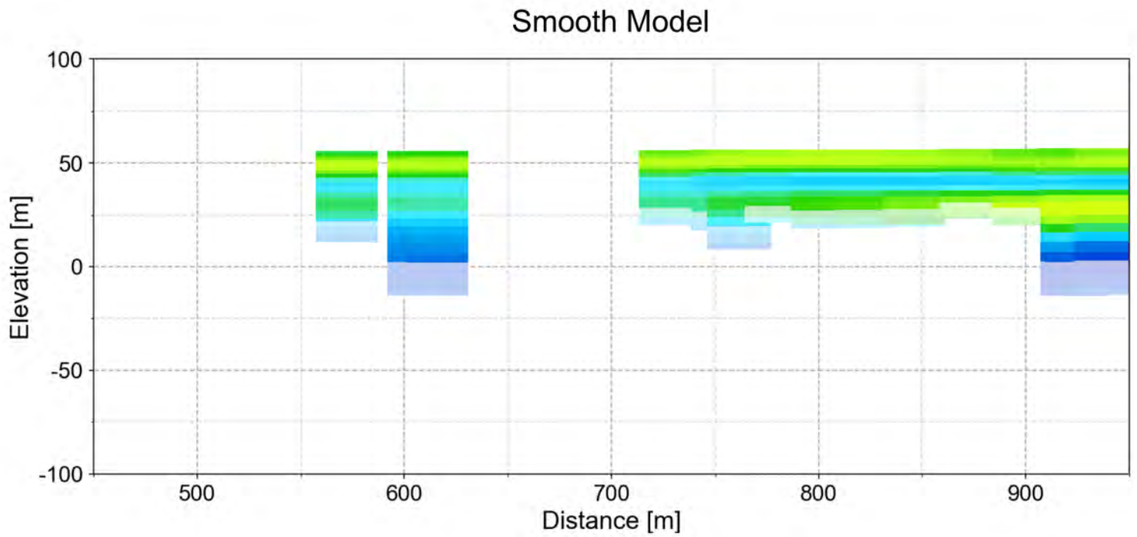
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SCWA GSA tTEM Survey: Line 100100 450-950 m

tTEM Model Section







Legend for Maps

- tTEM data used for inversion
- Section (current page)
- Sections (other pages)
- Electric transmission lines (CA StateGeoportal, 2020)
- Pipelines (AmeriGEOSS, 2022)
- Quaternary fault (USGS, 2018)

Legend for Model Sections

Smooth model

Spatially constrained inversion (30 layers)

Above DOI*

Below DOI*

3 10 100 300

Resistivity [ohm-m]

*DOI = Depth of investigation

Copeland Creek tTEM Results
Santa Rosa Plain GSA
Sonoma County, CA

RAMBOLL

COLLIER GEOPHYSICS

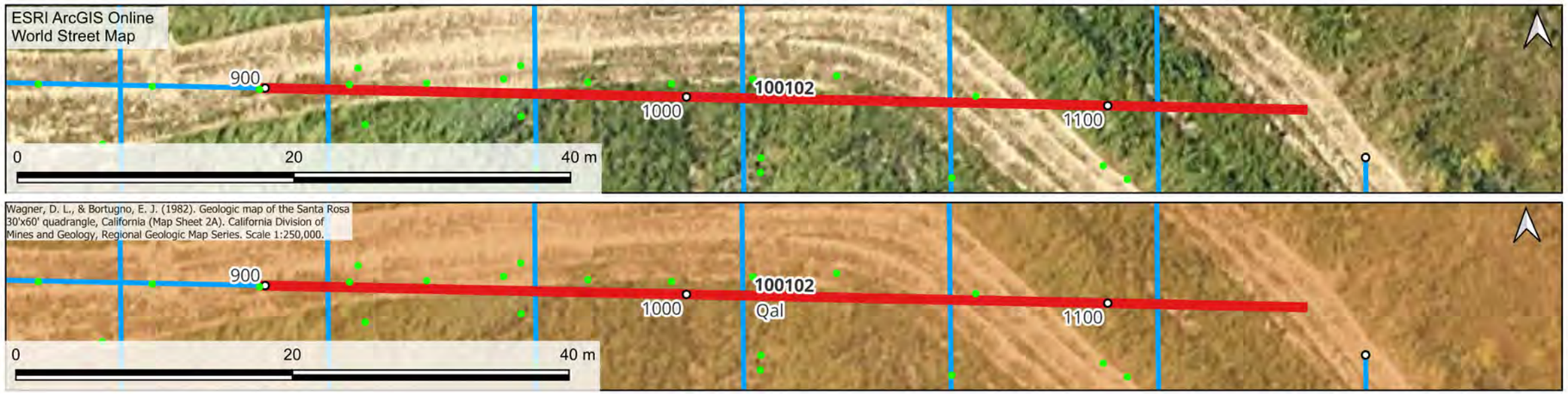
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Project #: 1940113846

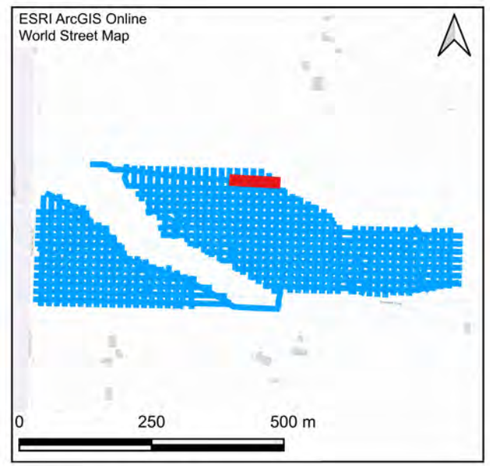
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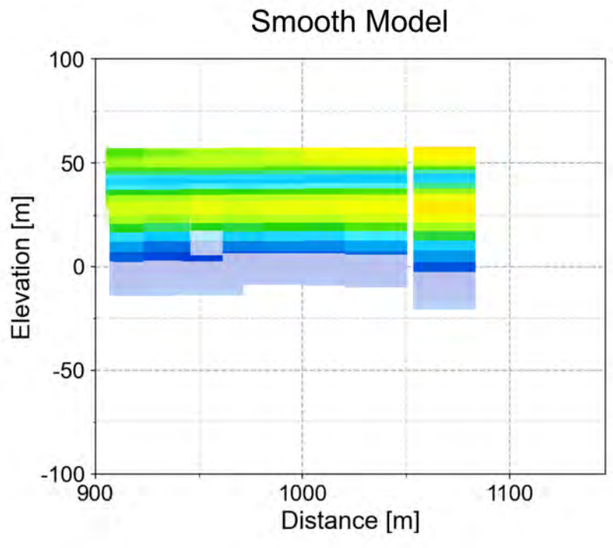
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SCWA GSA tTEM Survey: Line 100100 900-1146 m

tTEM Model Section







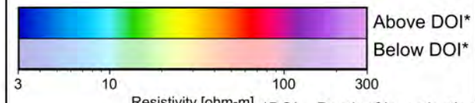
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Legend for Model Sections

Smooth model

Spatially constrained inversion (30 layers)



Copeland Creek tTEM Results
Santa Rosa Plain GSA
Sonoma County, CA

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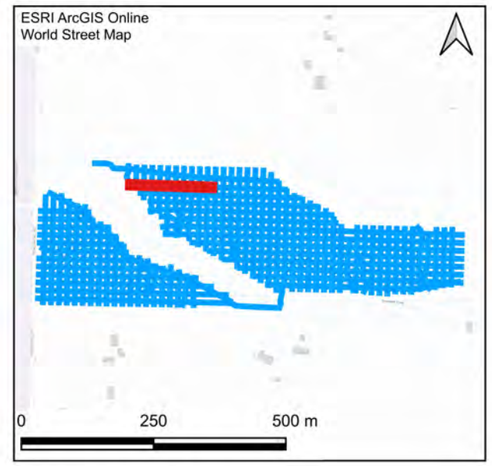
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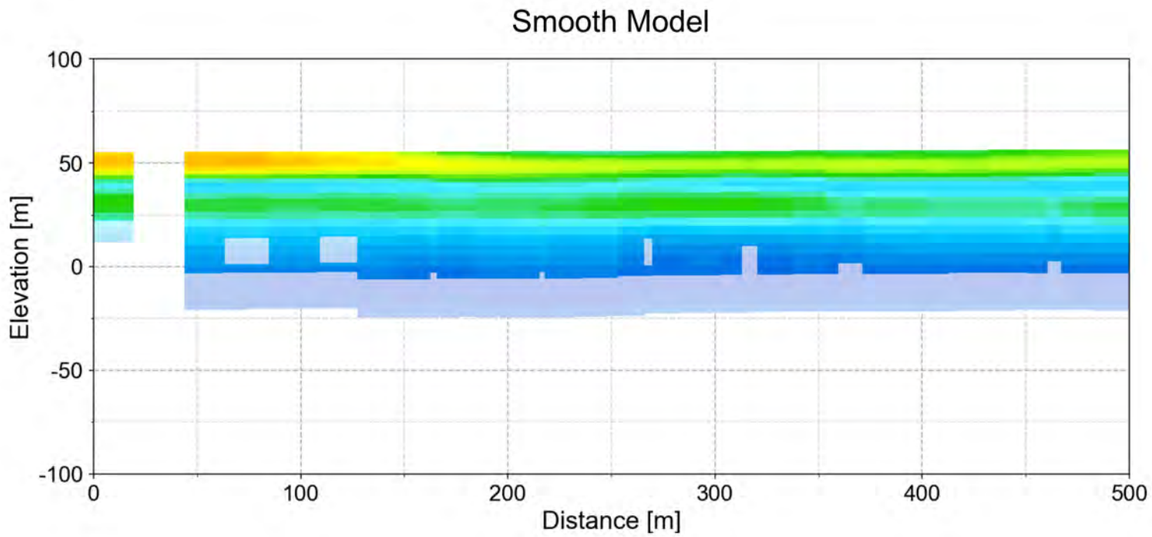
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SCWA GSA tTEM Survey: Line 100200 0-500 m

tTEM Model Section







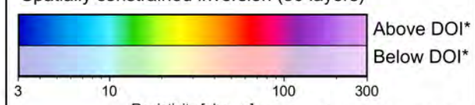
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Legend for Model Sections

Smooth model

Spatially constrained inversion (30 layers)



Copeland Creek tTEM Results
Santa Rosa Plain GSA
Sonoma County, CA

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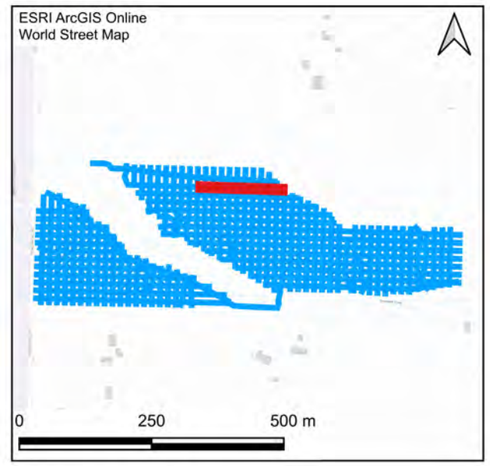
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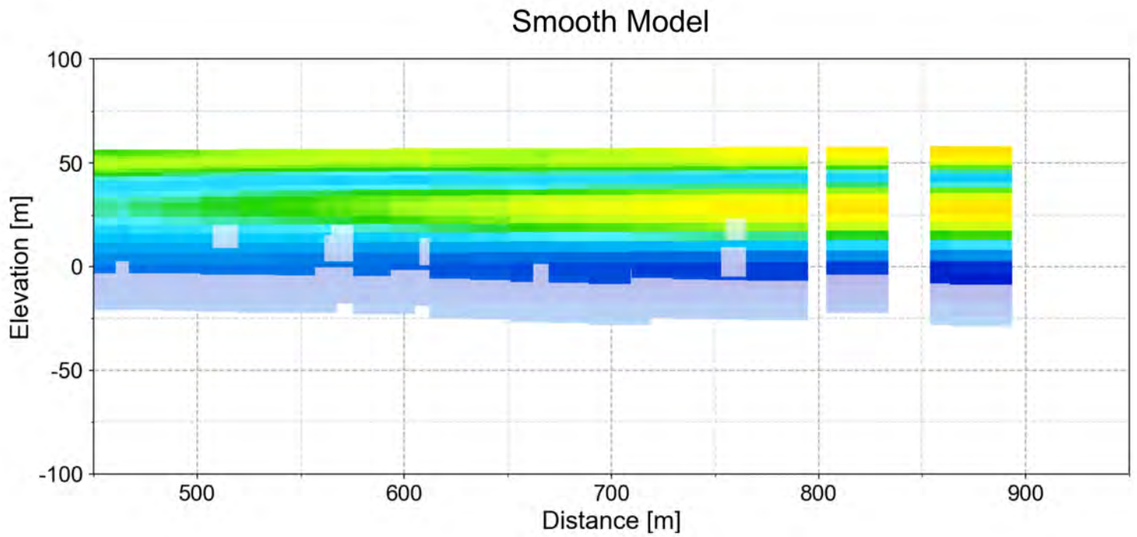
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SCWA GSA tTEM Survey: Line 100200 450-950 m

tTEM Model Section







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Legend for Model Sections

Smooth model

Spatially constrained inversion (30 layers)

Above DOI*
Below DOI*

3 10 100 300

Resistivity [ohm-m] *DOI = Depth of investigation

Copeland Creek tTEM Results
Santa Rosa Plain GSA
Sonoma County, CA

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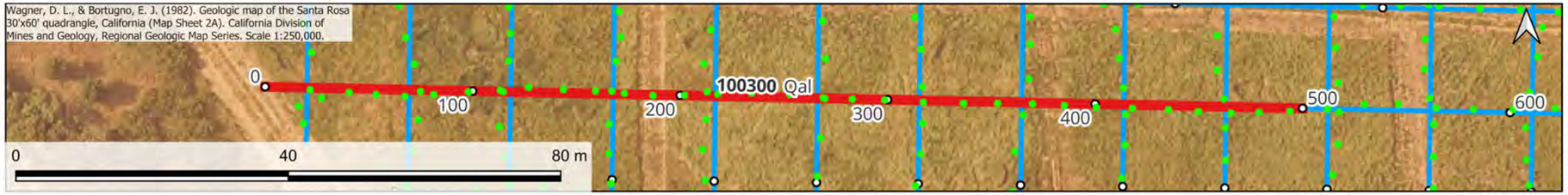
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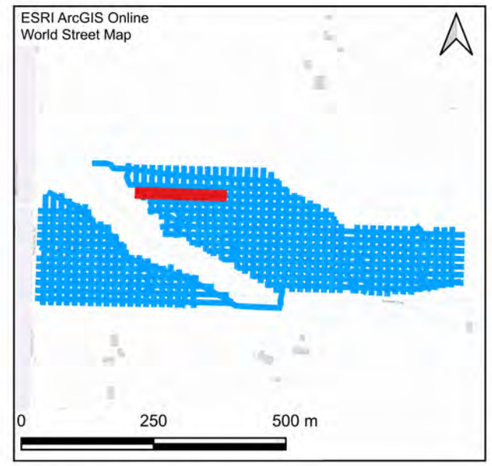
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SCWA GSA tTEM Survey: Line 100300 0-500 m

tTEM Model Section

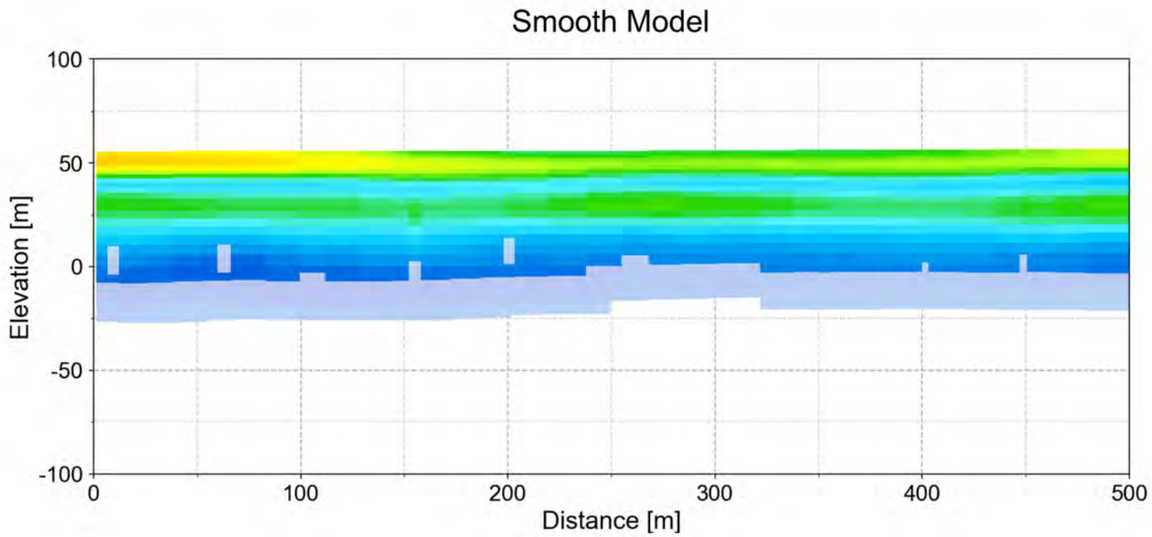






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Legend for Model Sections

Smooth model

Spatially constrained inversion (30 layers)

Above DOI*

Below DOI*

3 10 100 300

Resistivity [ohm-m]

*DOI = Depth of investigation

Copeland Creek tTEM Results
Santa Rosa Plain GSA
Sonoma County, CA

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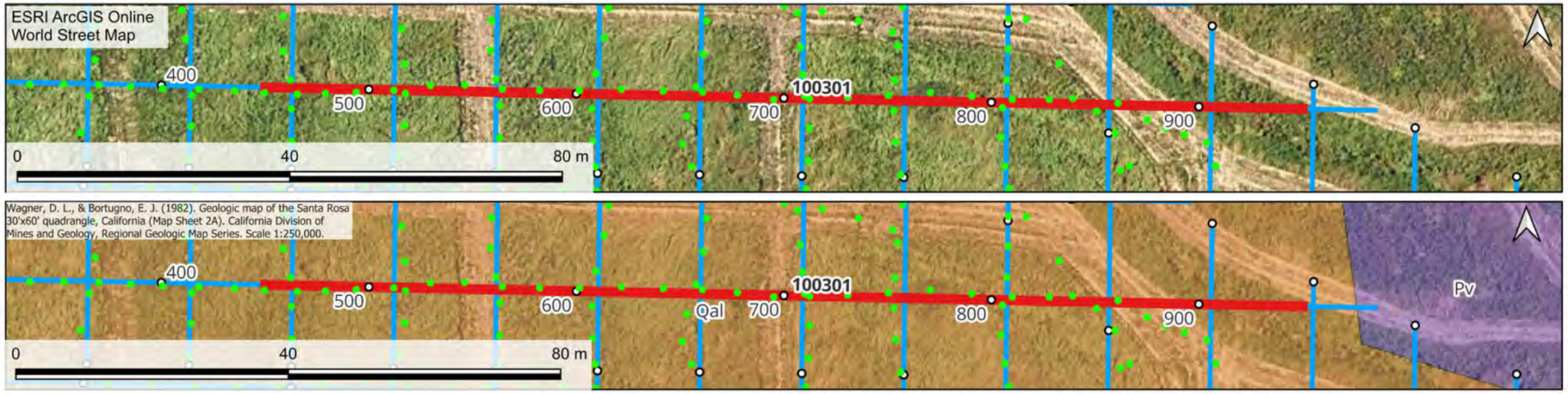
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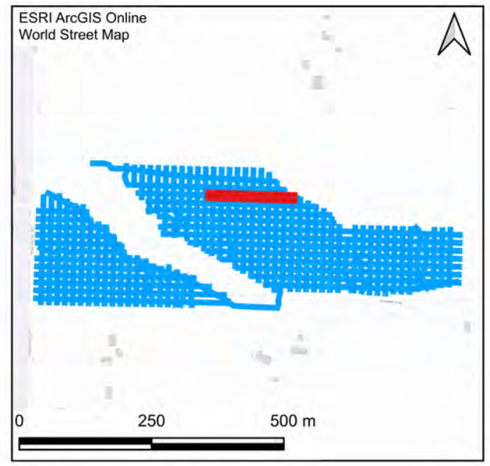
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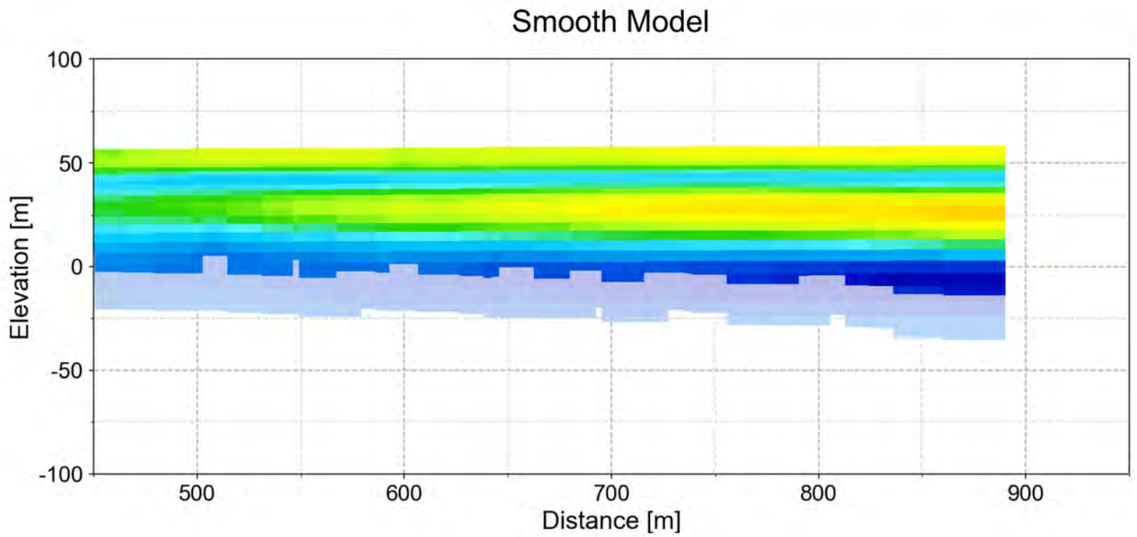
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SCWA GSA tTEM Survey: Line 100300 450-950 m

tTEM Model Section







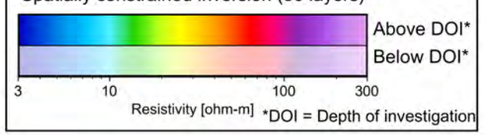
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Legend for Model Sections

Smooth model

Spatially constrained inversion (30 layers)



Copeland Creek tTEM Results
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Sonoma County, CA

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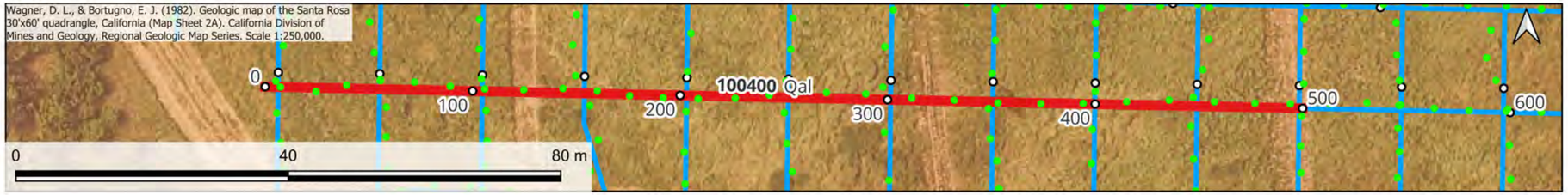
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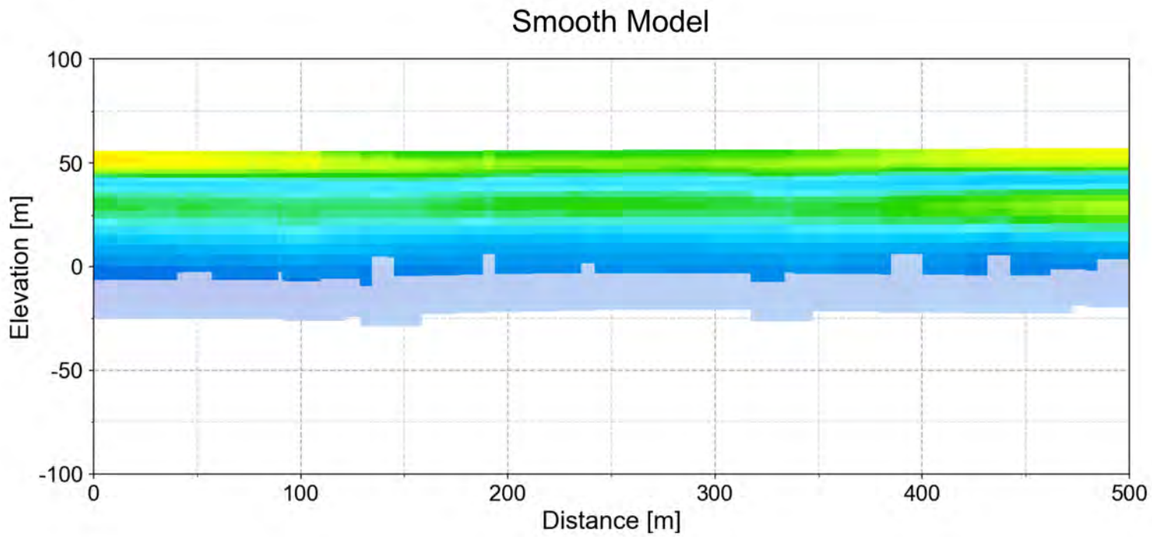
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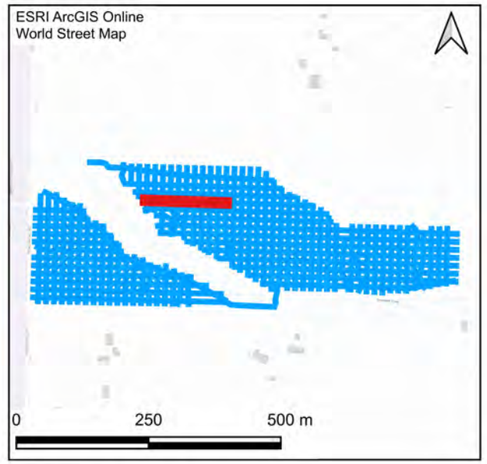
SCWA GSA tTEM Survey: Line 100400 0-500 m

tTEM Model Section









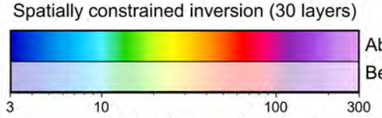
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Legend for Model Sections

Smooth model

Spatially constrained inversion (30 layers)



*DOI = Depth of investigation

Copeland Creek tTEM Results
Santa Rosa Plain GSA
Sonoma County, CA

RAMBOLL

COLLIER GEOPHYSICS

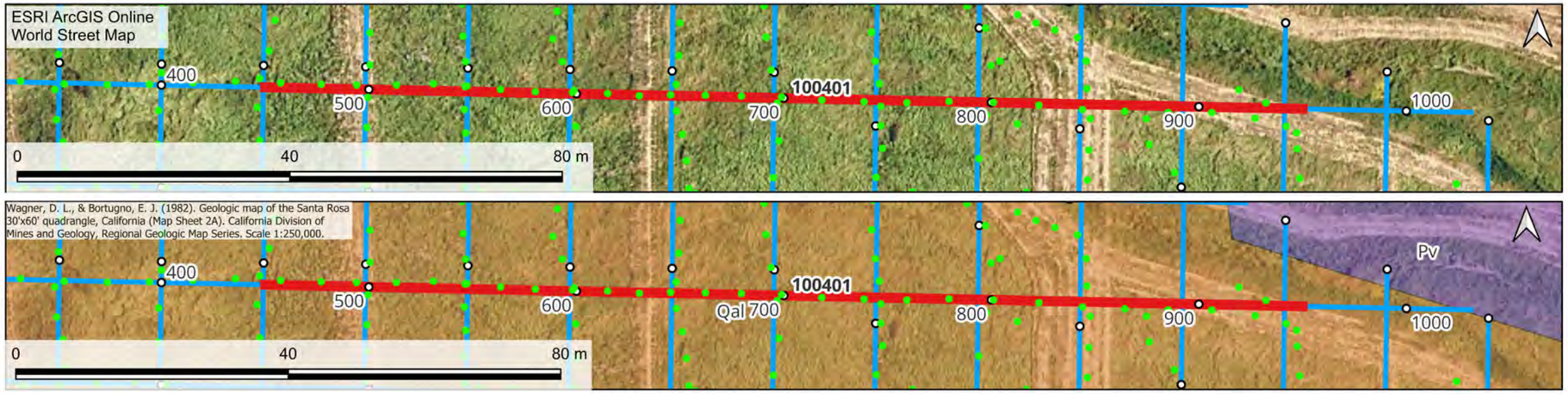
Sonoma County Water Agency
Project #: 1940113846

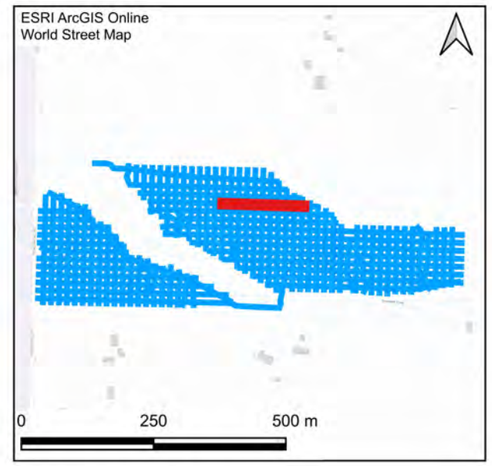
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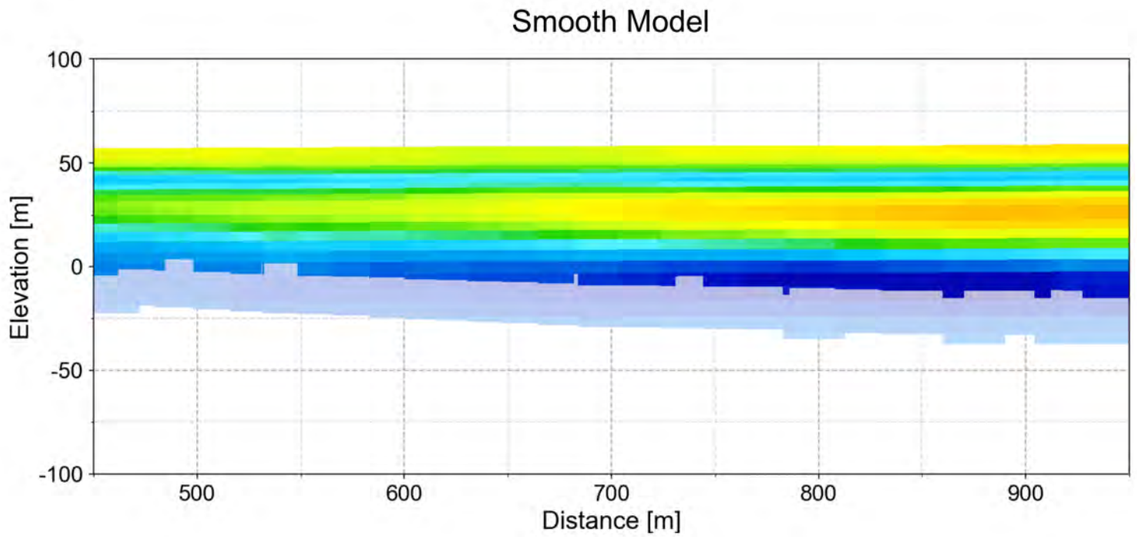
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SCWA GSA tTEM Survey: Line 100400 450-950 m

tTEM Model Section







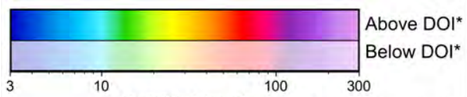
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Legend for Model Sections

Smooth model

Spatially constrained inversion (30 layers)



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Copeland Creek tTEM Results
Santa Rosa Plain GSA
Sonoma County, CA

RAMBOLL

COLLIER GEOPHYSICS

Sonoma County Water Agency
Project #: 1940113846

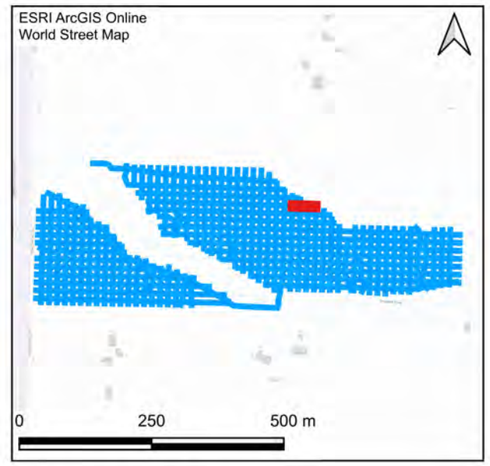
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SCWA GSA tTEM Survey: Line 100400 900-1031 m

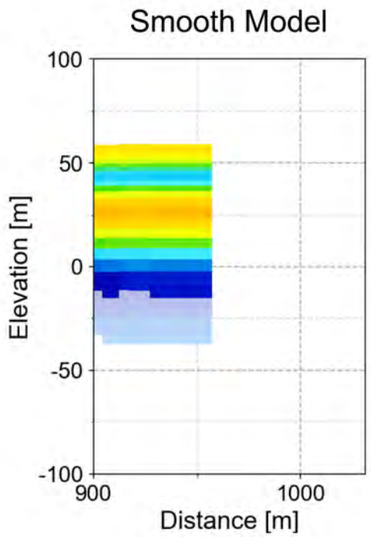
tTEM Model Section





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Legend for Model Sections

Smooth model

Spatially constrained inversion (30 layers)

Above DOI*

Below DOI*

3 10 100 300

Resistivity [ohm-m] *DOI = Depth of investigation

Copeland Creek tTEM Results
Santa Rosa Plain GSA
Sonoma County, CA

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Sonoma County Water Agency
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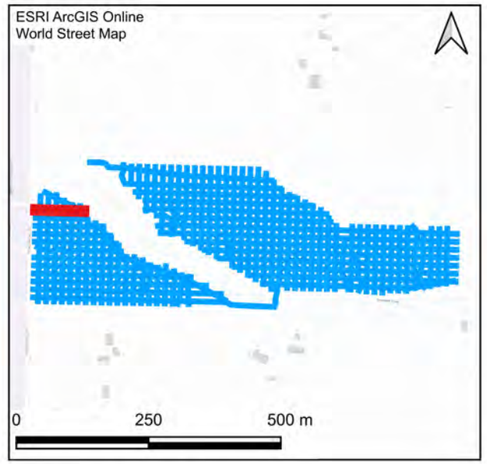
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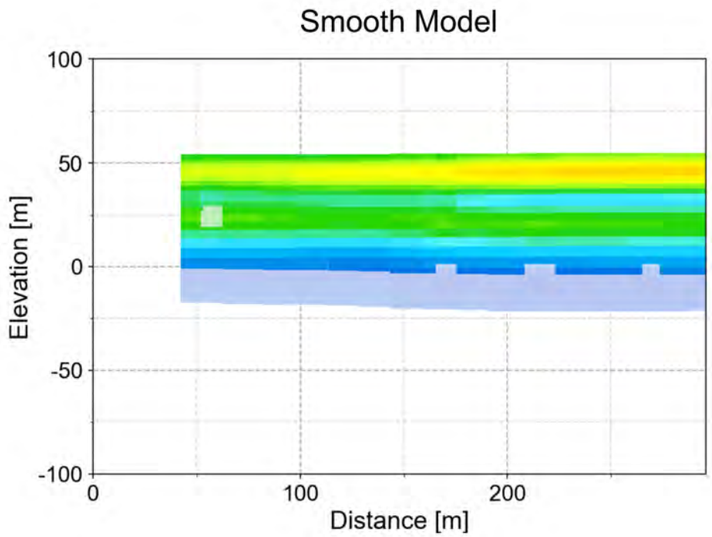
tTEM Model Section





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Legend for Model Sections

Smooth model

Spatially constrained inversion (30 layers)

Above DOI*

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Resistivity [ohm-m] *DOI = Depth of investigation

Copeland Creek tTEM Results
Santa Rosa Plain GSA
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Sonoma County Water Agency
Project #: 1940113846

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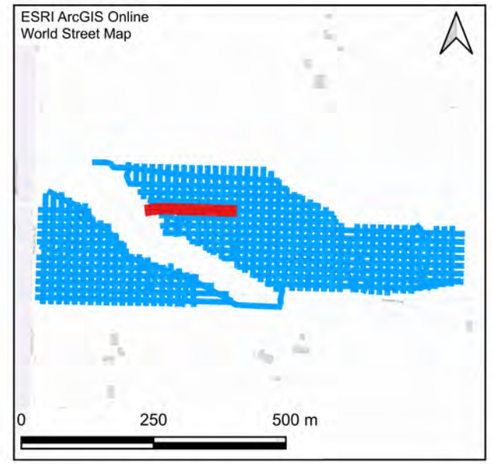
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tTEM Model Section

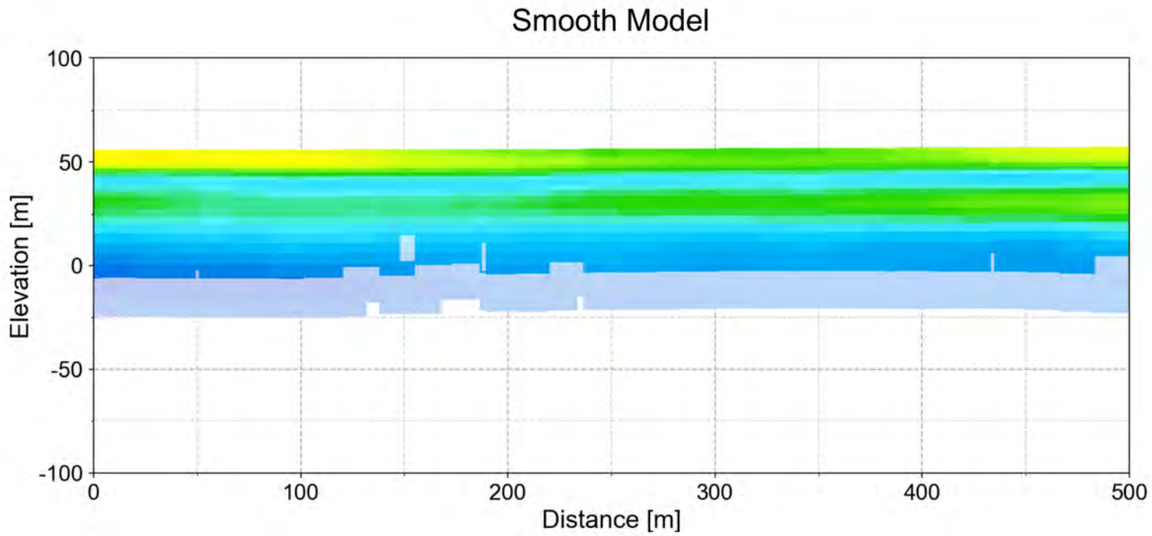






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Legend for Model Sections

Smooth model

Spatially constrained inversion (30 layers)

Above DOI*

Below DOI*

3 10 100 300

Resistivity [ohm-m]

*DOI = Depth of investigation

Copeland Creek tTEM Results
Santa Rosa Plain GSA
Sonoma County, CA

RAMBOLL

COLLIER GEOPHYSICS

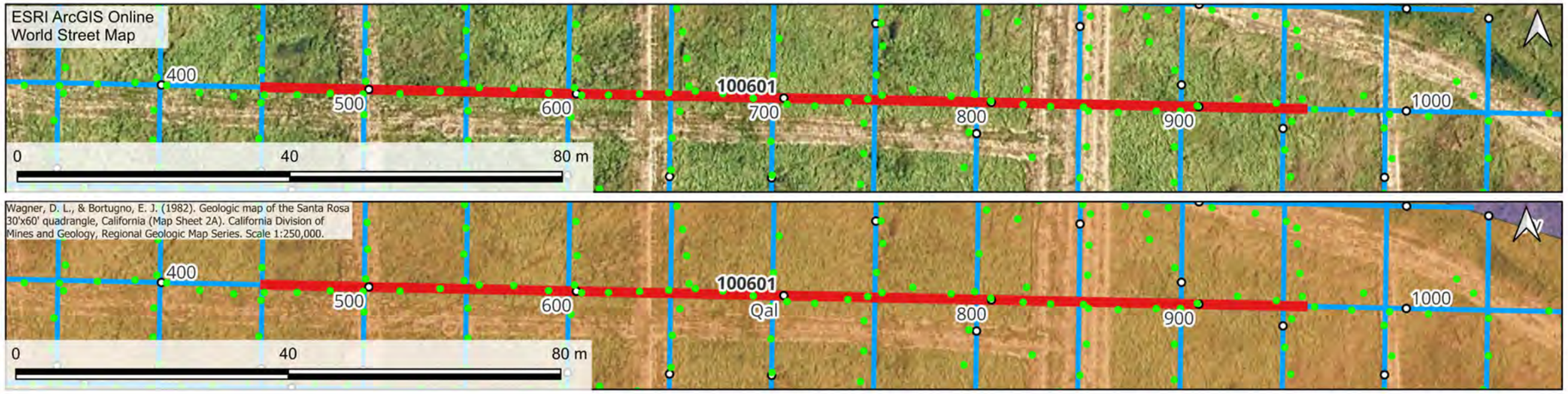
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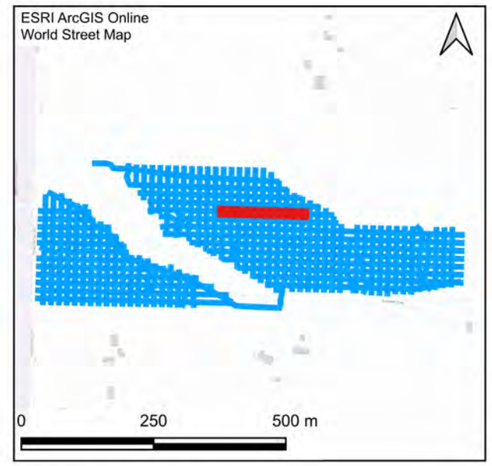
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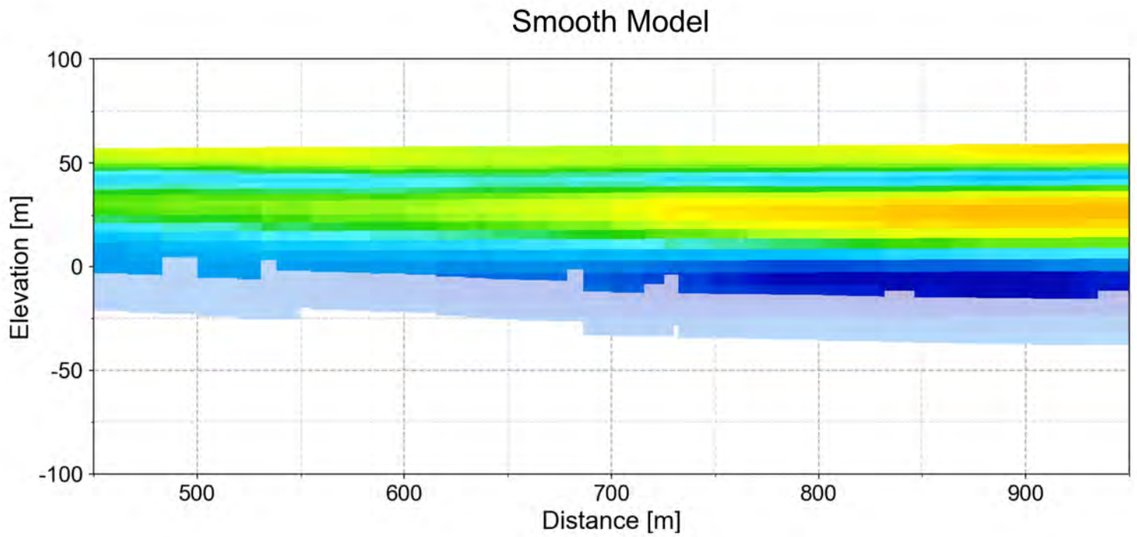
Date: 2025-12-30, Created by: JP, Checked by: JC, Approved by: TPK

SCWA GSA tTEM Survey: Line 100600 450-950 m

tTEM Model Section







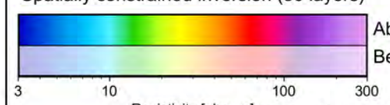
Legend for Maps

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- Quaternary fault (USGS, 2018)

Legend for Model Sections

Smooth model

Spatially constrained inversion (30 layers)



*DOI = Depth of investigation

Copeland Creek tTEM Results
Santa Rosa Plain GSA
Sonoma County, CA

RAMBOLL
COLLIER GEOPHYSICS

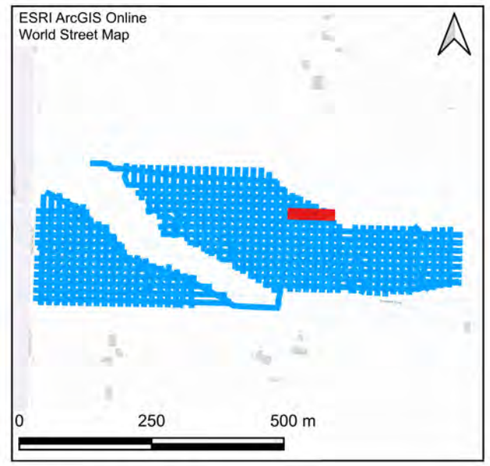
Sonoma County Water Agency
Project #: 1940113846

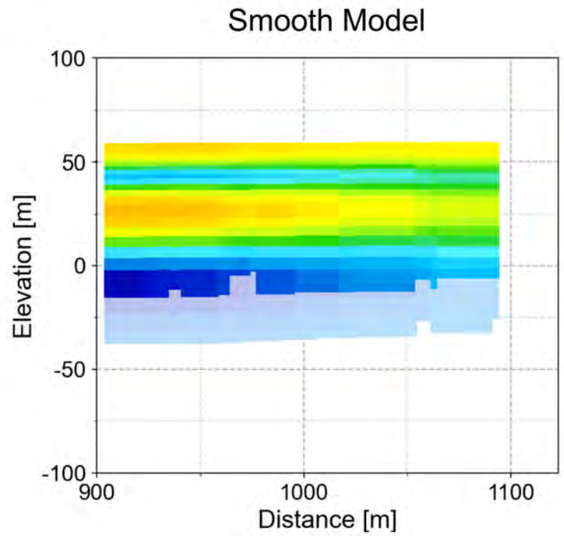
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Date: 2025-12-30, Created by: JP, Checked by: JC, Approved by: TPK

SCWA GSA tTEM Survey: Line 100600 900-1123 m

tTEM Model Section







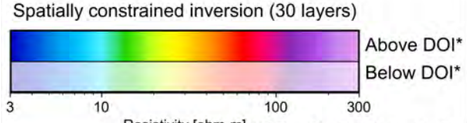
Legend for Maps

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Legend for Model Sections

Smooth model

Spatially constrained inversion (30 layers)



*DOI = Depth of investigation

Copeland Creek tTEM Results
Santa Rosa Plain GSA
Sonoma County, CA

RAMBOLL

COLLIER GEOPHYSICS

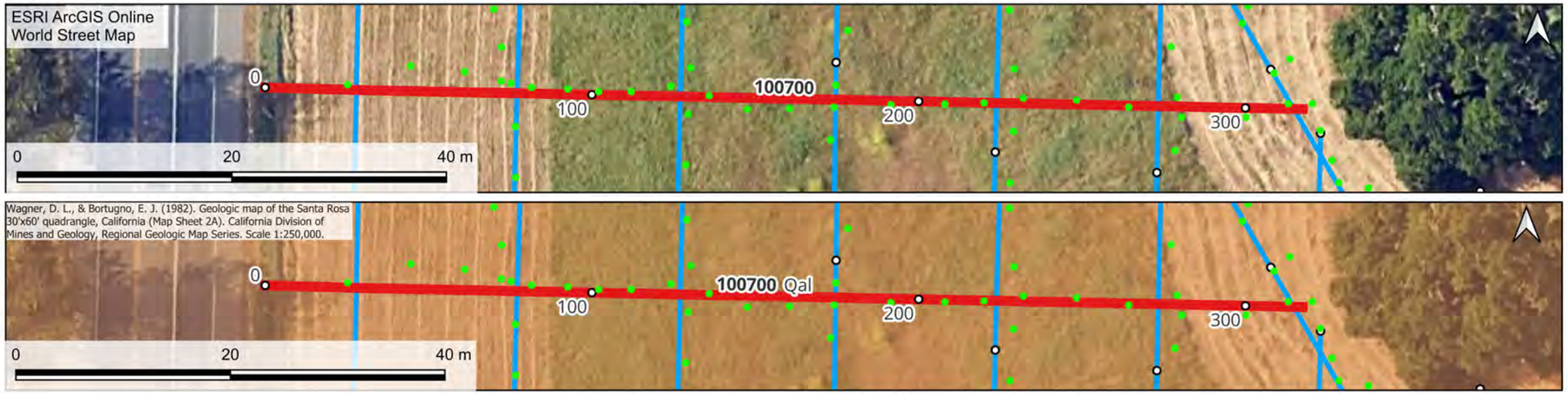
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Project #: 1940113846

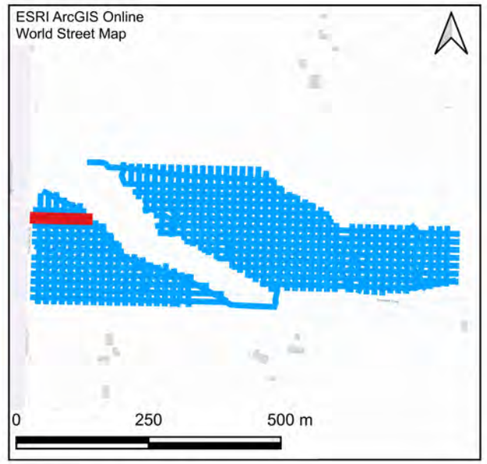
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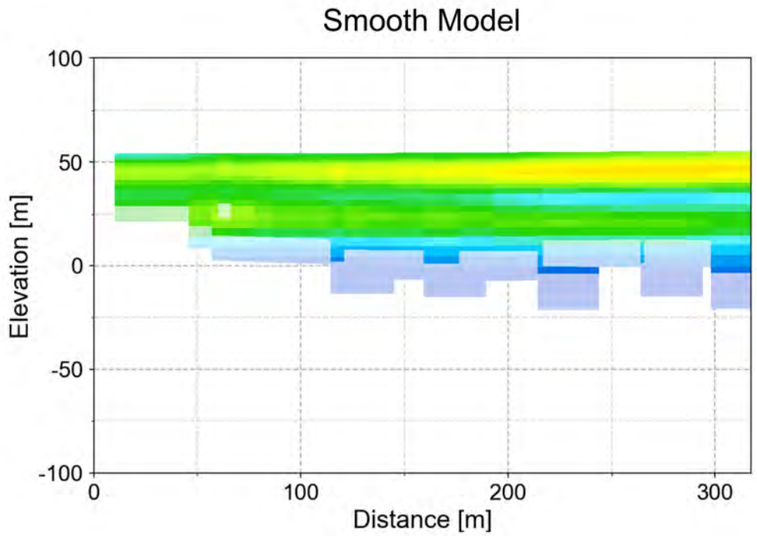
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SCWA GSA tTEM Survey: Line 100700 0-317 m

tTEM Model Section







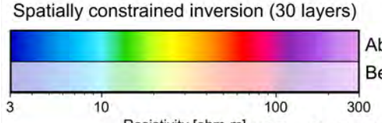
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Legend for Model Sections

Smooth model

Spatially constrained inversion (30 layers)



Copeland Creek tTEM Results
Santa Rosa Plain GSA
Sonoma County, CA

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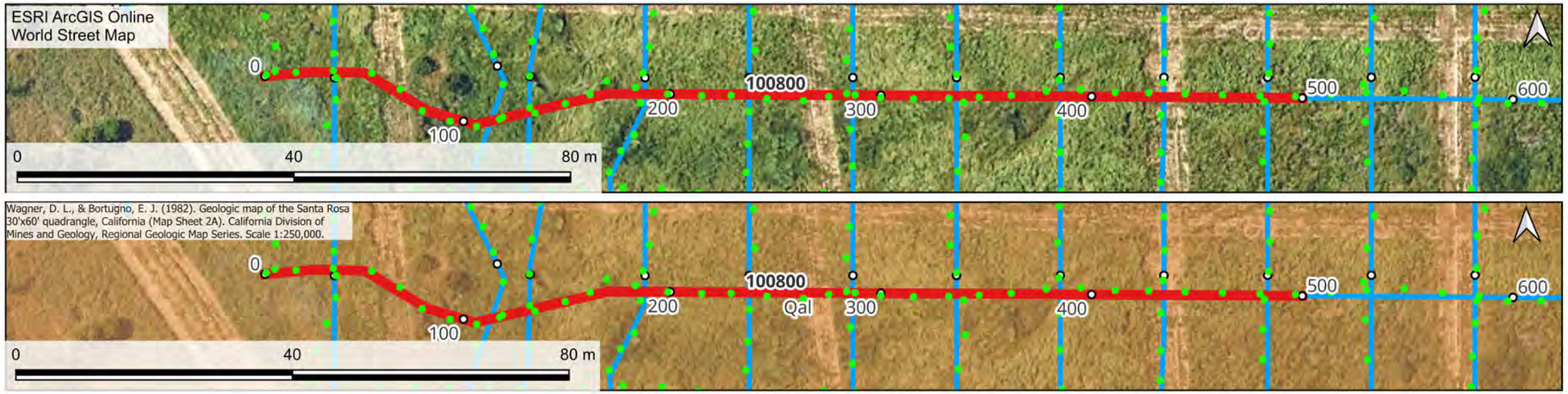
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Project #: 1940113846

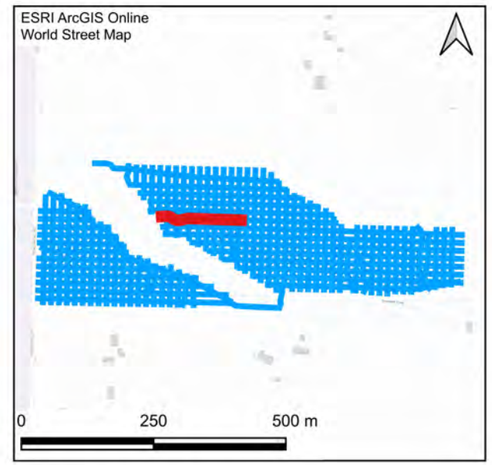
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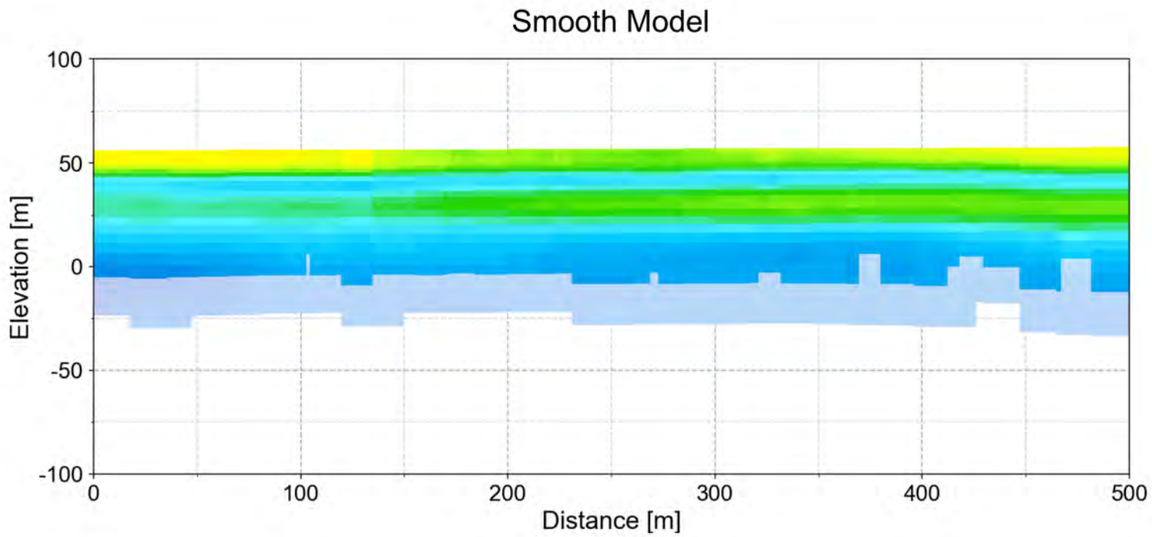
Date: 2025-12-30, Created by: JP, Checked by: JC, Approved by: TPK

SCWA GSA tTEM Survey: Line 100800 0-500 m

tTEM Model Section







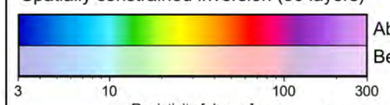
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- Quaternary fault (USGS, 2018)

Legend for Model Sections

Smooth model

Spatially constrained inversion (30 layers)



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Copeland Creek tTEM Results
Santa Rosa Plain GSA
Sonoma County, CA

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COLLIER GEOPHYSICS

Sonoma County Water Agency
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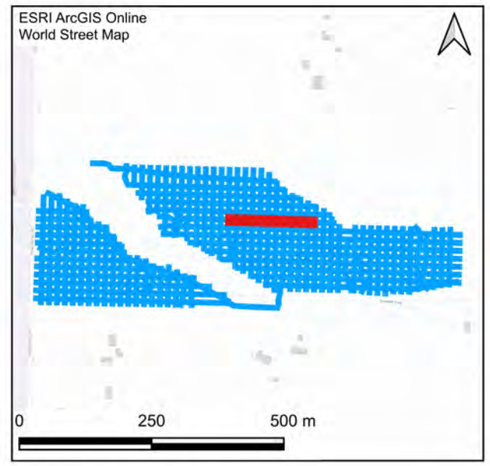
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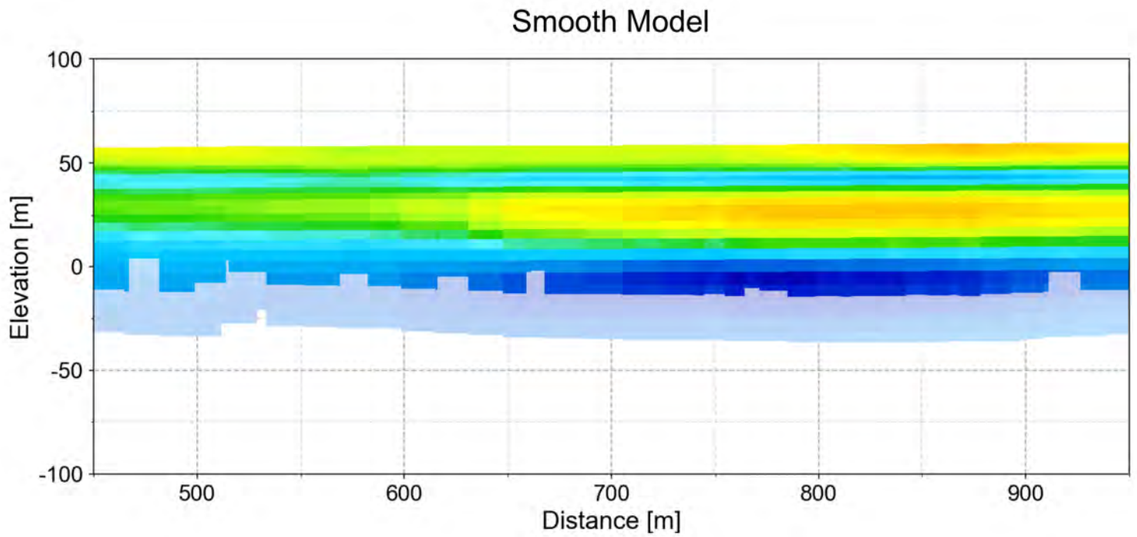
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SCWA GSA tTEM Survey: Line 100800 450-950 m

tTEM Model Section







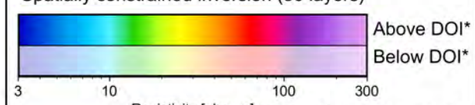
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Legend for Model Sections

Smooth model

Spatially constrained inversion (30 layers)



Copeland Creek tTEM Results
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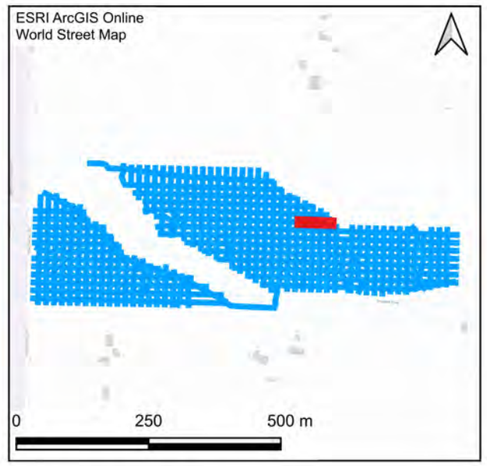
Sonoma County Water Agency
Project #: 1940113846

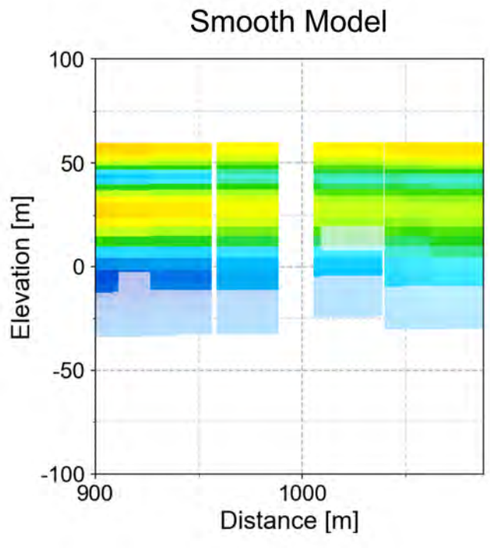
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Date: 2025-12-30, Created by: JP, Checked by: JC, Approved by: TPK

SCWA GSA tTEM Survey: Line 100800 900-1087 m

tTEM Model Section







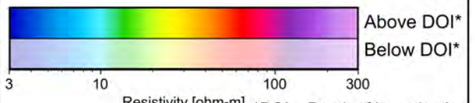
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Legend for Model Sections

Smooth model

Spatially constrained inversion (30 layers)



Copeland Creek tTEM Results
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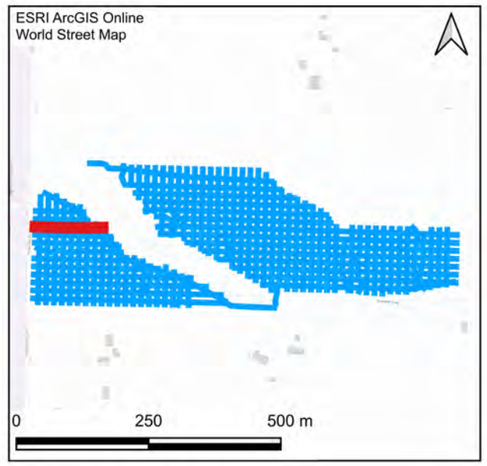
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SCWA GSA tTEM Survey: Line 100900 0-419 m

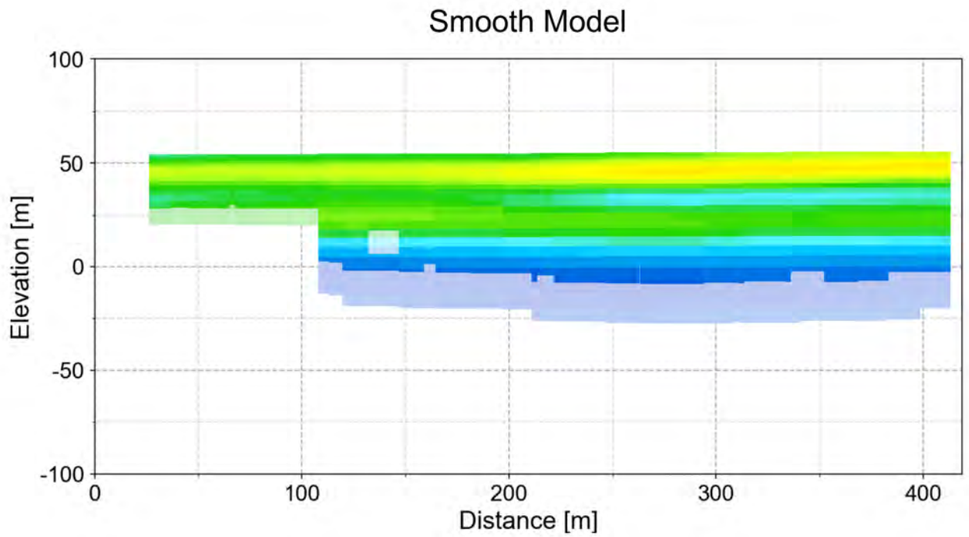
tTEM Model Section





Legend for Maps

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Legend for Model Sections

Smooth model

Spatially constrained inversion (30 layers)

Above DOI*

Below DOI*

3 10 100 300

Resistivity [ohm-m]

*DOI = Depth of investigation

Copeland Creek tTEM Results
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Sonoma County, CA

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COLLIER GEOPHYSICS

Sonoma County Water Agency
Project #: 1940113846

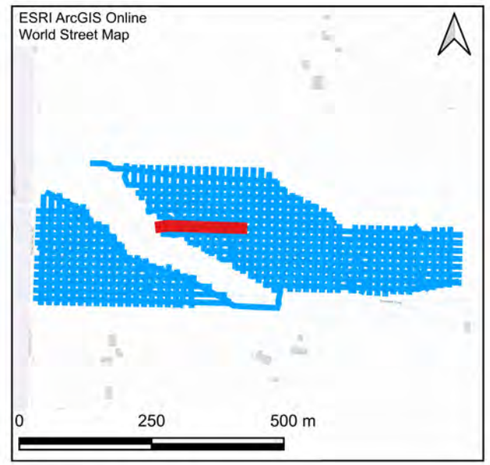
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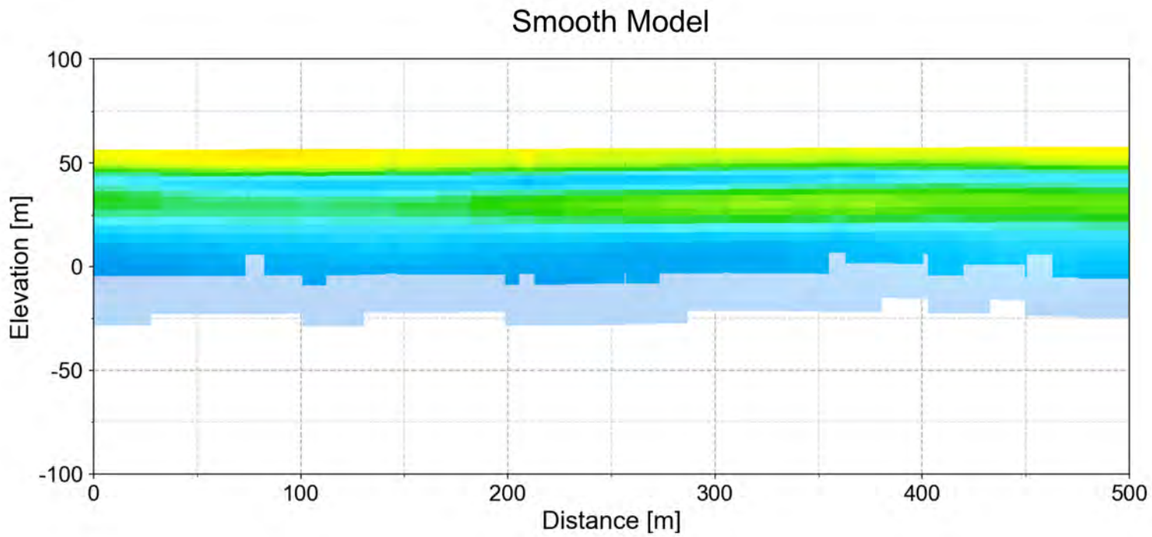
Date: 2025-12-30, Created by: JP, Checked by: JC, Approved by: TPK

SCWA GSA tTEM Survey: Line 101000 0-500 m

tTEM Model Section







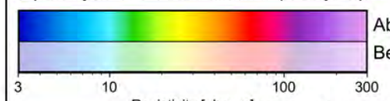
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Legend for Model Sections

Smooth model

Spatially constrained inversion (30 layers)



*DOI = Depth of investigation

Copeland Creek tTEM Results
Santa Rosa Plain GSA
Sonoma County, CA

RAMBOLL

COLLIER GEOPHYSICS

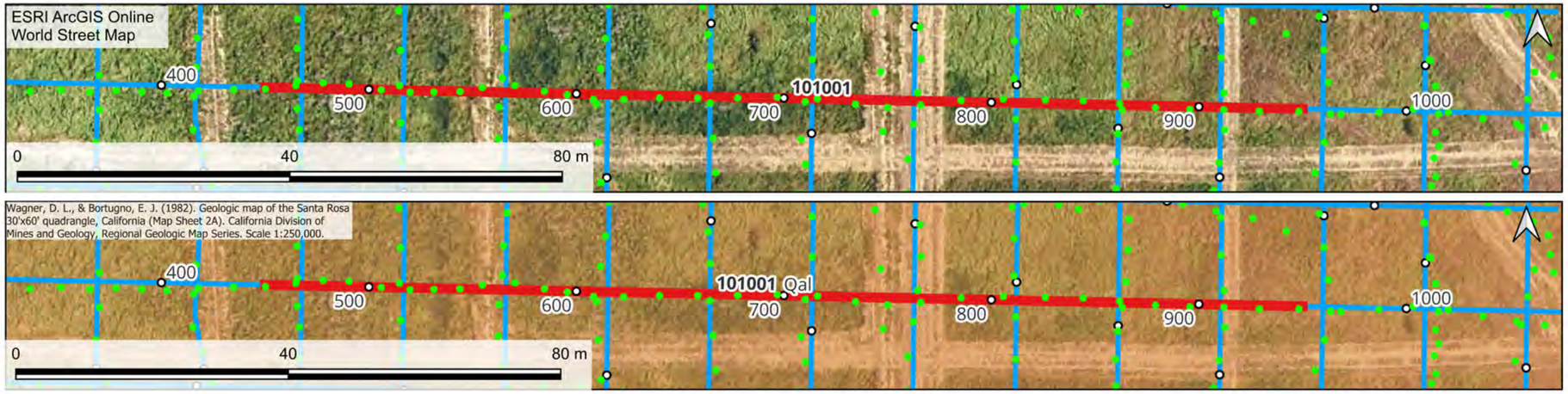
Sonoma County Water Agency
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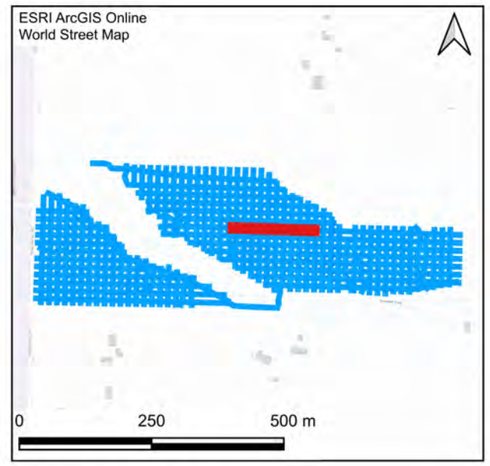
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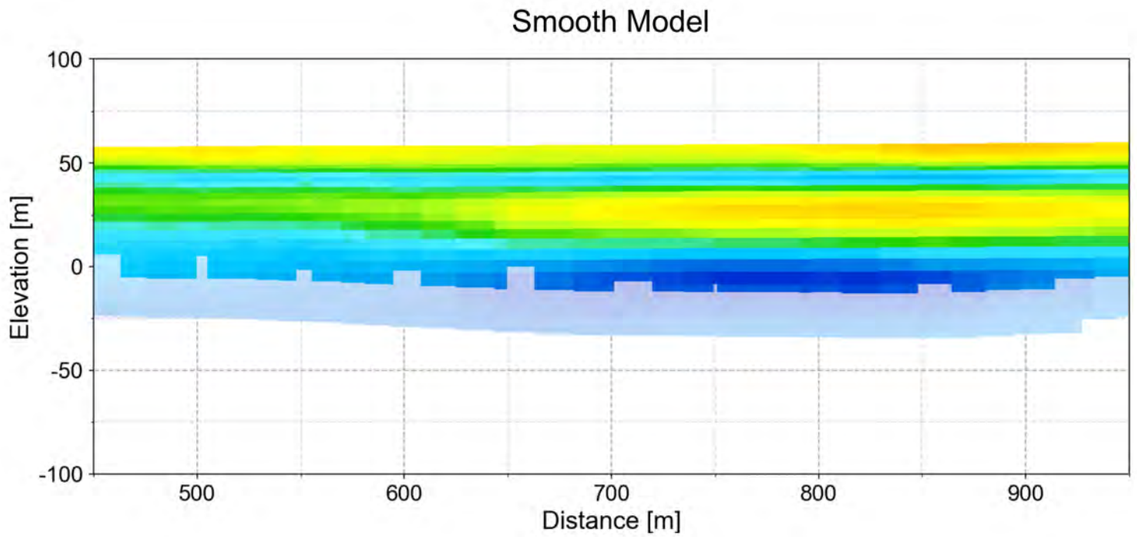
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SCWA GSA tTEM Survey: Line 101000 450-950 m

tTEM Model Section







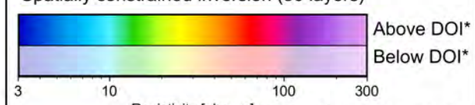
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Legend for Model Sections

Smooth model

Spatially constrained inversion (30 layers)



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Copeland Creek tTEM Results
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Sonoma County, CA

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COLLIER GEOPHYSICS

Sonoma County Water Agency
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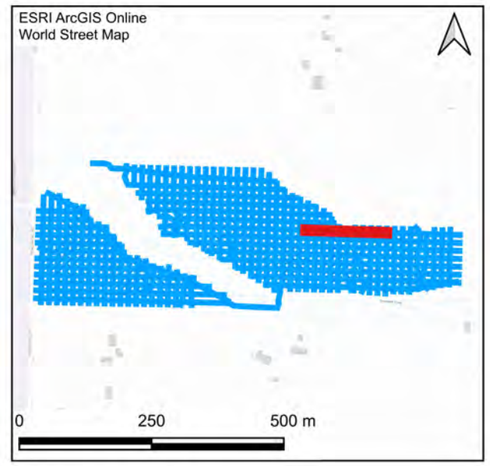
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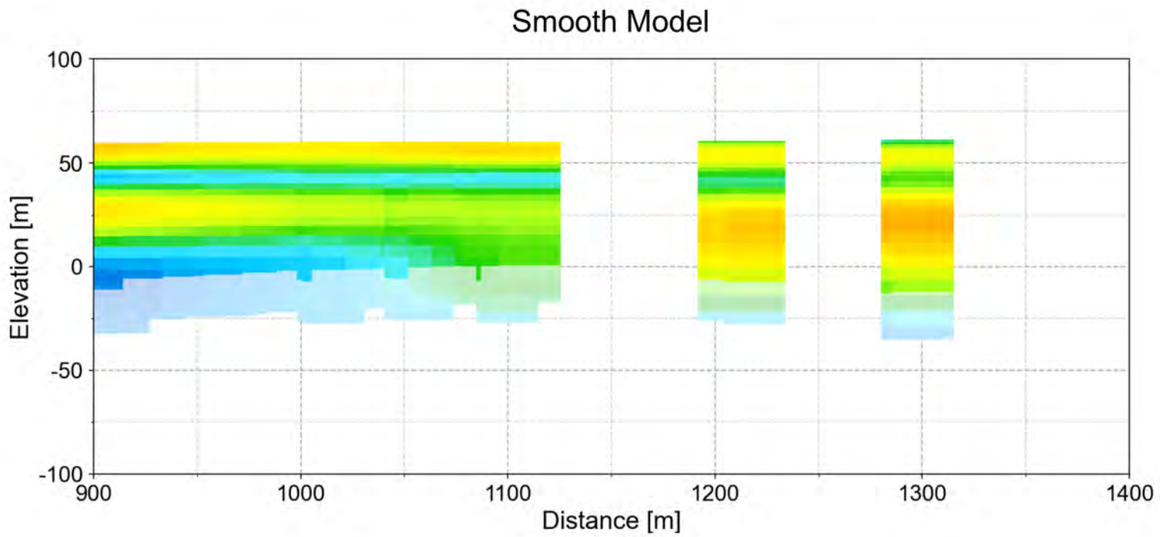
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SCWA GSA tTEM Survey: Line 101000 900-1400 m

tTEM Model Section







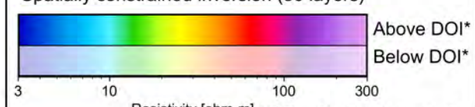
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Legend for Model Sections

Smooth model

Spatially constrained inversion (30 layers)



Copeland Creek tTEM Results
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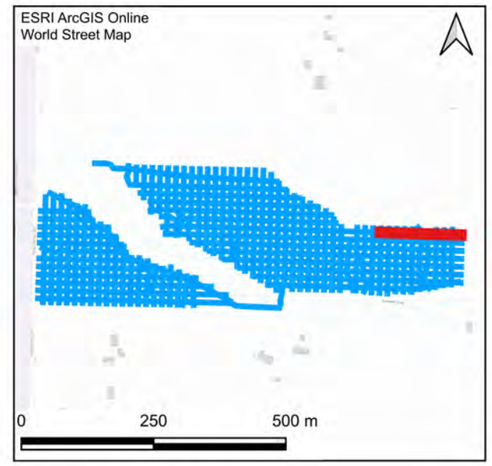
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Project #: 1940113846

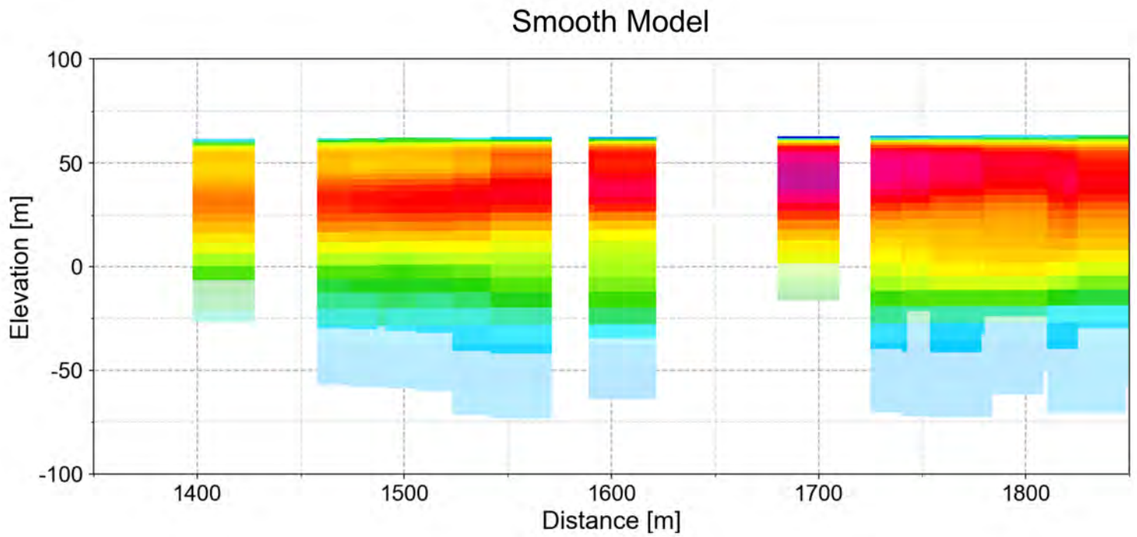
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Date: 2025-12-30, Created by: JP, Checked by: JC, Approved by: TPK

SCWA GSA tTEM Survey: Line 101000 1350-1850 m

tTEM Model Section







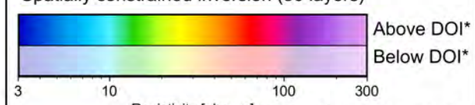
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Legend for Model Sections

Smooth model

Spatially constrained inversion (30 layers)



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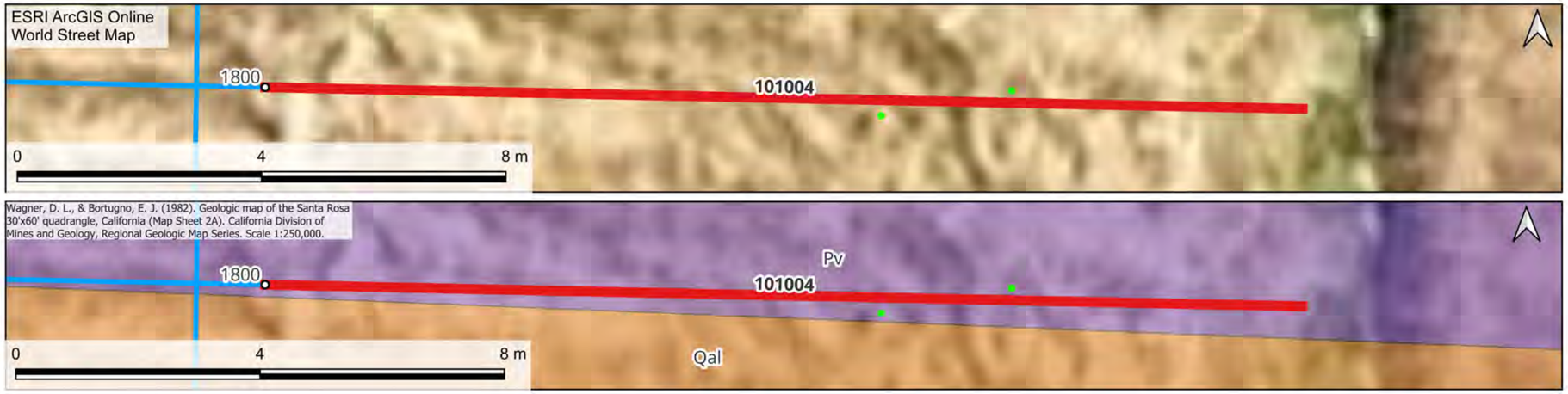
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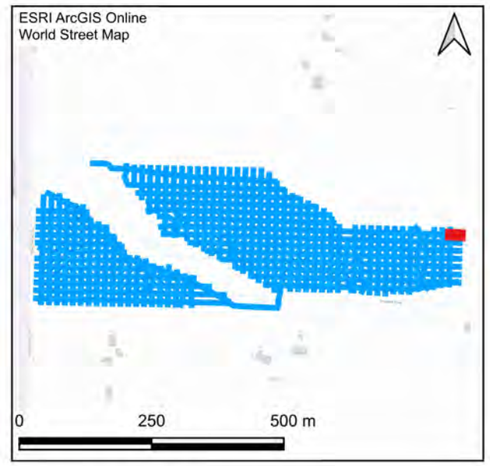
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Date: 2025-12-30, Created by: JP, Checked by: JC, Approved by: TPK

SCWA GSA tTEM Survey: Line 101000 1800-1856 m

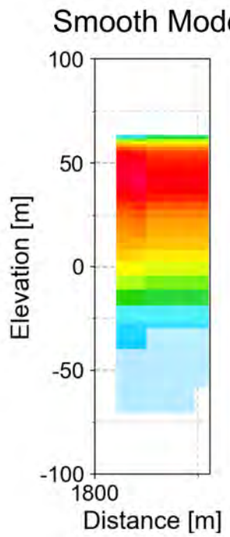
tTEM Model Section





Legend for Maps

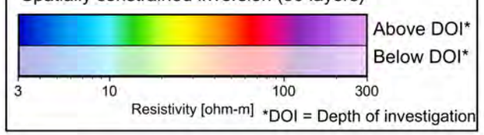
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Legend for Model Sections

Smooth model

Spatially constrained inversion (30 layers)



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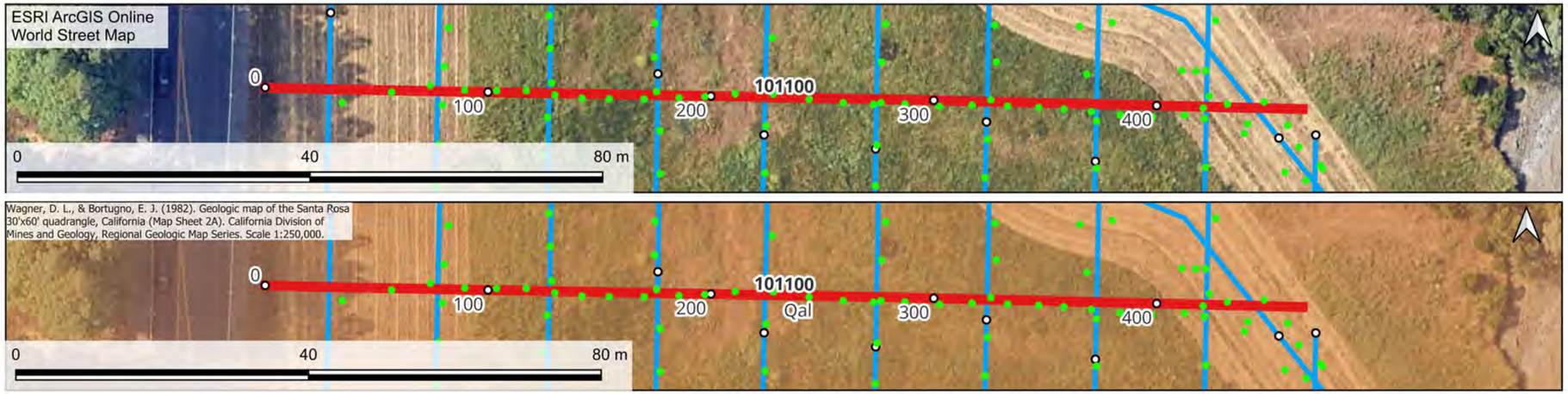
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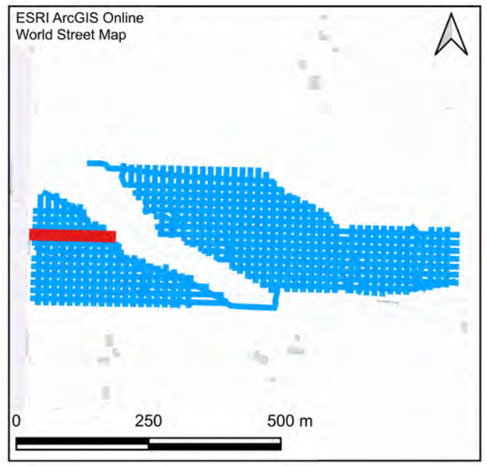
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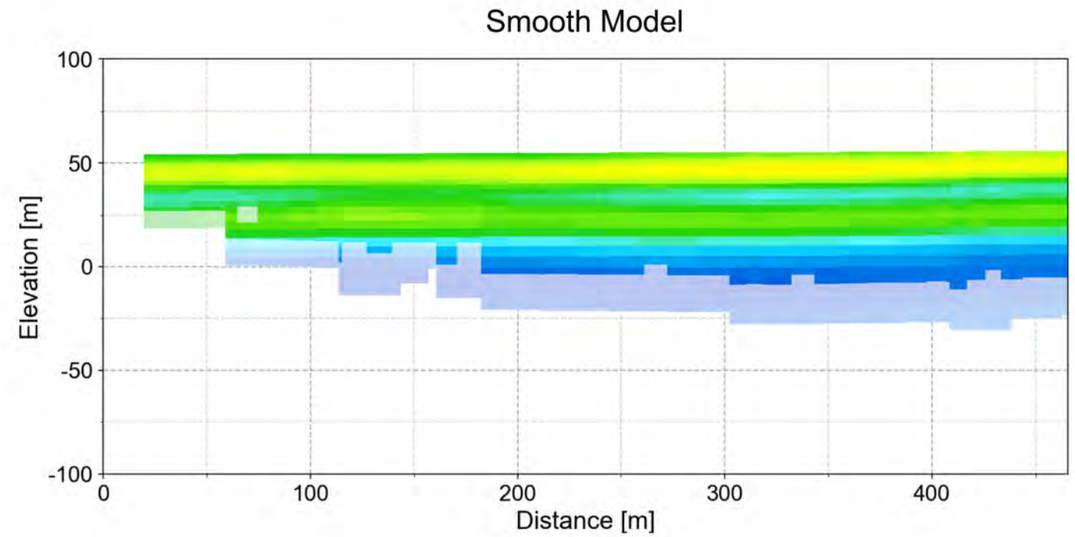
Date: 2025-12-30, Created by: JP, Checked by: JC, Approved by: TPK

SCWA GSA tTEM Survey: Line 101100 0-465 m

tTEM Model Section







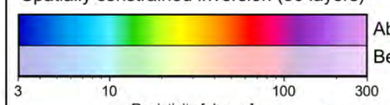
Legend for Maps

- tTEM data used for inversion
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- Pipelines (AmeriGEOSS, 2022)
- Quaternary fault (USGS, 2018)

Legend for Model Sections

Smooth model

Spatially constrained inversion (30 layers)



*DOI = Depth of investigation

Copeland Creek tTEM Results
Santa Rosa Plain GSA
Sonoma County, CA

RAMBOLL

COLLIER GEOPHYSICS

Sonoma County Water Agency
Project #: 1940113846

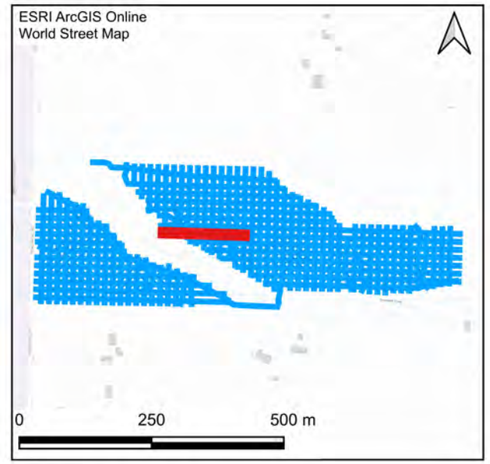
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Date: 2025-12-30, Created by: JP, Checked by: JC, Approved by: TPK

SCWA GSA tTEM Survey: Line 101200 0-500 m

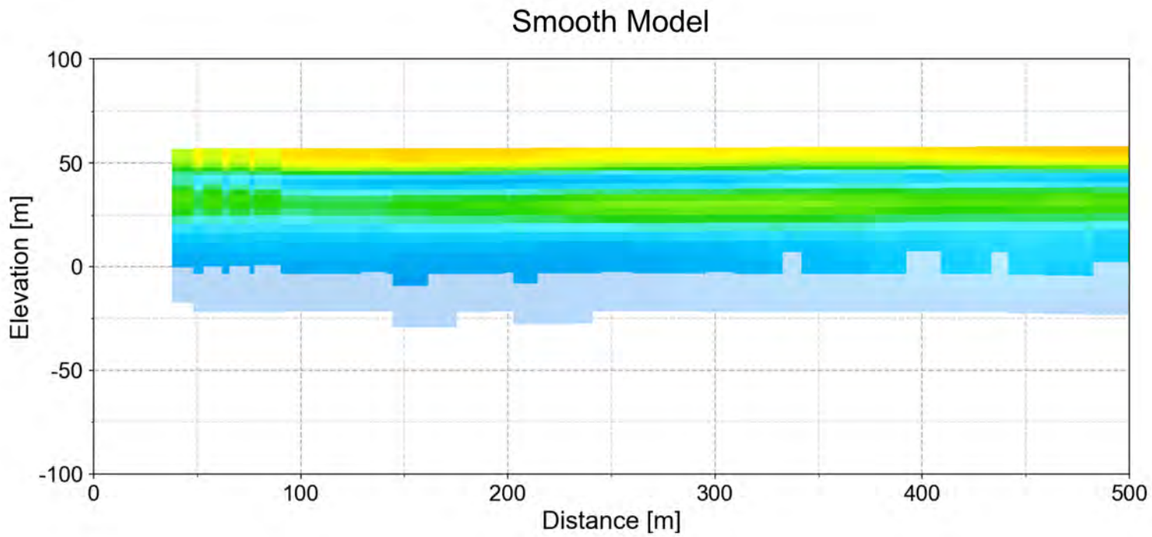
tTEM Model Section





Legend for Maps

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Legend for Model Sections

Smooth model

Spatially constrained inversion (30 layers)

Above DOI*

Below DOI*

3 10 100 300

Resistivity [ohm-m]

*DOI = Depth of investigation

Copeland Creek tTEM Results
Santa Rosa Plain GSA
Sonoma County, CA

RAMBOLL

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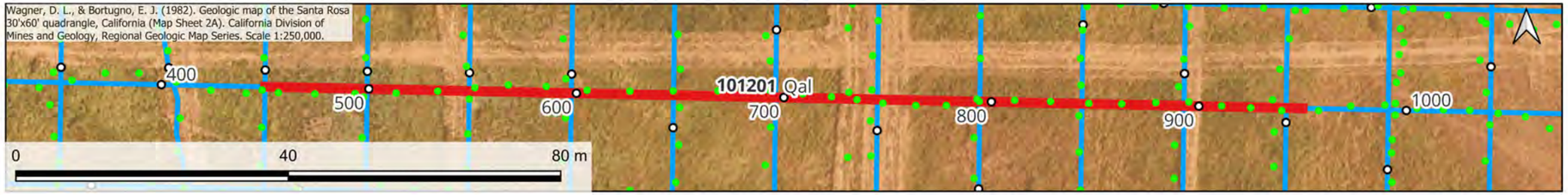
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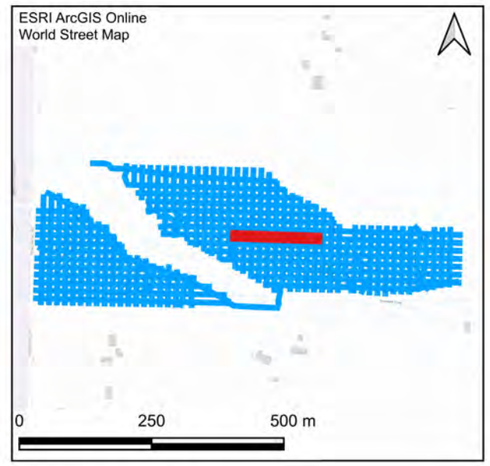
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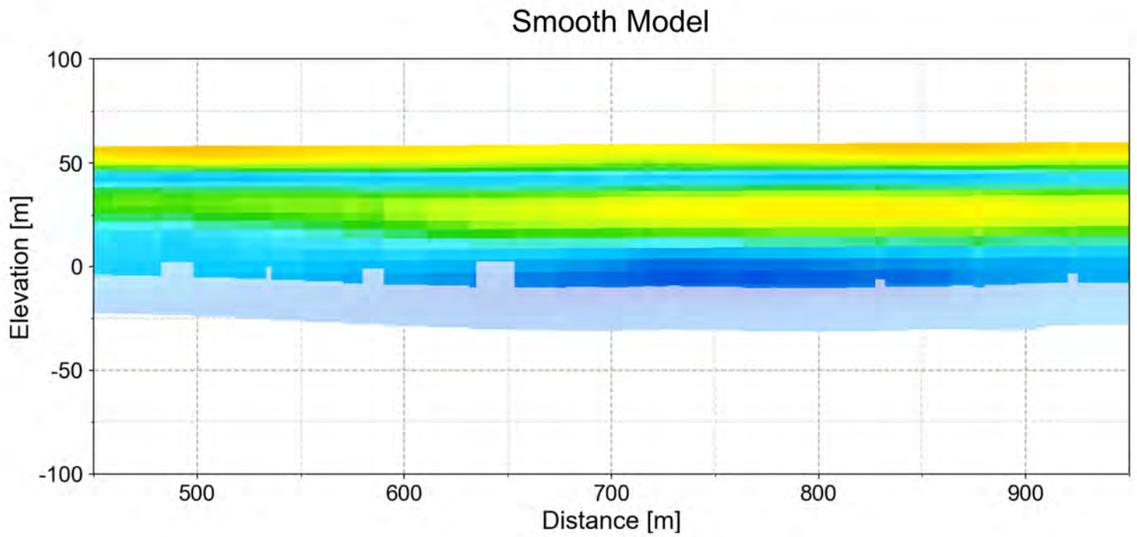
SCWA GSA tTEM Survey: Line 101200 450-950 m

tTEM Model Section









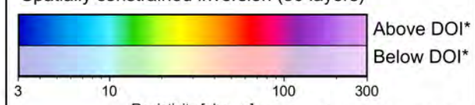
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Legend for Model Sections

Smooth model

Spatially constrained inversion (30 layers)



Copeland Creek tTEM Results
Santa Rosa Plain GSA
Sonoma County, CA

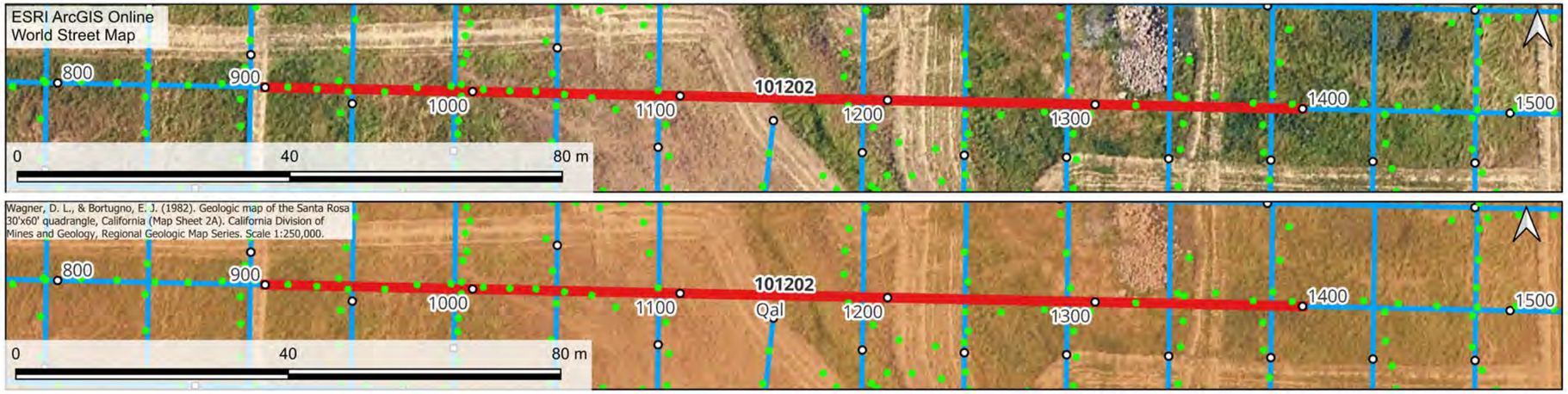
RAMBOLL
COLLIER GEOPHYSICS

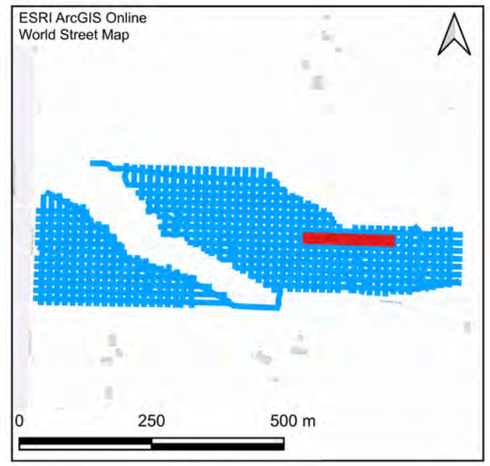
Sonoma County Water Agency
Project #: 1940113846

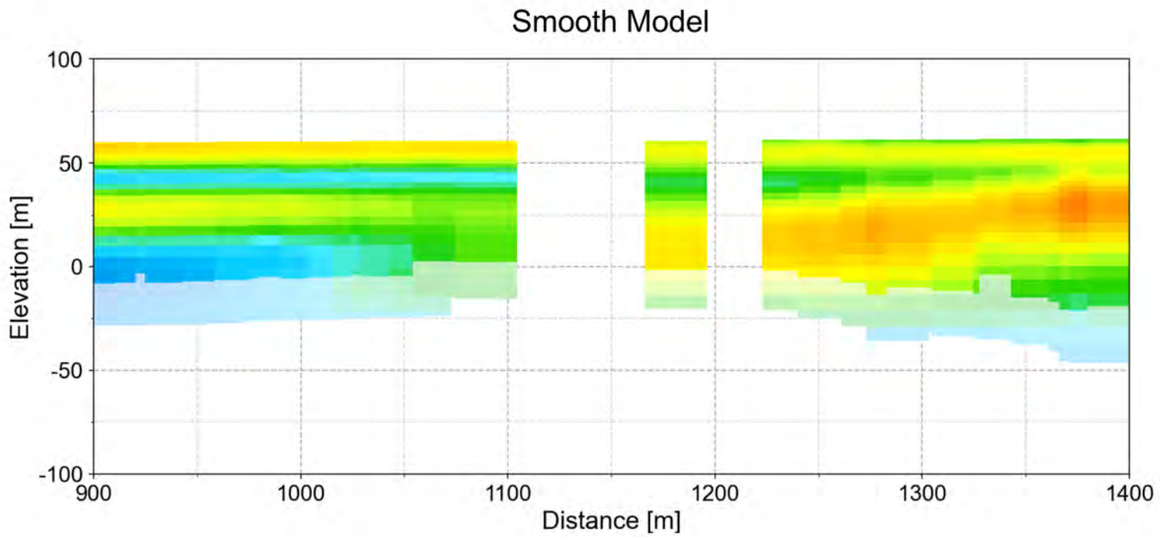
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Date: 2025-12-30, Created by: JP, Checked by: JC, Approved by: TPK

SCWA GSA tTEM Survey: Line 101200 900-1400 m

tTEM Model Section







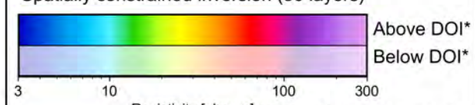
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Legend for Model Sections

Smooth model

Spatially constrained inversion (30 layers)



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Santa Rosa Plain GSA
Sonoma County, CA

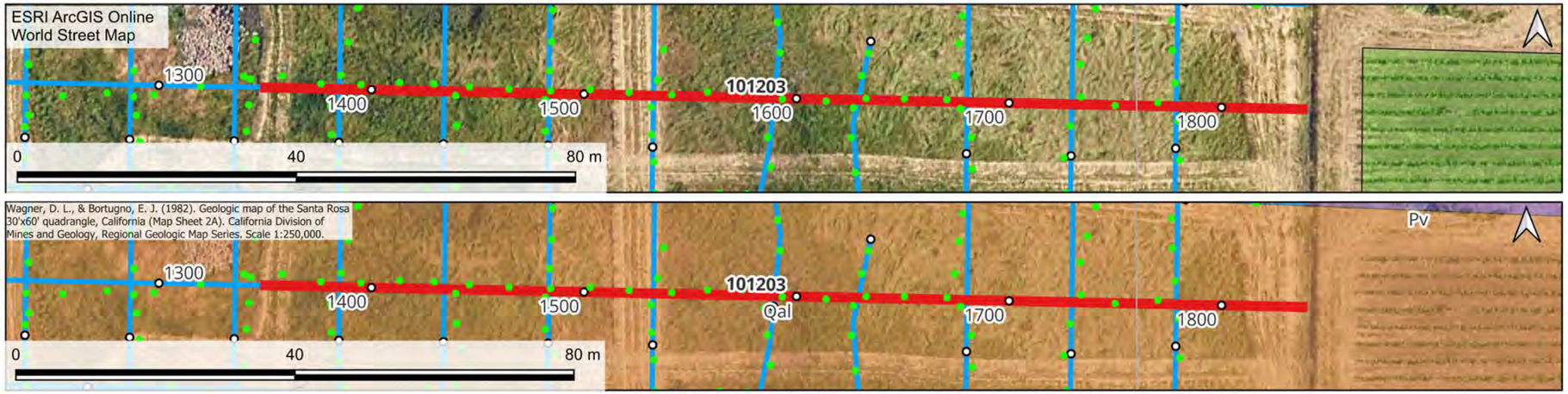
RAMBOLL
COLLIER GEOPHYSICS

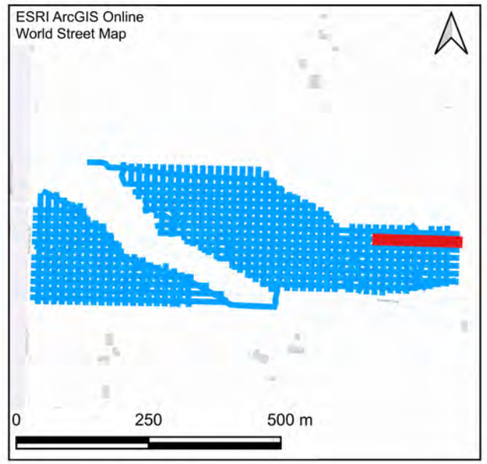
Sonoma County Water Agency
Project #: 1940113846

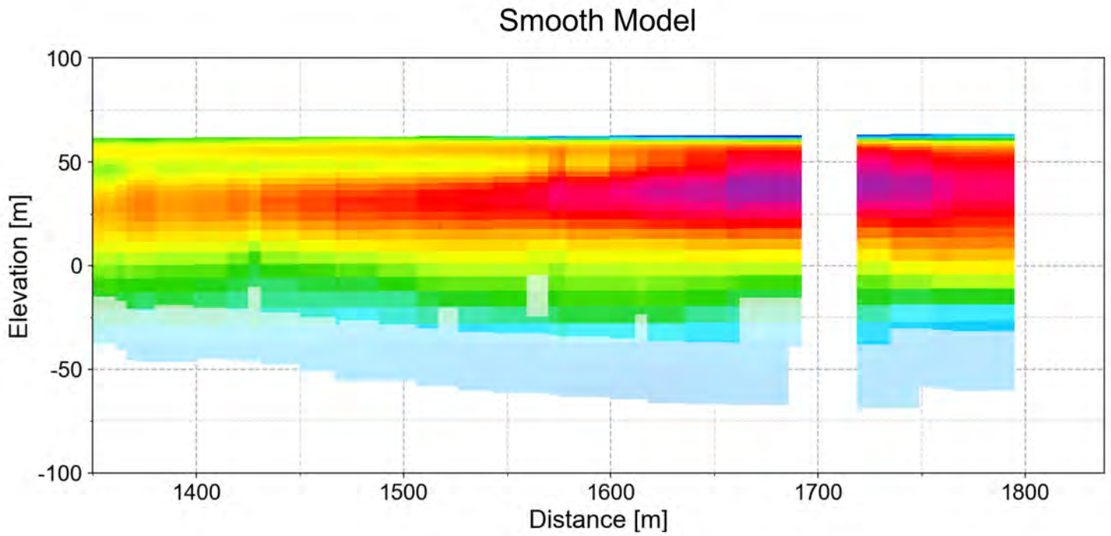
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Date: 2025-12-30, Created by: JP, Checked by: JC, Approved by: TPK

SCWA GSA tTEM Survey: Line 101200 1350-1838 m

tTEM Model Section







Legend for Maps

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Legend for Model Sections

Smooth model

Spatially constrained inversion (30 layers)

Above DOI*

Below DOI*

3 10 100 300

Resistivity [ohm-m]

*DOI = Depth of investigation

Copeland Creek tTEM Results
Santa Rosa Plain GSA
Sonoma County, CA

RAMBOLL

COLLIER GEOPHYSICS

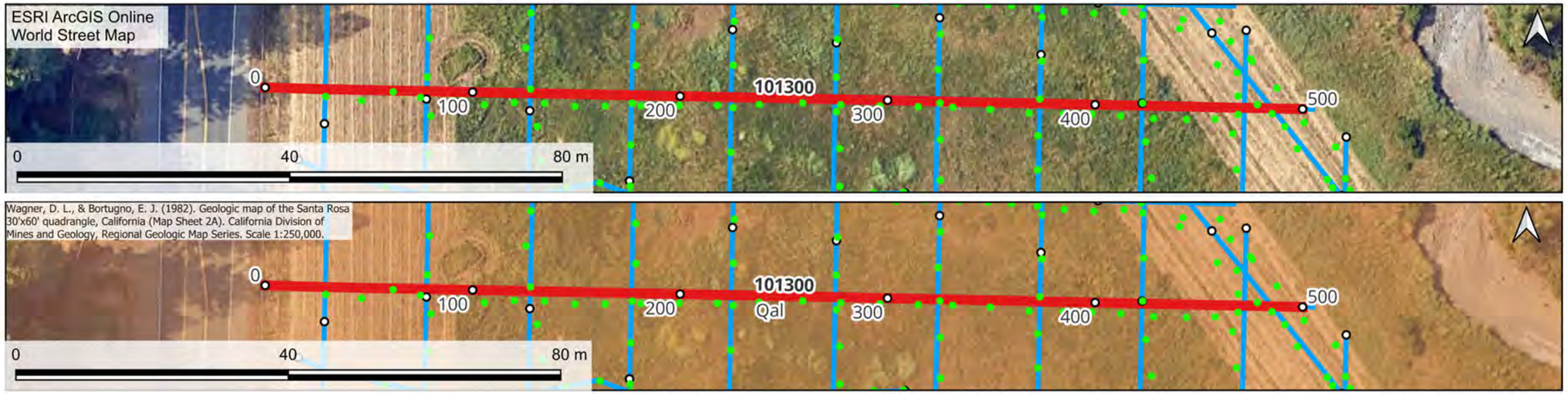
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Project #: 1940113846

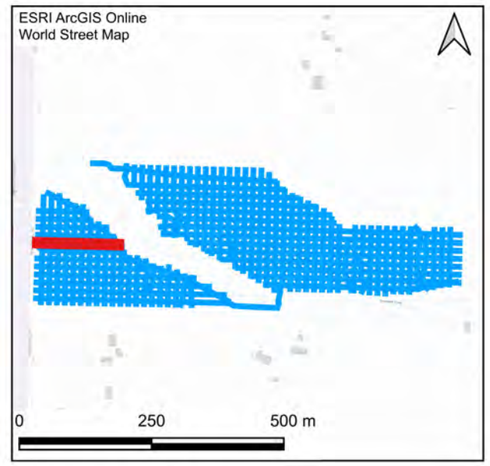
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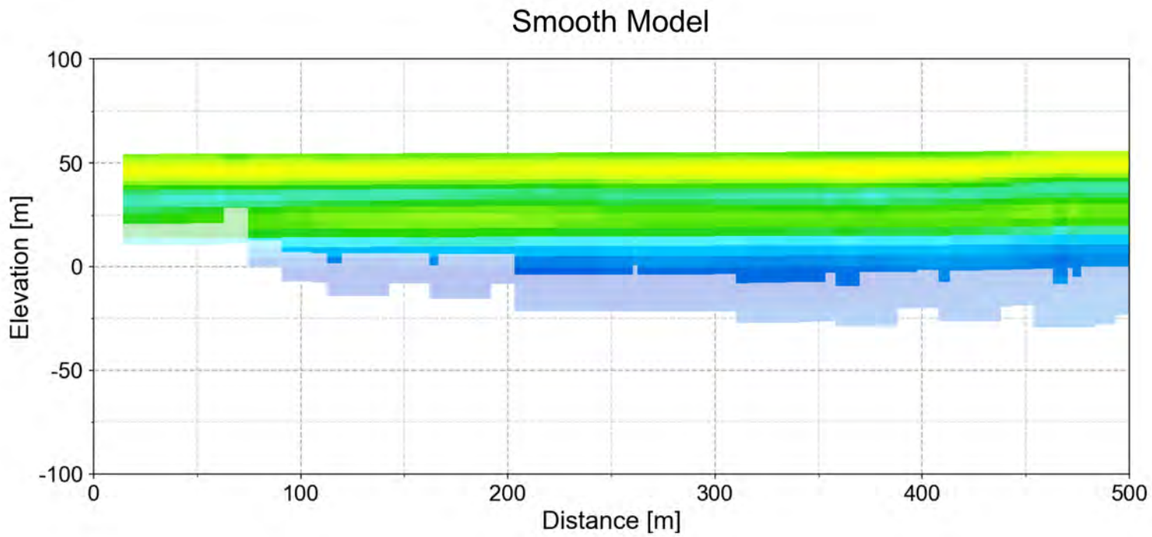
Date: 2025-12-30, Created by: JP, Checked by: JC, Approved by: TPK

SCWA GSA tTEM Survey: Line 101300 0-500 m

tTEM Model Section







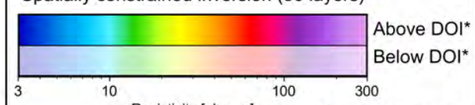
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Legend for Model Sections

Smooth model

Spatially constrained inversion (30 layers)



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Copeland Creek tTEM Results
Santa Rosa Plain GSA
Sonoma County, CA

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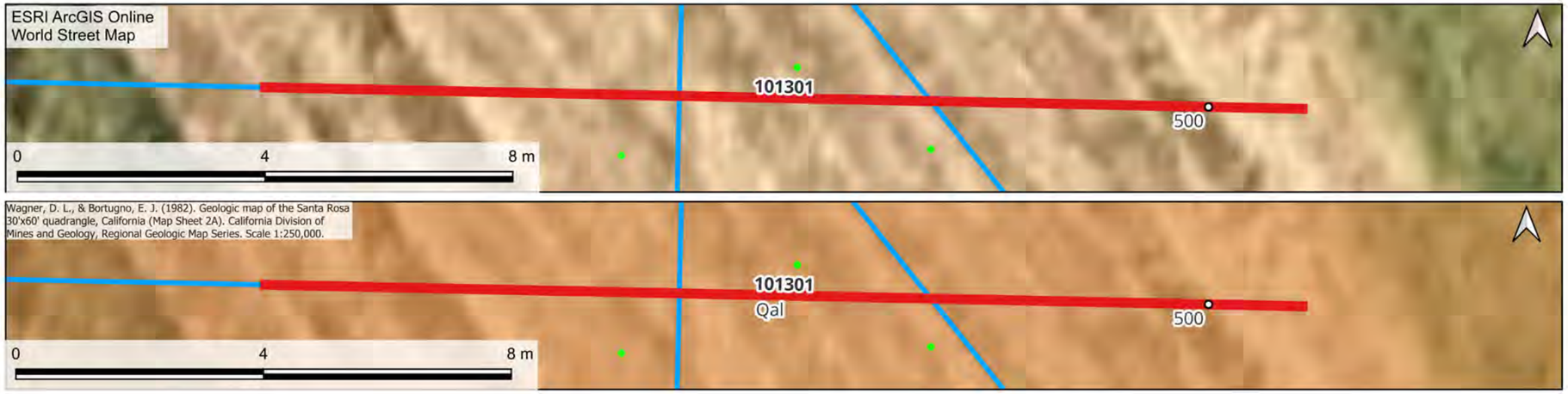
Sonoma County Water Agency
Project #: 1940113846

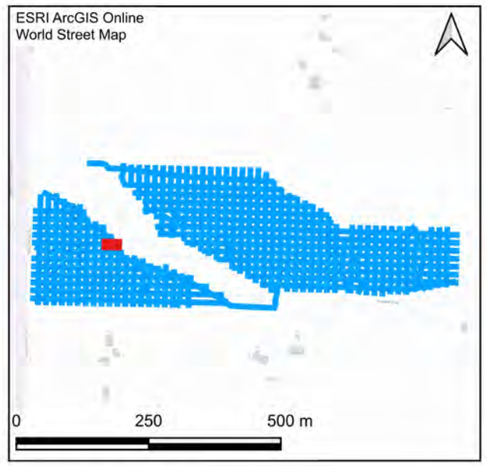
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SCWA GSA tTEM Survey: Line 101300 450-505 m

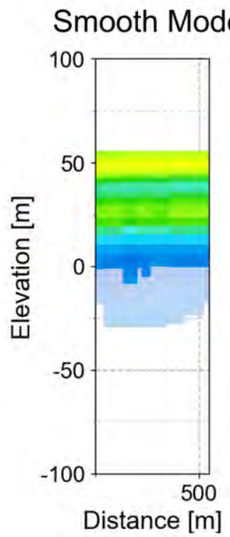
tTEM Model Section





Legend for Maps

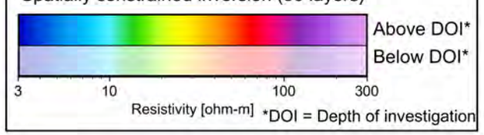
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Legend for Model Sections

Smooth model

Spatially constrained inversion (30 layers)



Copeland Creek tTEM Results
Santa Rosa Plain GSA
Sonoma County, CA

RAMBOLL

COLLIER GEOPHYSICS

Sonoma County Water Agency
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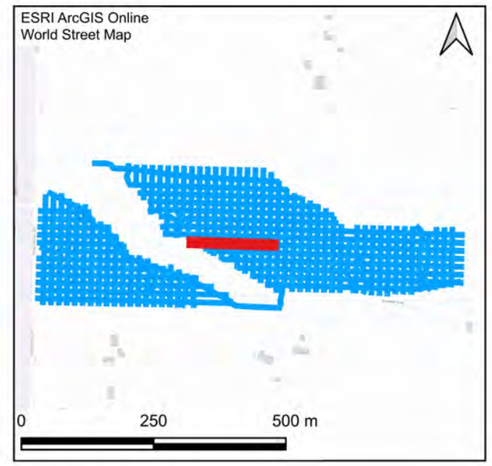
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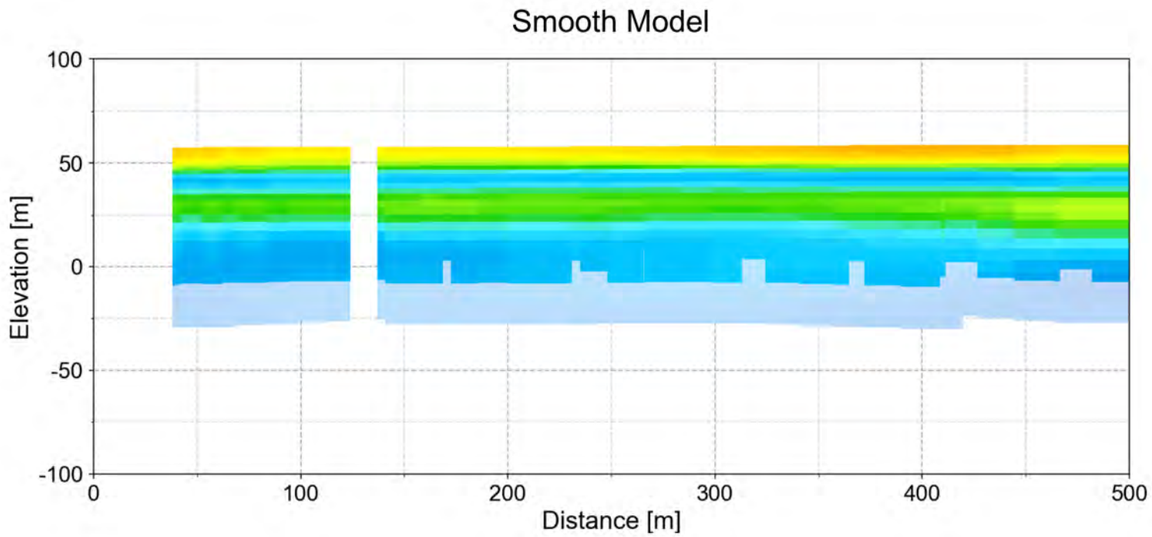
SCWA GSA tTEM Survey: Line 101400 0-500 m

tTEM Model Section









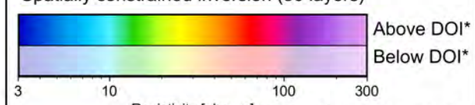
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Legend for Model Sections

Smooth model

Spatially constrained inversion (30 layers)



Copeland Creek tTEM Results
Santa Rosa Plain GSA
Sonoma County, CA

RAMBOLL

COLLIER GEOPHYSICS

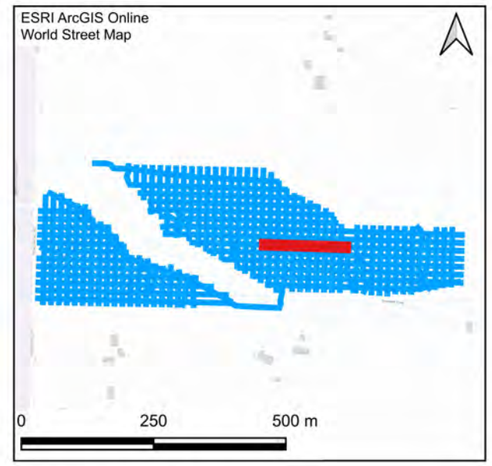
Sonoma County Water Agency
Project #: 1940113846

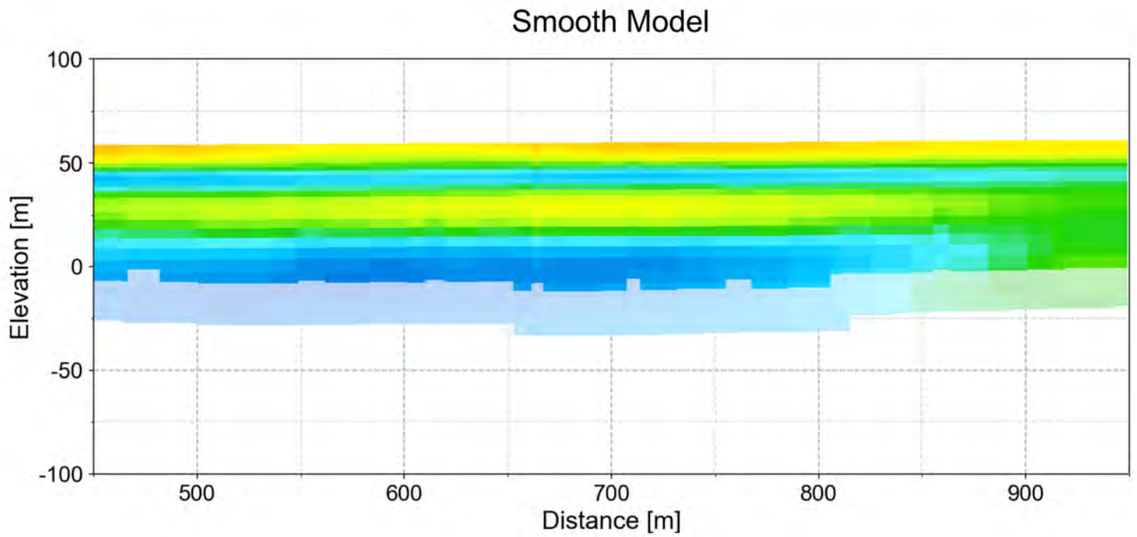
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Date: 2025-12-30, Created by: JP, Checked by: JC, Approved by: TPK

SCWA GSA tTEM Survey: Line 101400 450-950 m

tTEM Model Section







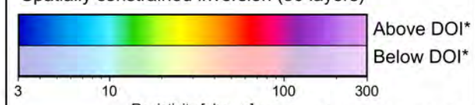
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Legend for Model Sections

Smooth model

Spatially constrained inversion (30 layers)



*DOI = Depth of investigation

Copeland Creek tTEM Results
Santa Rosa Plain GSA
Sonoma County, CA

RAMBOLL

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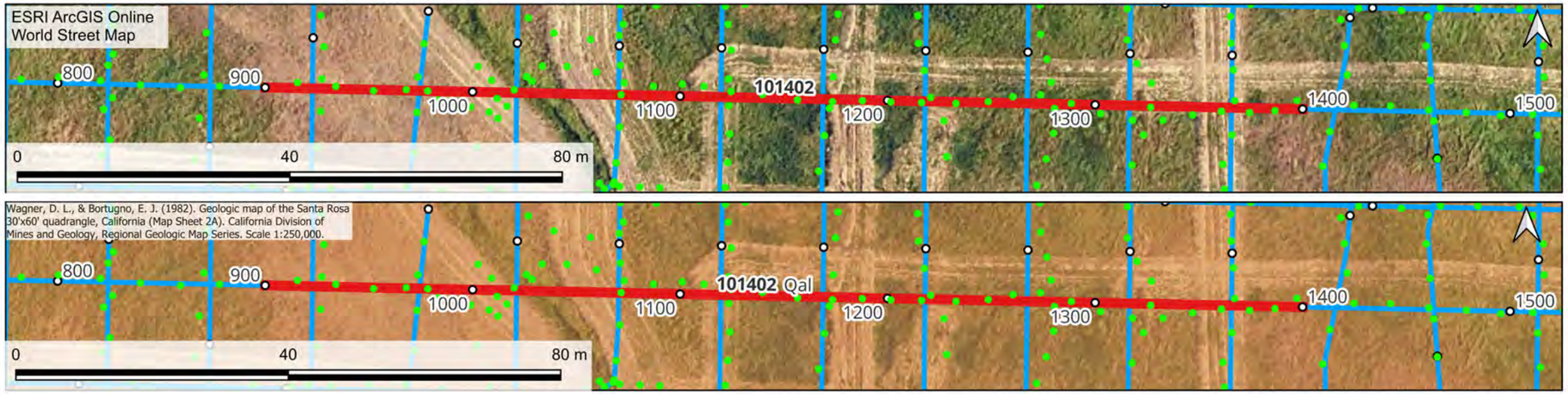
Sonoma County Water Agency
Project #: 1940113846

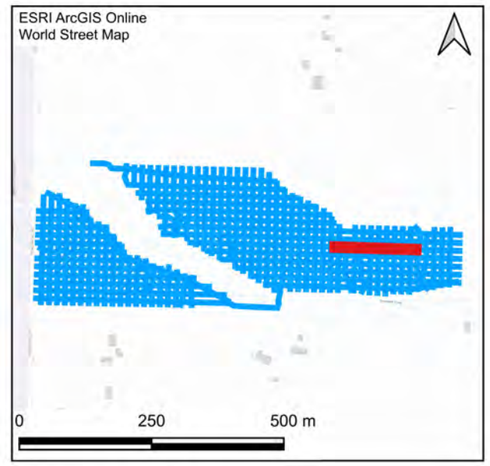
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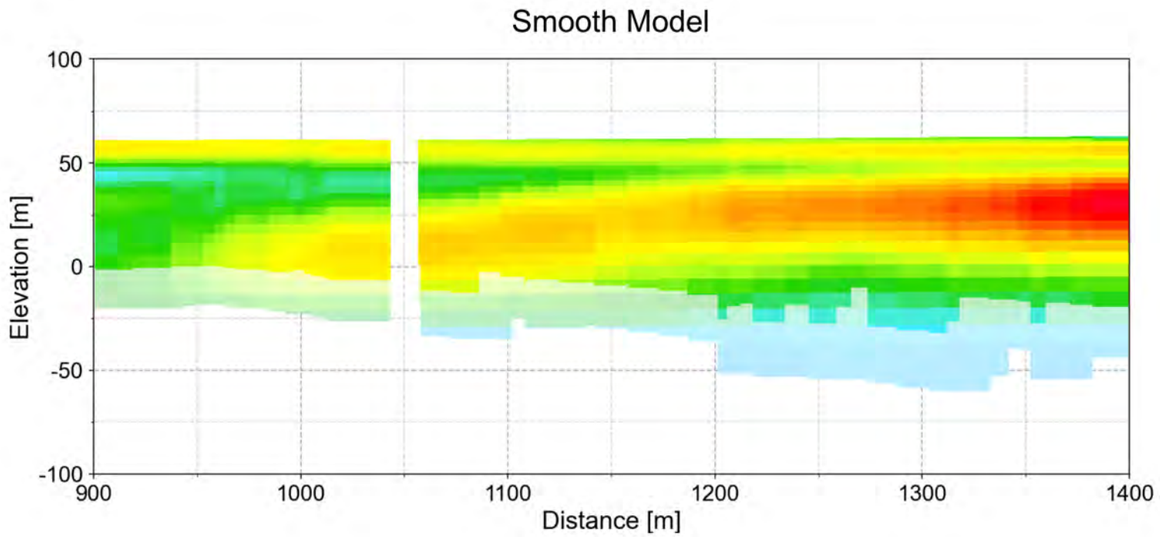
Date: 2025-12-30, Created by: JP, Checked by: JC, Approved by: TPK

SCWA GSA tTEM Survey: Line 101400 900-1400 m

tTEM Model Section







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Legend for Model Sections

Smooth model

Spatially constrained inversion (30 layers)

Above DOI*
Below DOI*

3 10 100 300

Resistivity [ohm-m] *DOI = Depth of investigation

Copeland Creek tTEM Results
Santa Rosa Plain GSA
Sonoma County, CA

RAMBOLL
COLLIER GEOPHYSICS

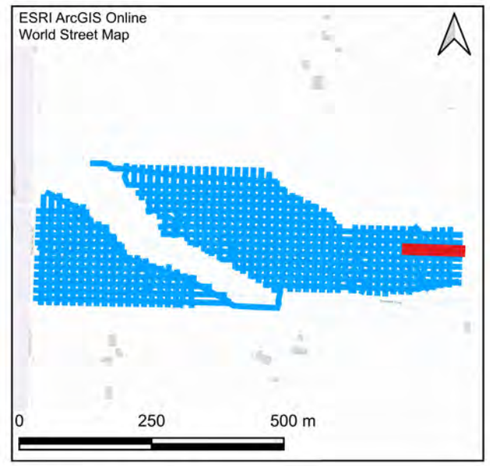
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SCWA GSA tTEM Survey: Line 101400 1350-1671 m

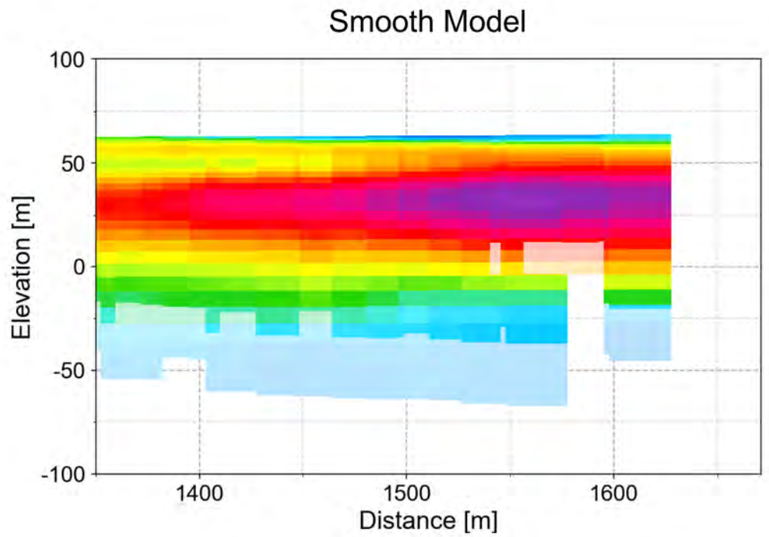
tTEM Model Section





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Resistivity [ohm-m]

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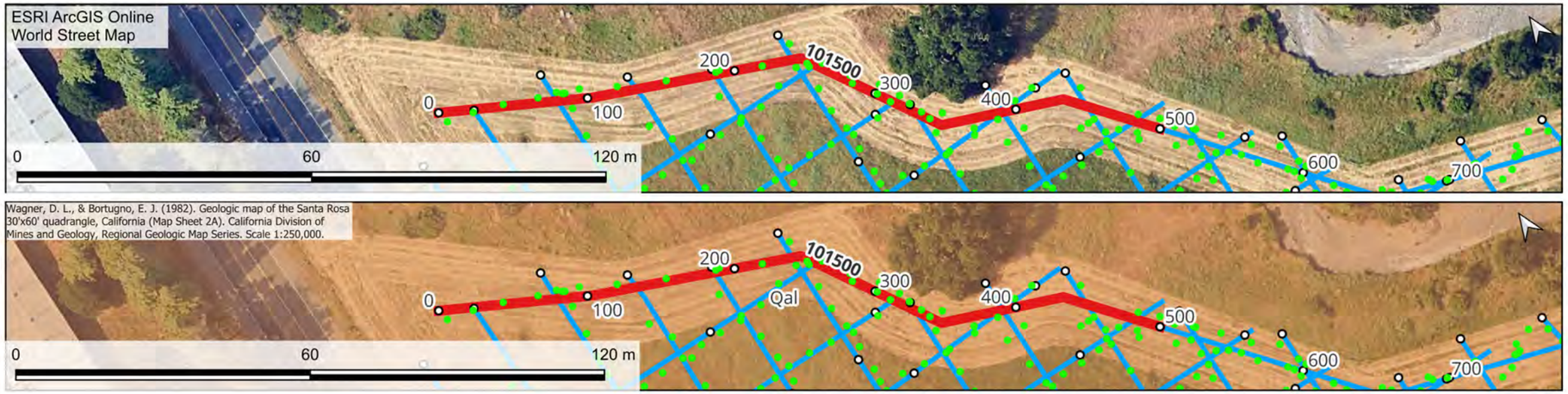
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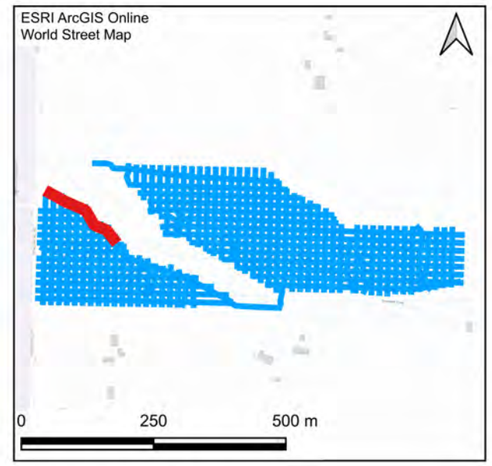
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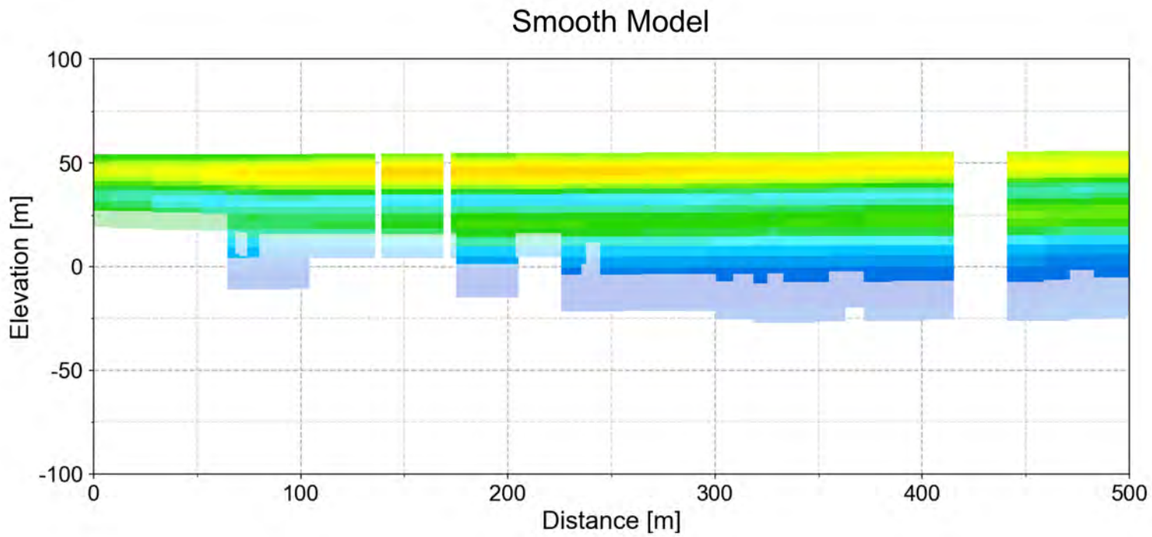
Date: 2025-12-30, Created by: JP, Checked by: JC, Approved by: TPK

SCWA GSA tTEM Survey: Line 101500 0-500 m

tTEM Model Section







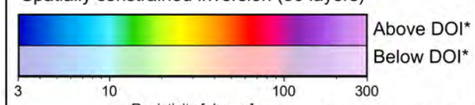
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Legend for Model Sections

Smooth model

Spatially constrained inversion (30 layers)



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Copeland Creek tTEM Results
Santa Rosa Plain GSA
Sonoma County, CA

RAMBOLL

COLLIER GEOPHYSICS

Sonoma County Water Agency
Project #: 1940113846

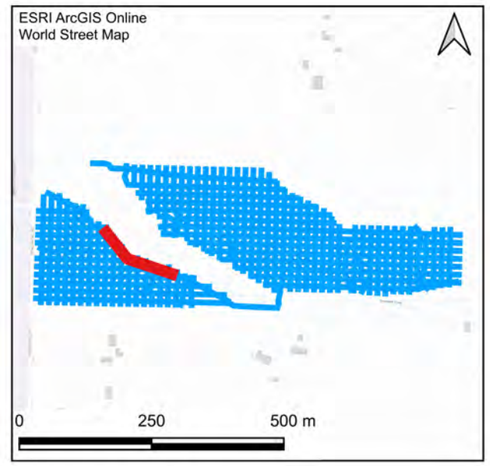
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Date: 2025-12-30, Created by: JP, Checked by: JC, Approved by: TPK

SCWA GSA tTEM Survey: Line 101500 450-950 m

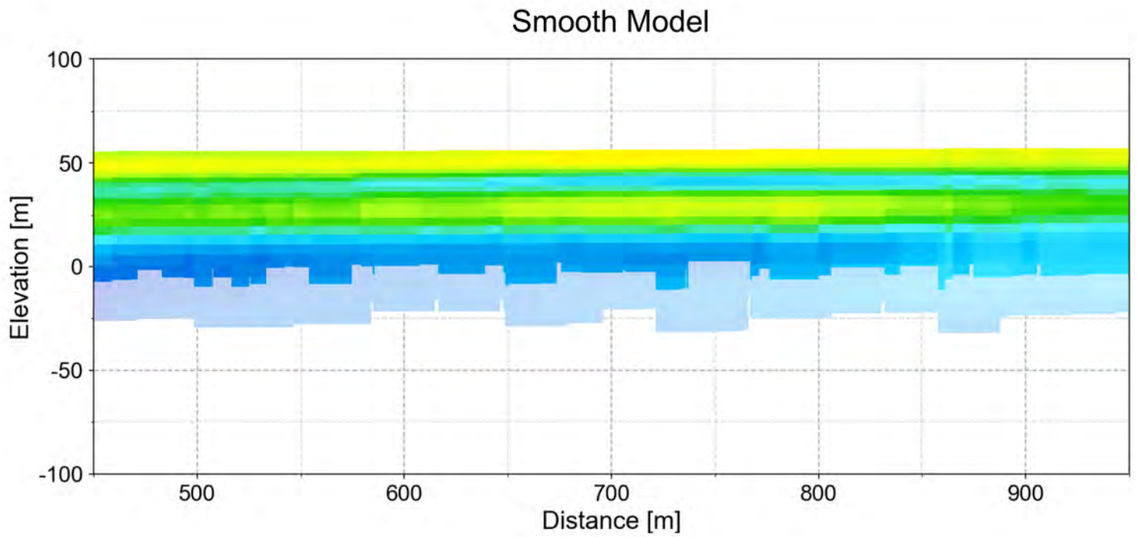
tTEM Model Section





Legend for Maps

- tTEM data used for inversion
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- Pipelines (AmeriGEOSS, 2022)
- Quaternary fault (USGS, 2018)



Legend for Model Sections

Smooth model

Spatially constrained inversion (30 layers)

Above DOI*

Below DOI*

3 10 100 300

Resistivity [ohm-m]

*DOI = Depth of investigation

Copeland Creek tTEM Results
Santa Rosa Plain GSA
Sonoma County, CA

RAMBOLL

COLLIER GEOPHYSICS

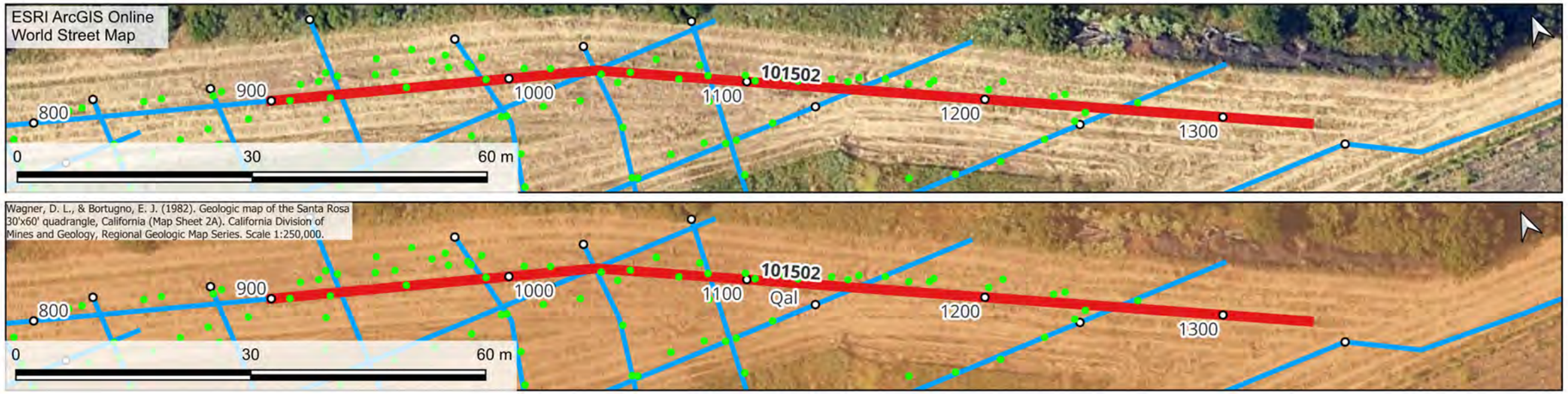
Sonoma County Water Agency
Project #: 1940113846

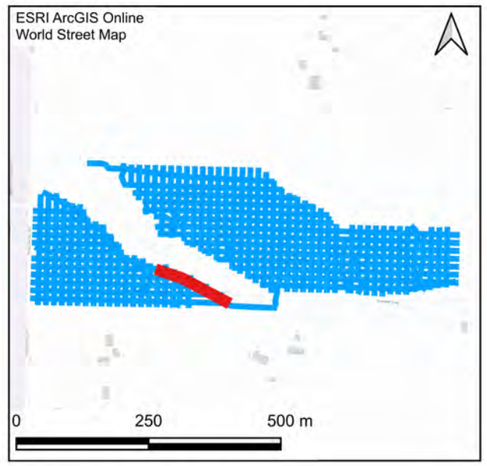
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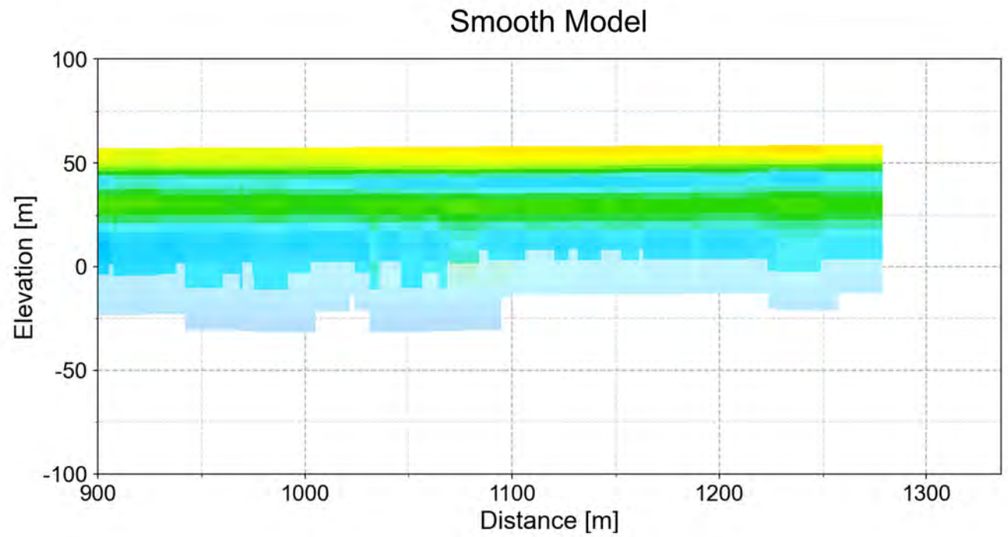
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SCWA GSA tTEM Survey: Line 101500 900-1336 m

tTEM Model Section







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Legend for Model Sections

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Resistivity [ohm-m] *DOI = Depth of investigation

Copeland Creek tTEM Results
Santa Rosa Plain GSA
Sonoma County, CA

RAMBOLL

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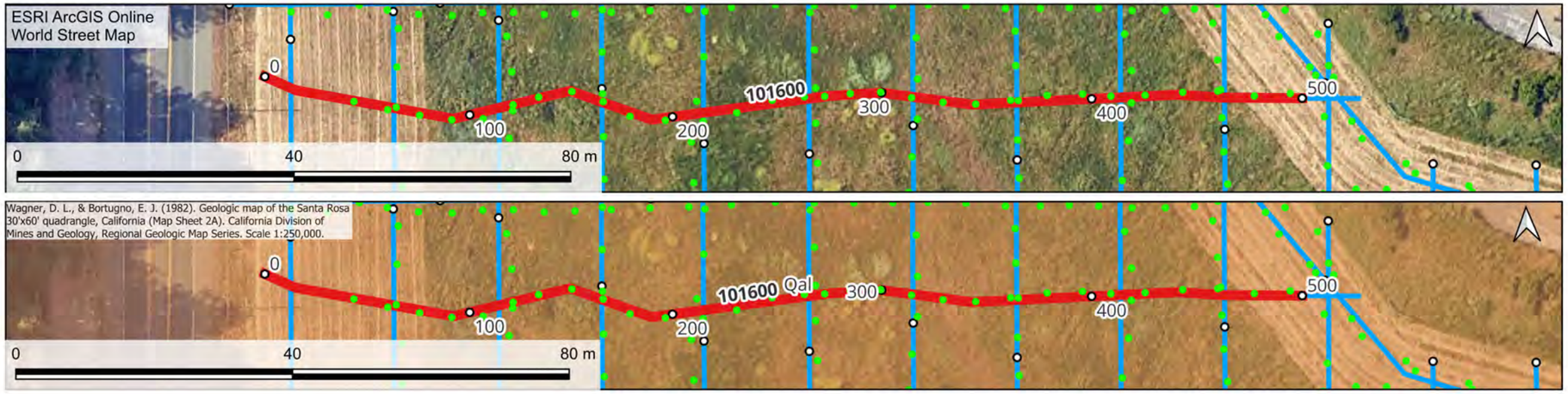
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Project #: 1940113846

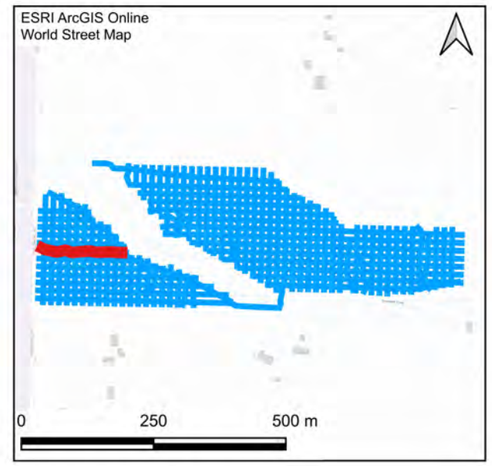
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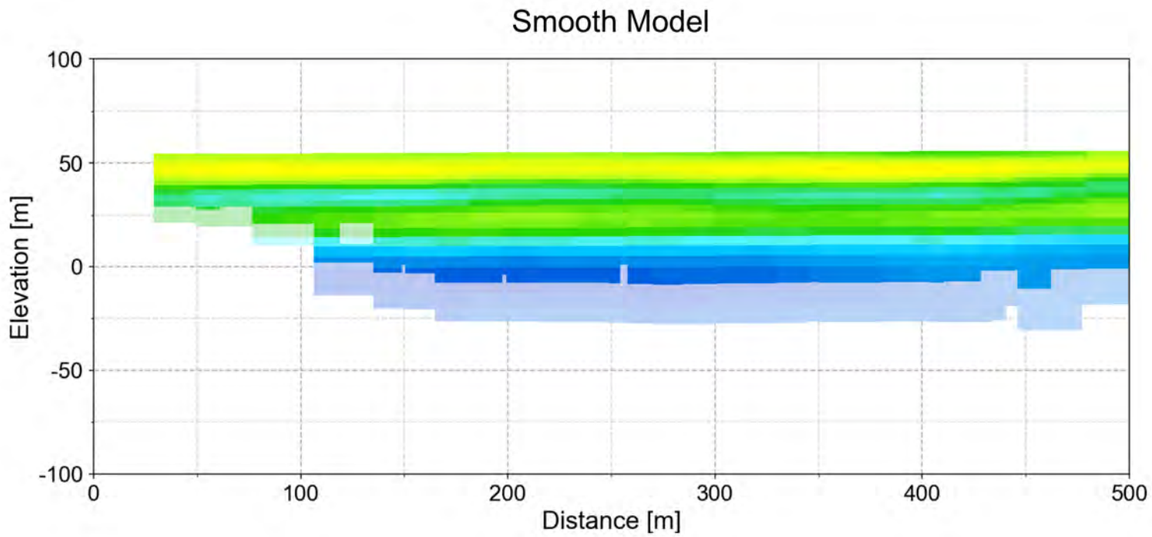
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SCWA GSA tTEM Survey: Line 101600 0-500 m

tTEM Model Section







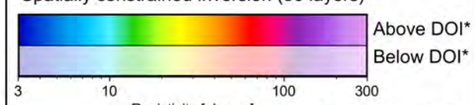
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Legend for Model Sections

Smooth model

Spatially constrained inversion (30 layers)



Copeland Creek tTEM Results
Santa Rosa Plain GSA
Sonoma County, CA

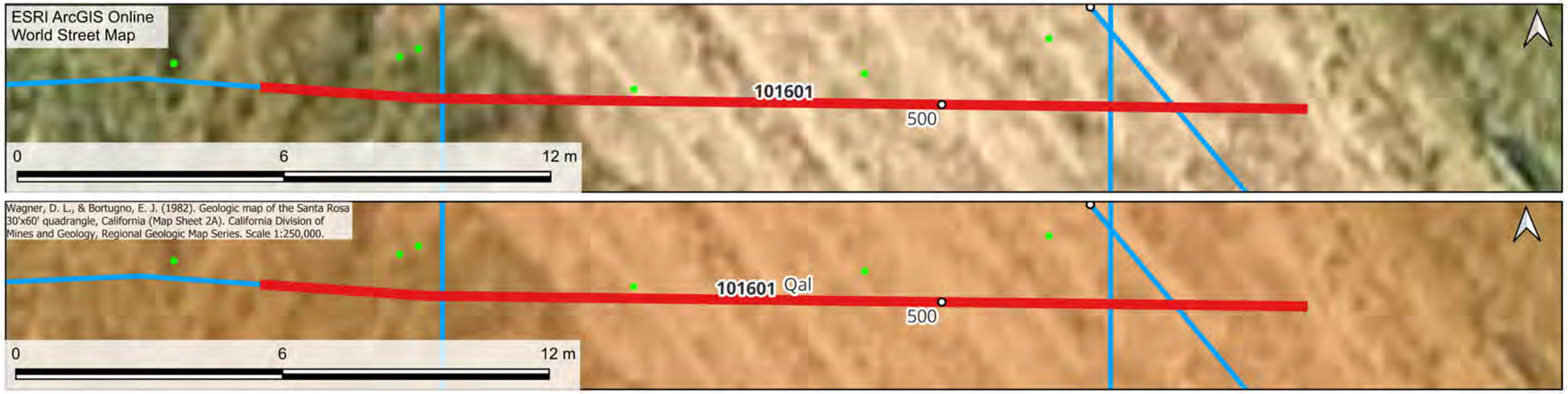
RAMBOLL
COLLIER GEOPHYSICS

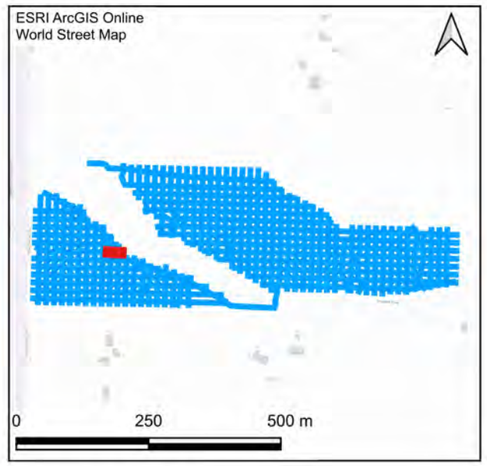
Sonoma County Water Agency
Project #: 1940113846

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Date: 2025-12-30, Created by: JP, Checked by: JC, Approved by: TPK

SCWA GSA tTEM Survey: Line 101600 450-527 m

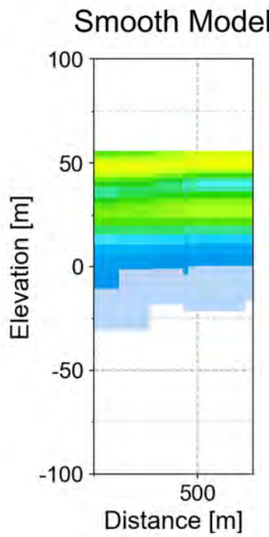
tTEM Model Section





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Legend for Model Sections

Smooth model

Spatially constrained inversion (30 layers)

Above DOI*

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3 10 100 300

Resistivity [ohm-m] *DOI = Depth of investigation

Copeland Creek tTEM Results
Santa Rosa Plain GSA
Sonoma County, CA

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Sonoma County Water Agency
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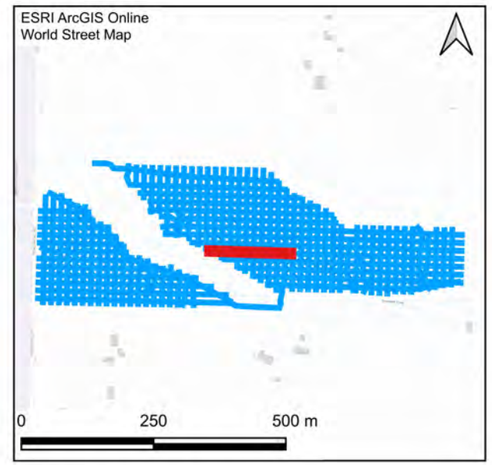
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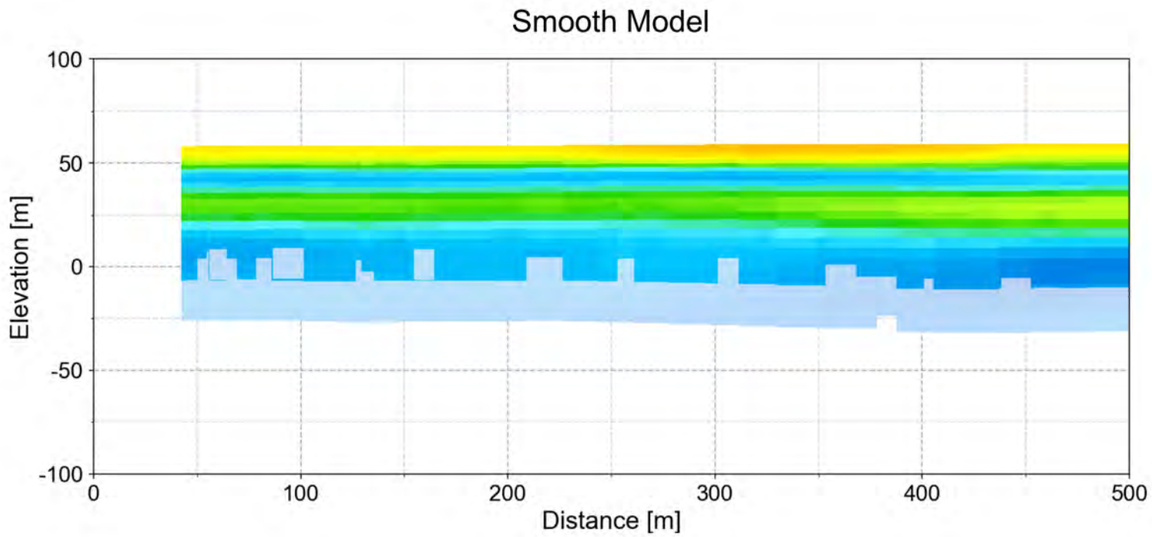
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SCWA GSA tTEM Survey: Line 101700 0-500 m

tTEM Model Section







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Copeland Creek tTEM Results
Santa Rosa Plain GSA
Sonoma County, CA

RAMBOLL

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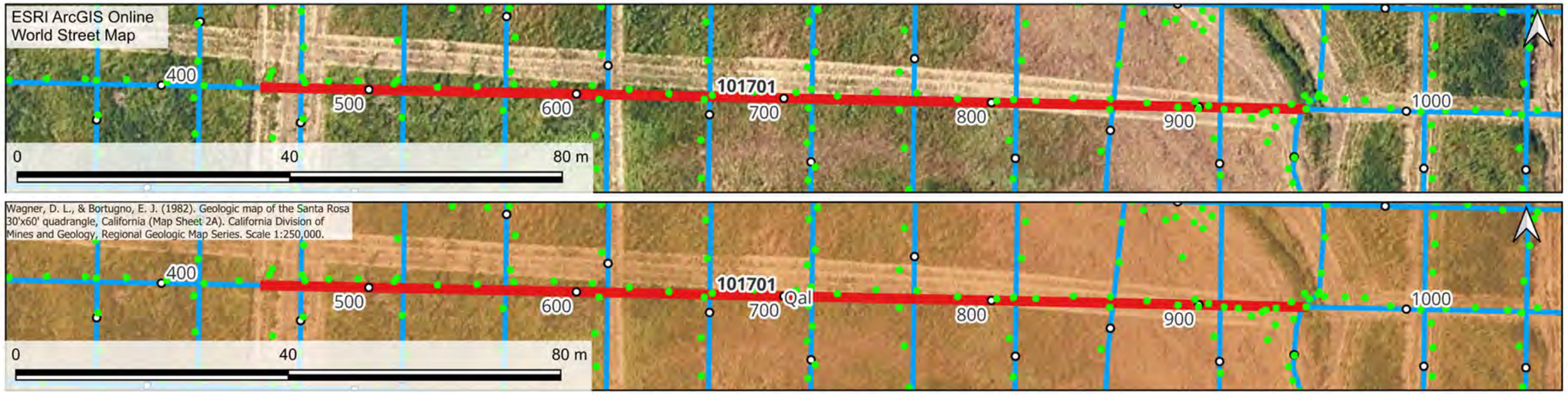
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Project #: 1940113846

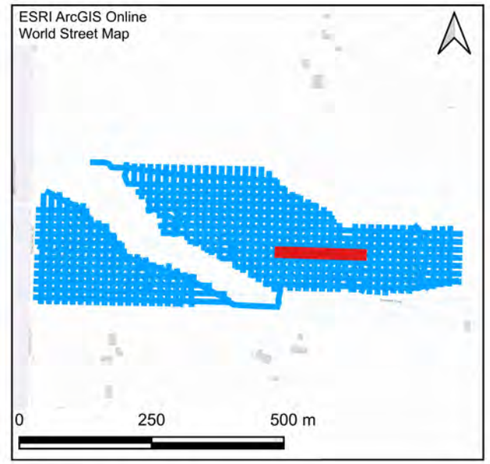
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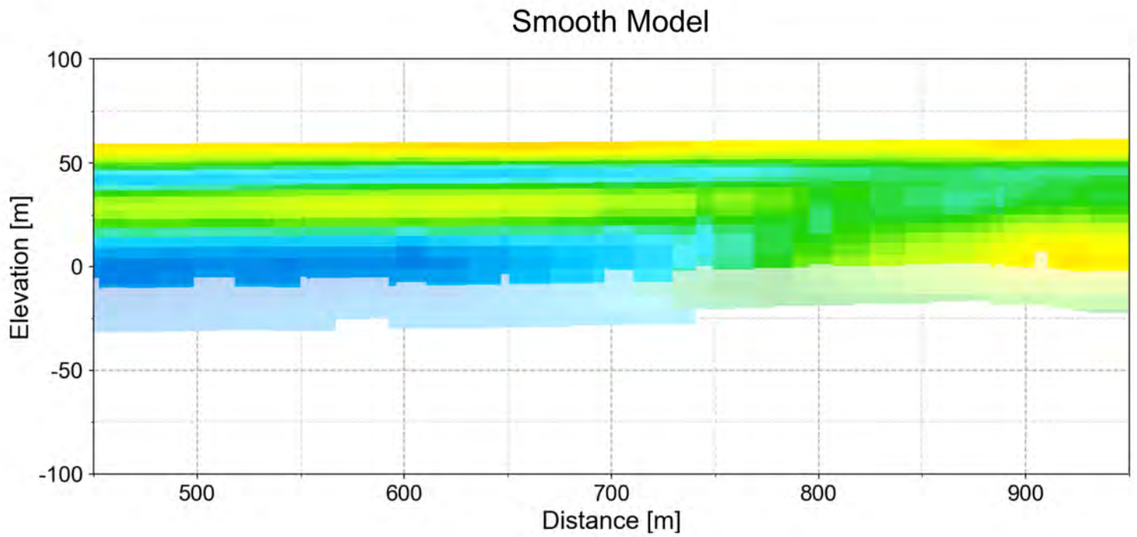
Date: 2025-12-30, Created by: JP, Checked by: JC, Approved by: TPK

SCWA GSA tTEM Survey: Line 101700 450-950 m

tTEM Model Section







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Copeland Creek tTEM Results
Santa Rosa Plain GSA
Sonoma County, CA

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COLLIER GEOPHYSICS

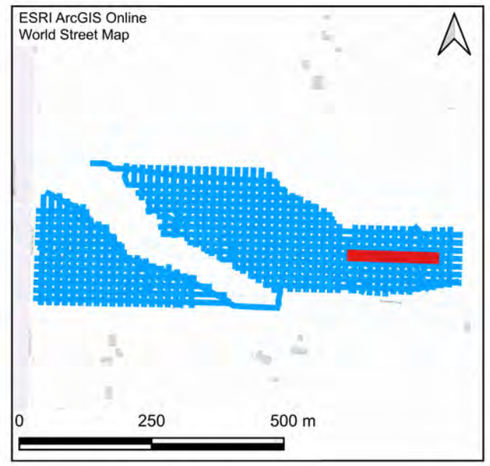
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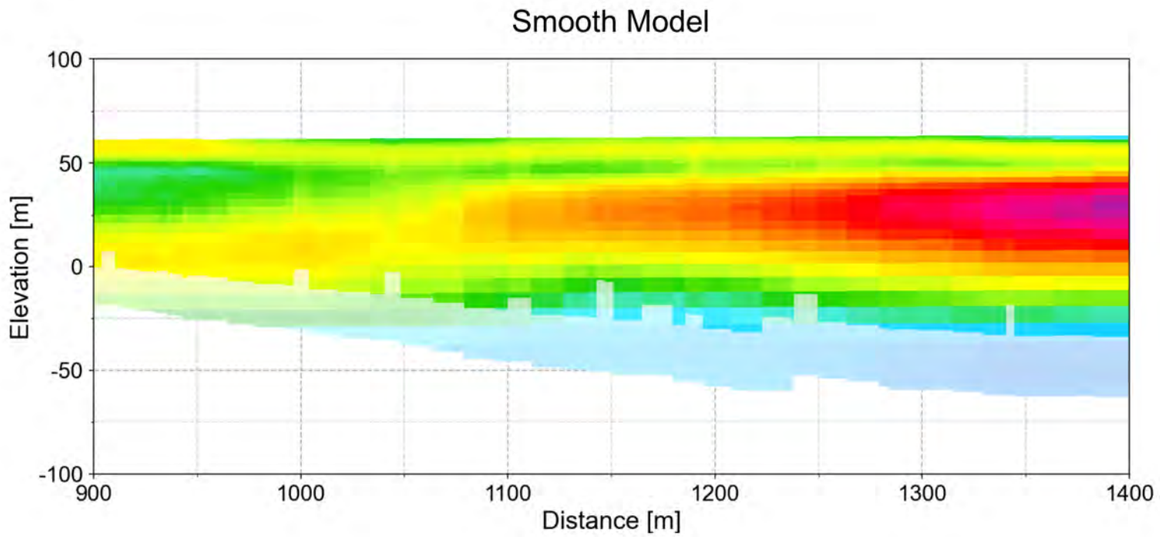
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SCWA GSA tTEM Survey: Line 101700 900-1400 m

tTEM Model Section







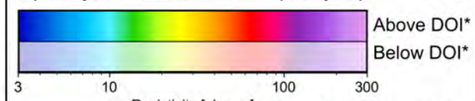
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Smooth model

Spatially constrained inversion (30 layers)



Copeland Creek tTEM Results
Santa Rosa Plain GSA
Sonoma County, CA

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COLLIER GEOPHYSICS

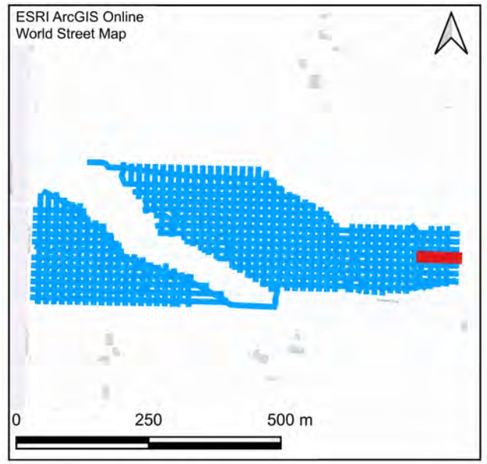
Sonoma County Water Agency
Project #: 1940113846

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Date: 2025-12-30, Created by: JP, Checked by: JC, Approved by: TPK

SCWA GSA tTEM Survey: Line 101700 1350-1560 m

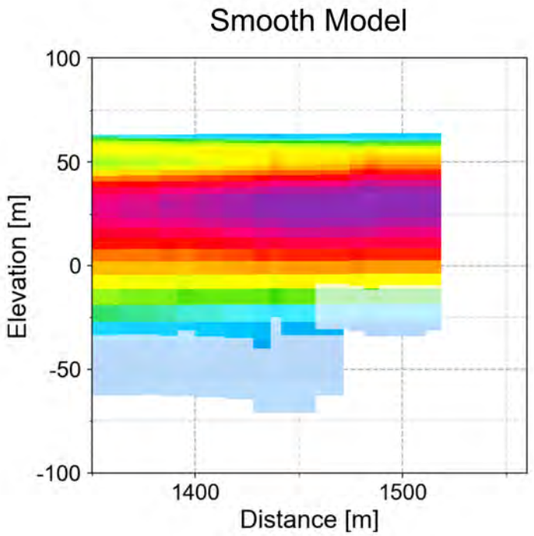
tTEM Model Section





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Santa Rosa Plain GSA
Sonoma County, CA

RAMBOLL

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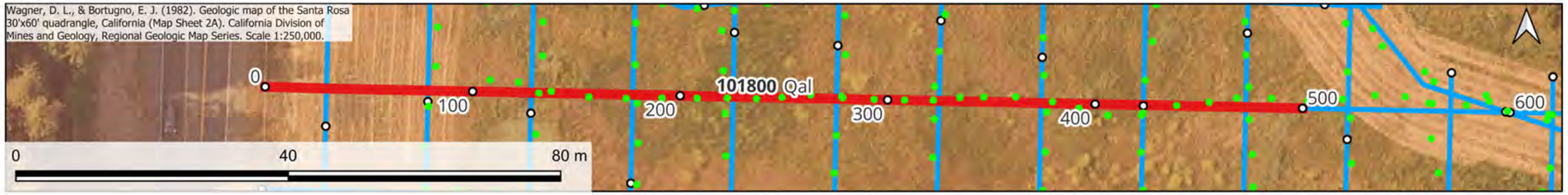
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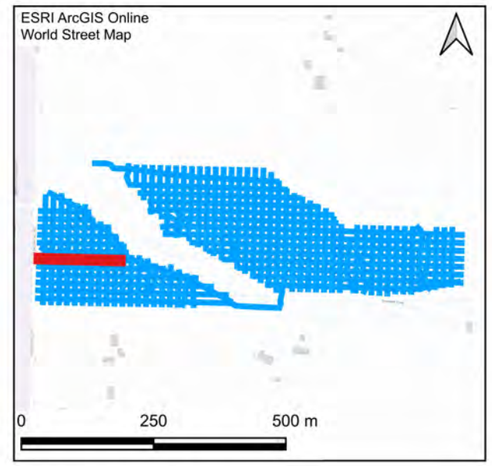
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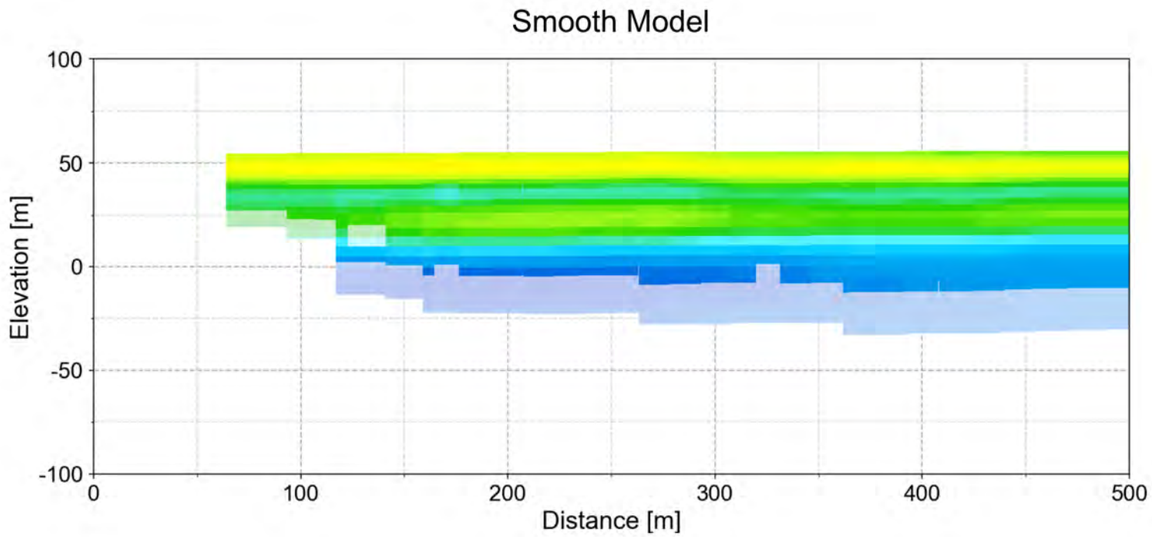
SCWA GSA tTEM Survey: Line 101800 0-500 m

tTEM Model Section









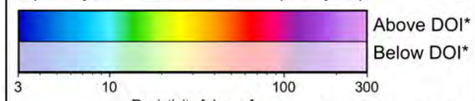
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Copeland Creek tTEM Results
Santa Rosa Plain GSA
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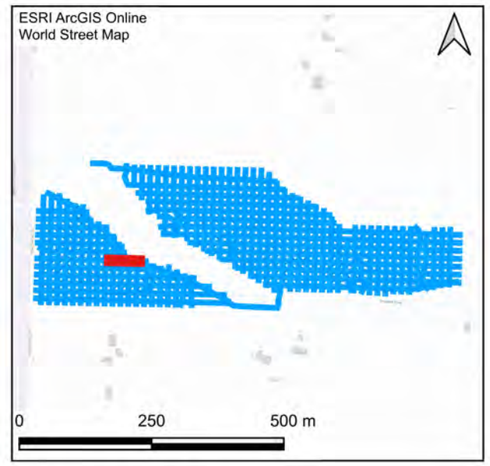
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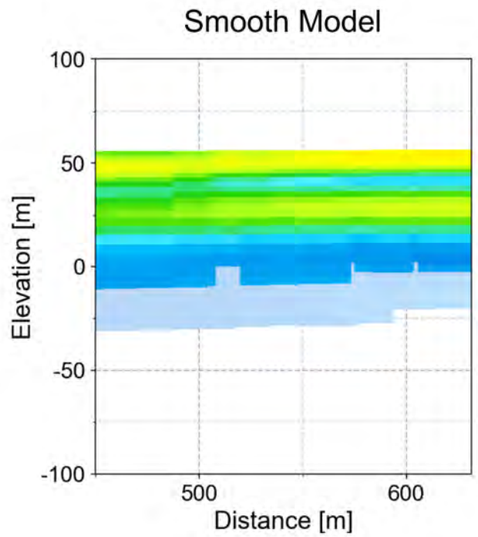
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Santa Rosa Plain GSA
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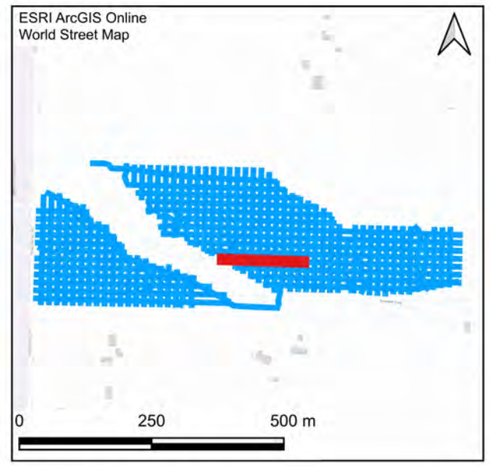
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SCWA GSA tTEM Survey: Line 101900 0-500 m

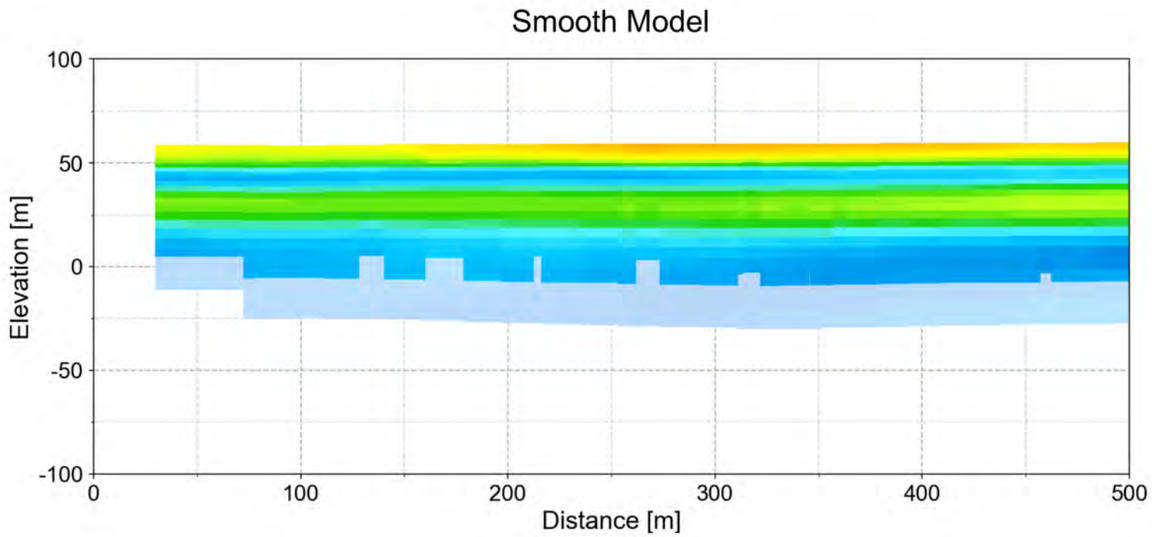
tTEM Model Section





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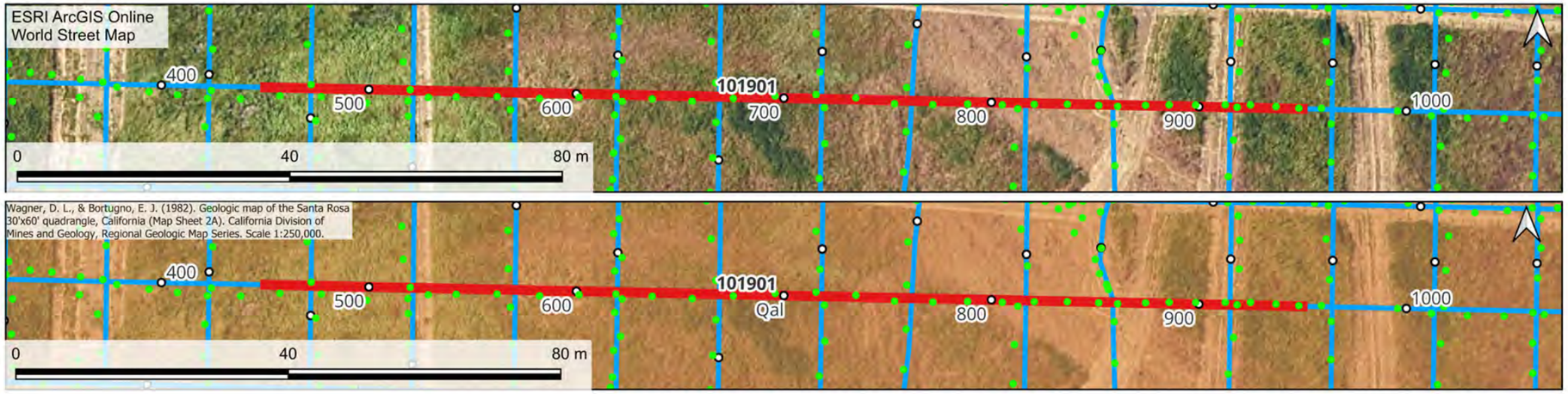
Sonoma County Water Agency
Project #: 1940113846

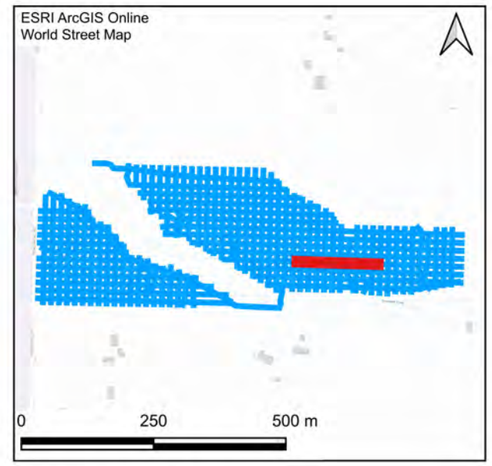
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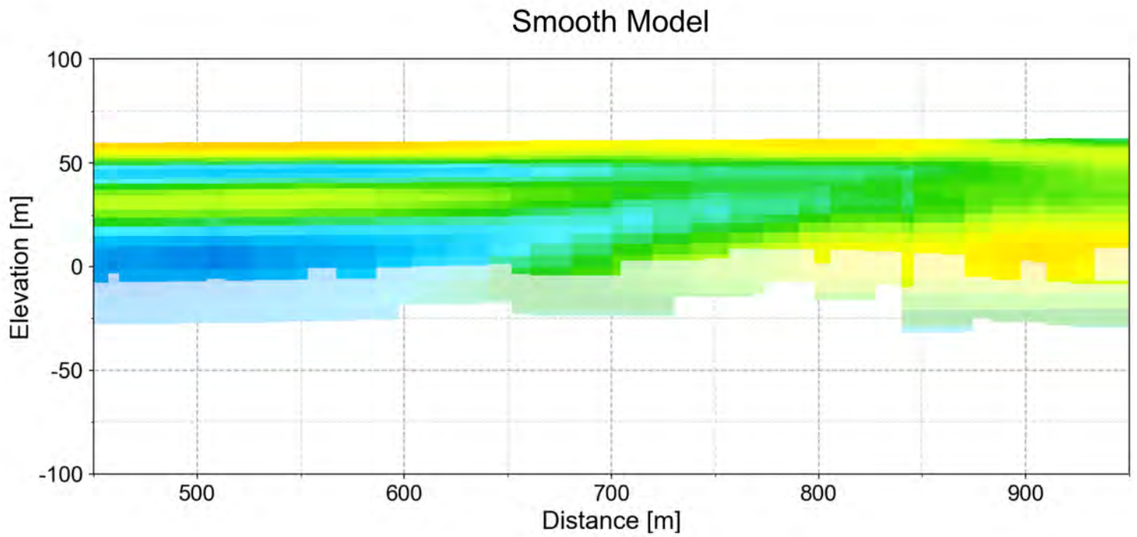
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SCWA GSA tTEM Survey: Line 101900 450-950 m

tTEM Model Section







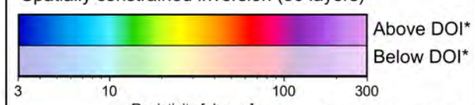
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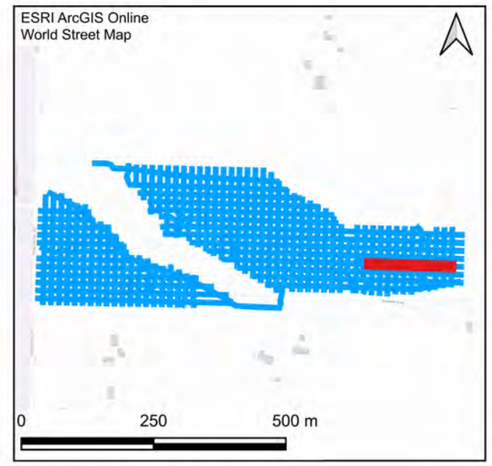
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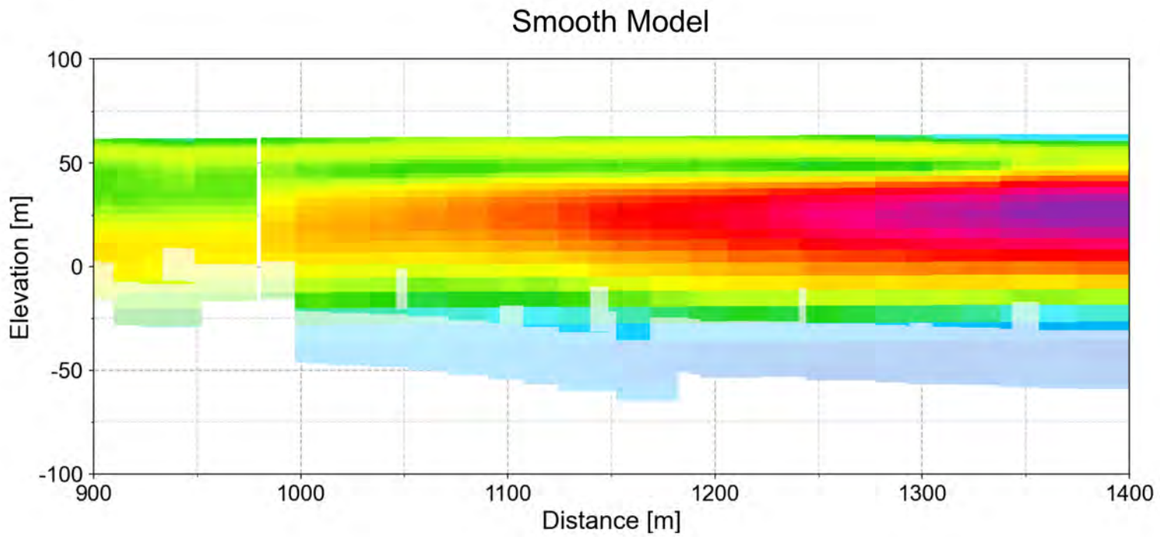
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SCWA GSA tTEM Survey: Line 101900 900-1400 m

tTEM Model Section







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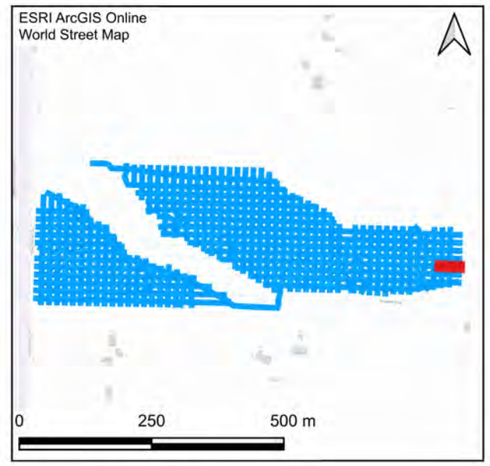
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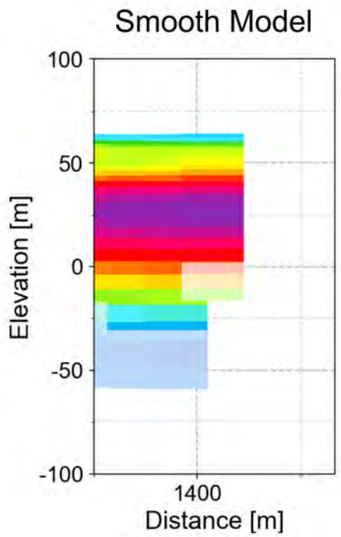
SCWA GSA tTEM Survey: Line 101900 1350-1466 m

tTEM Model Section









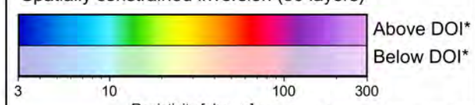
Legend for Maps

- tTEM data used for inversion
- Section (current page)
- Sections (other pages)
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- Pipelines (AmeriGEOSS, 2022)
- Quaternary fault (USGS, 2018)

Legend for Model Sections

Smooth model

Spatially constrained inversion (30 layers)



Copeland Creek tTEM Results
Santa Rosa Plain GSA
Sonoma County, CA

RAMBOLL

COLLIER GEOPHYSICS

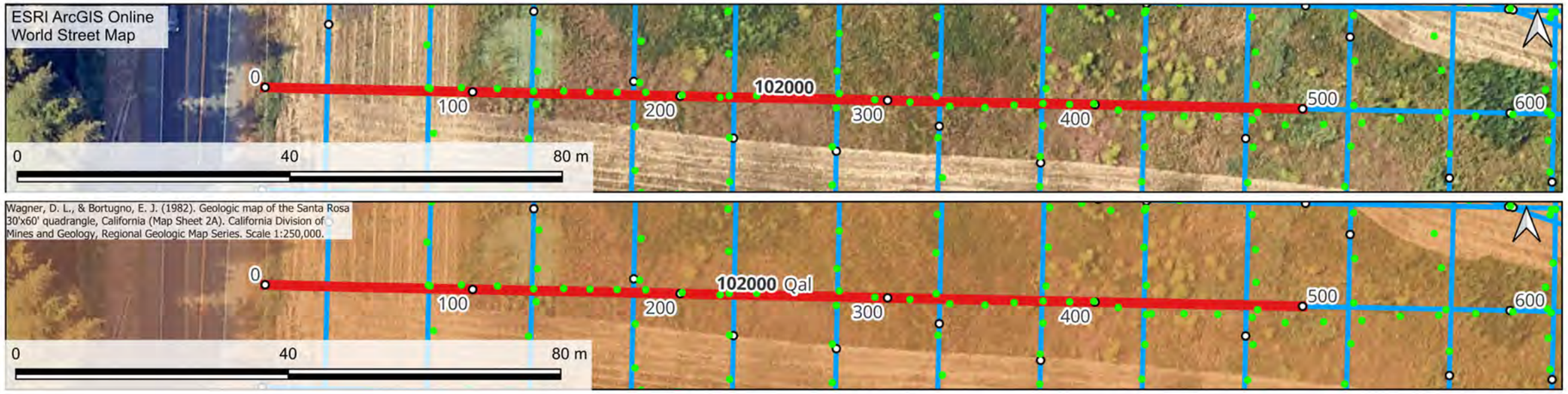
Sonoma County Water Agency
Project #:
1940113846

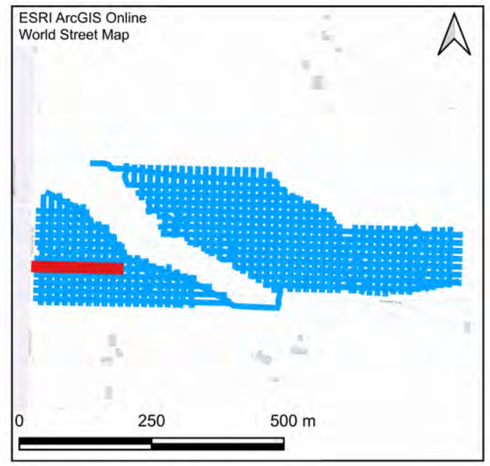
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Date: 2025-12-30, Created by: JP, Checked by: JC, Approved by: TPK

SCWA GSA tTEM Survey: Line 102000 0-500 m

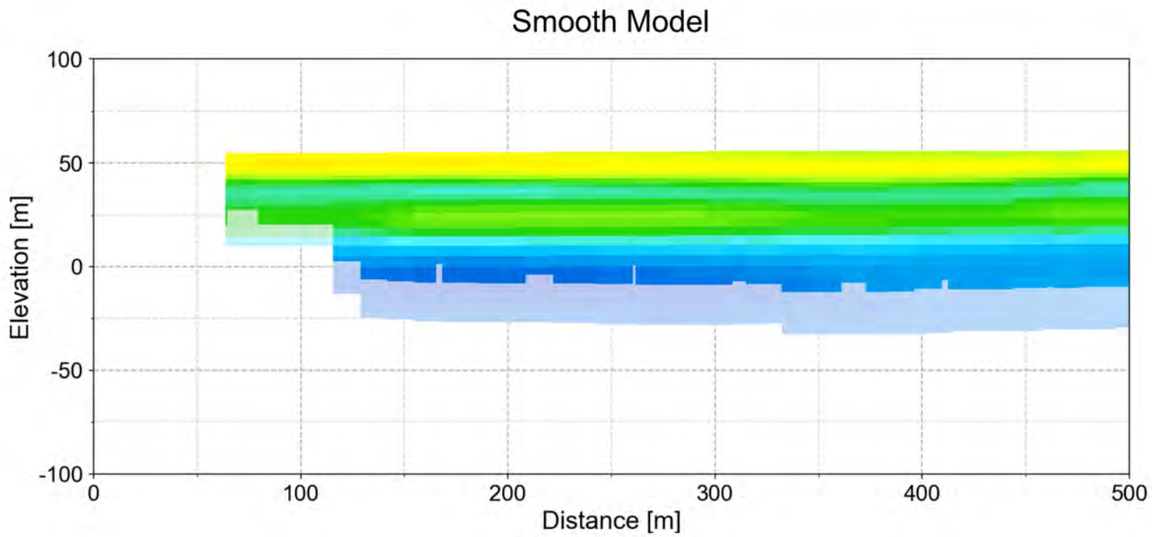
tTEM Model Section





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Legend for Model Sections

Smooth model

Spatially constrained inversion (30 layers)

Above DOI*

Below DOI*

3 10 100 300

Resistivity [ohm-m]

*DOI = Depth of investigation

Copeland Creek tTEM Results
Santa Rosa Plain GSA
Sonoma County, CA

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Sonoma County Water Agency
Project #: 1940113846

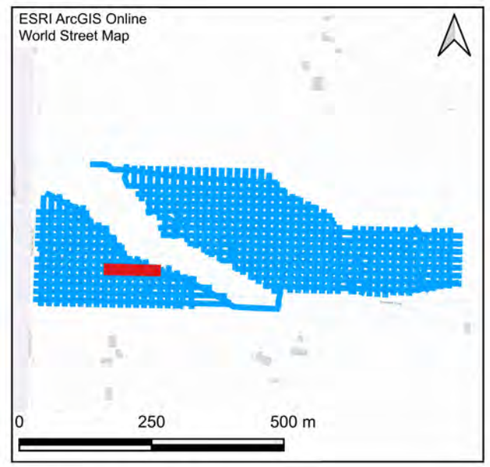
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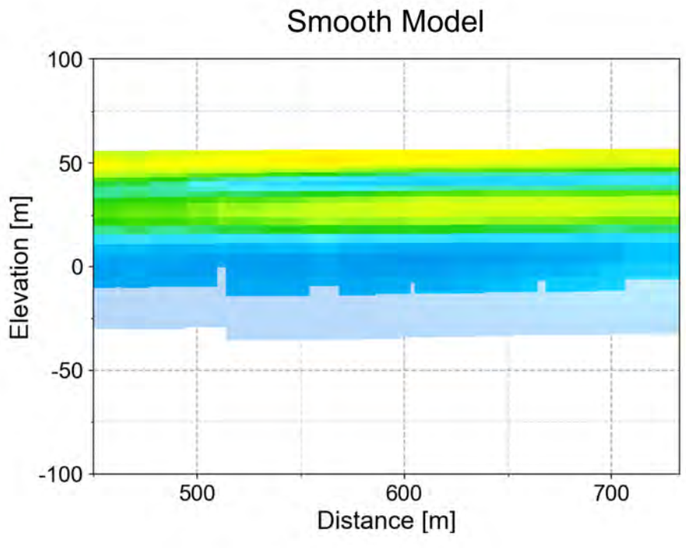
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SCWA GSA tTEM Survey: Line 102000 450-733 m

tTEM Model Section







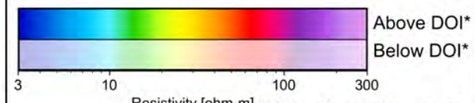
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Legend for Model Sections

Smooth model

Spatially constrained inversion (30 layers)



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Sonoma County, CA

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Sonoma County Water Agency
Project #: 1940113846

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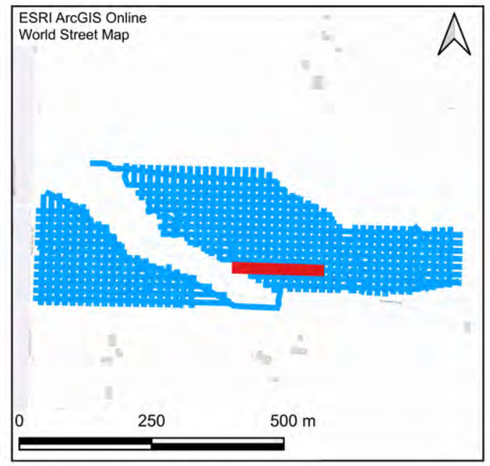
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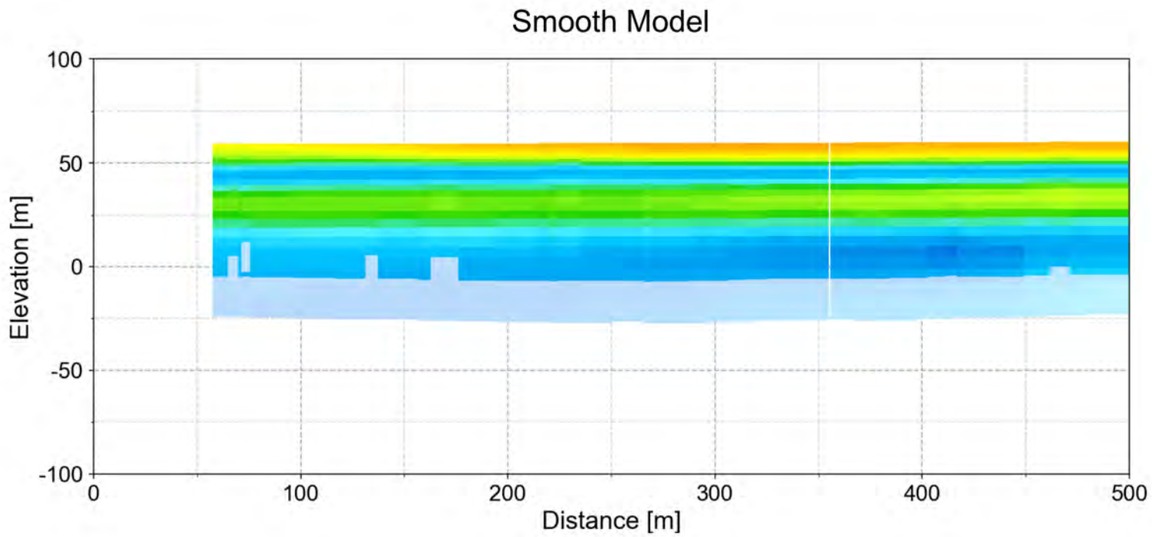
SCWA GSA tTEM Survey: Line 102100 0-500 m

tTEM Model Section









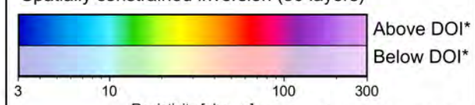
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Smooth model

Spatially constrained inversion (30 layers)



Copeland Creek tTEM Results
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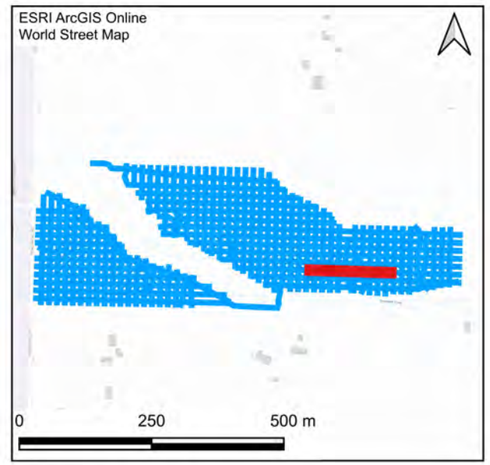
Sonoma County Water Agency
Project #: 1940113846

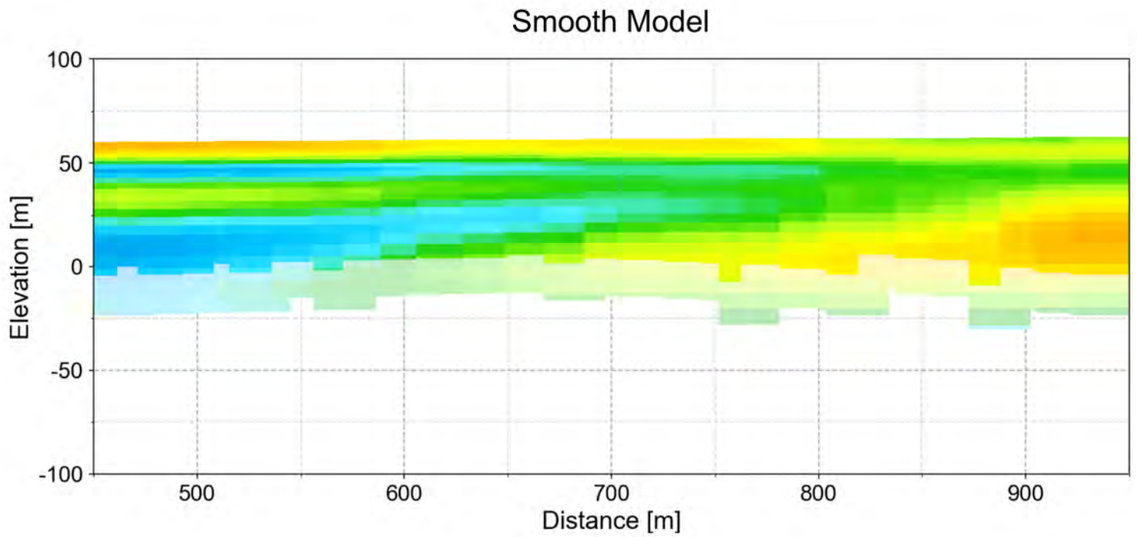
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Date: 2025-12-30, Created by: JP, Checked by: JC, Approved by: TPK

SCWA GSA tTEM Survey: Line 102100 450-950 m

tTEM Model Section







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Legend for Model Sections

Smooth model

Spatially constrained inversion (30 layers)

Above DOI*

Below DOI*

3 10 100 300

Resistivity [ohm-m]

*DOI = Depth of investigation

Copeland Creek tTEM Results
Santa Rosa Plain GSA
Sonoma County, CA

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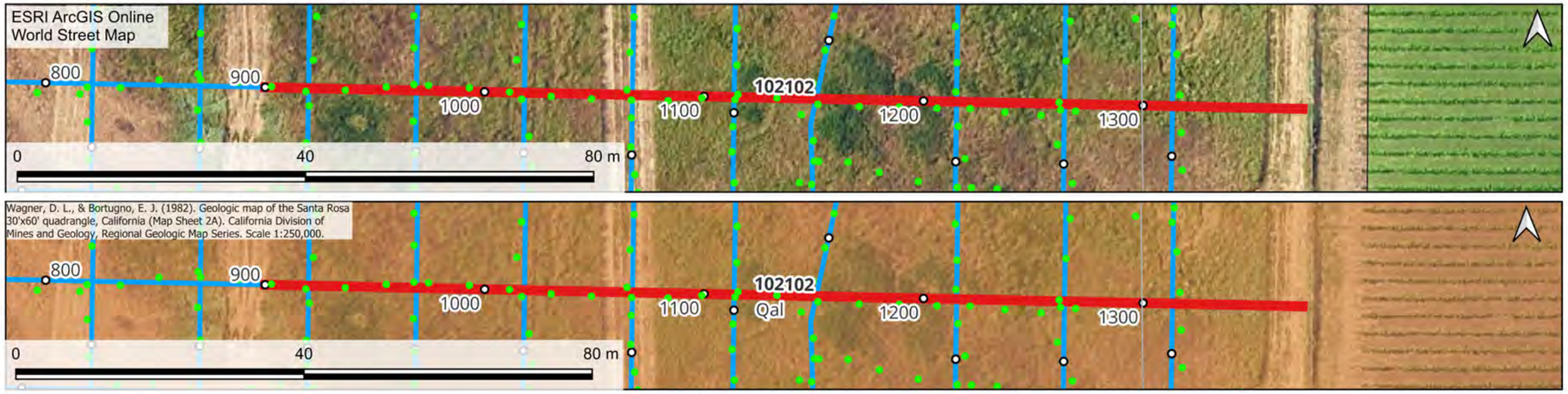
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Project #: 1940113846

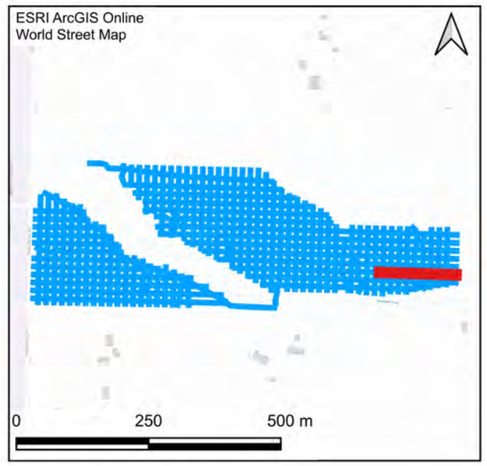
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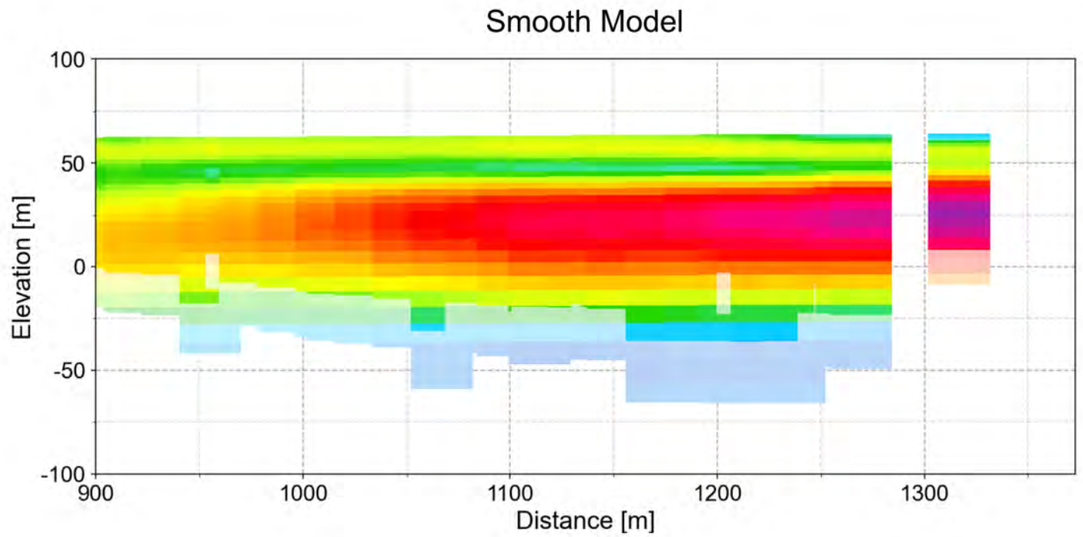
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SCWA GSA tTEM Survey: Line 102100 900-1373 m

tTEM Model Section







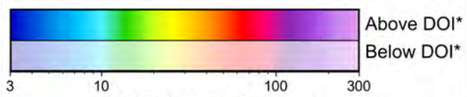
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Smooth model

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Sonoma County, CA

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COLLIER GEOPHYSICS

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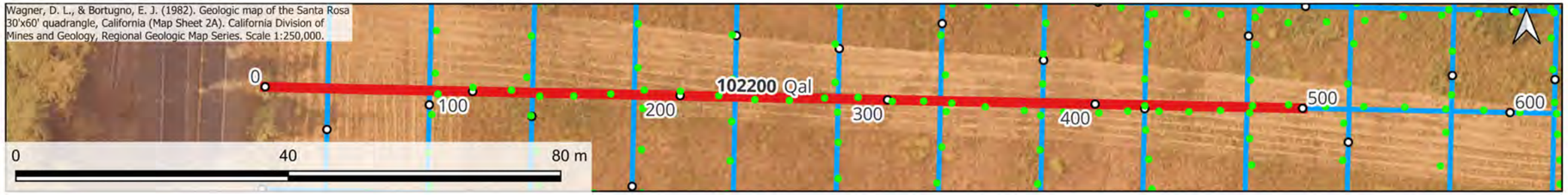
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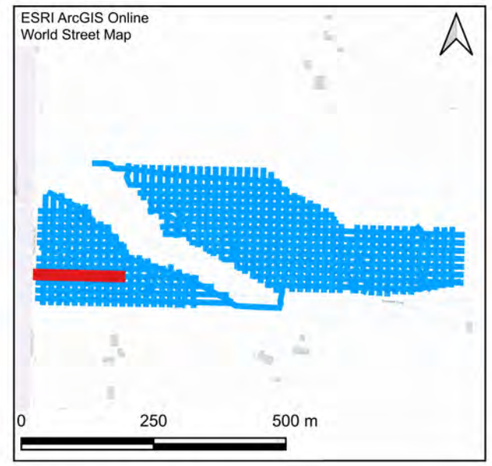
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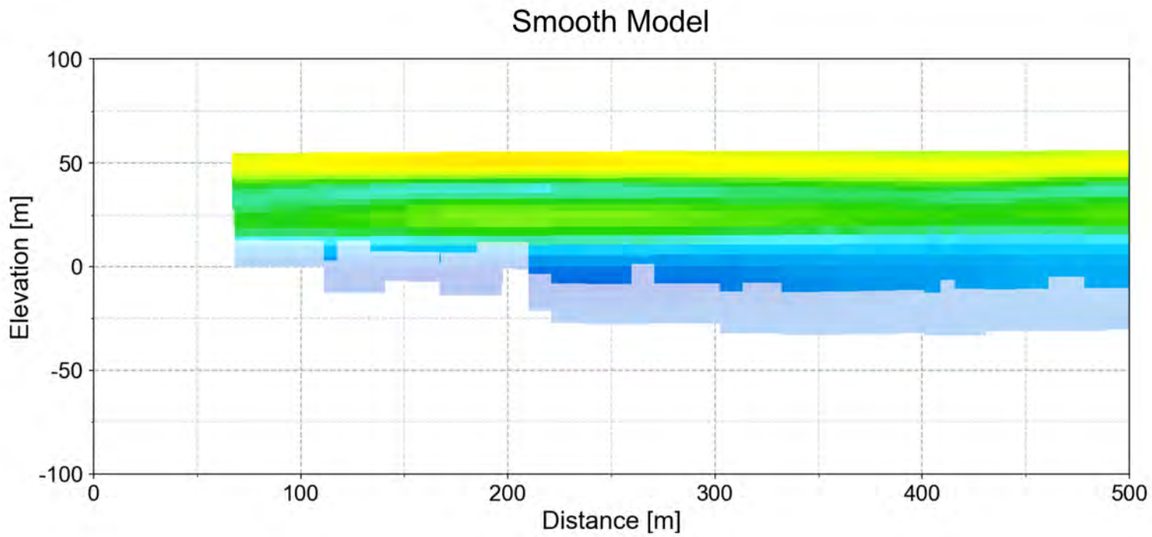
SCWA GSA tTEM Survey: Line 102200 0-500 m

tTEM Model Section









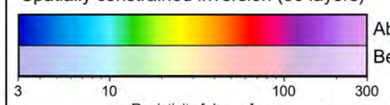
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Legend for Model Sections

Smooth model

Spatially constrained inversion (30 layers)



*DOI = Depth of investigation

Copeland Creek tTEM Results
Santa Rosa Plain GSA
Sonoma County, CA

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COLLIER GEOPHYSICS

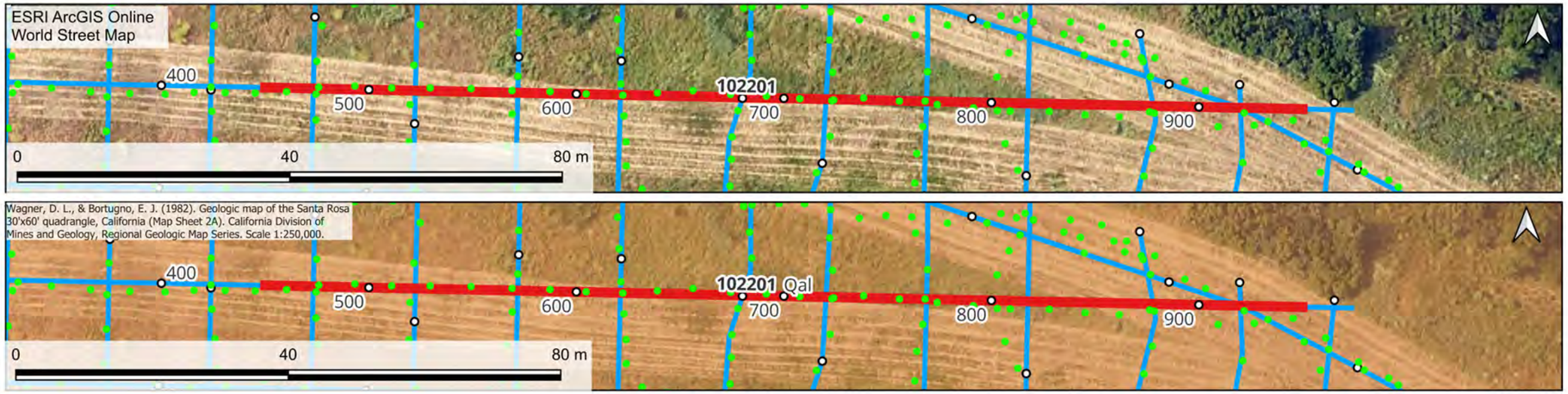
Sonoma County Water Agency
Project #: 1940113846

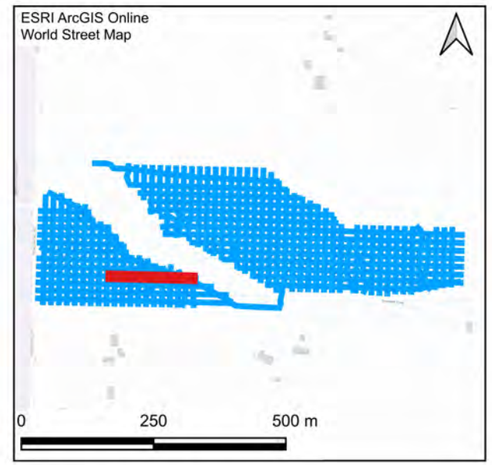
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Date: 2025-12-30, Created by: JP, Checked by: JC, Approved by: TPK

SCWA GSA tTEM Survey: Line 102200 450-950 m

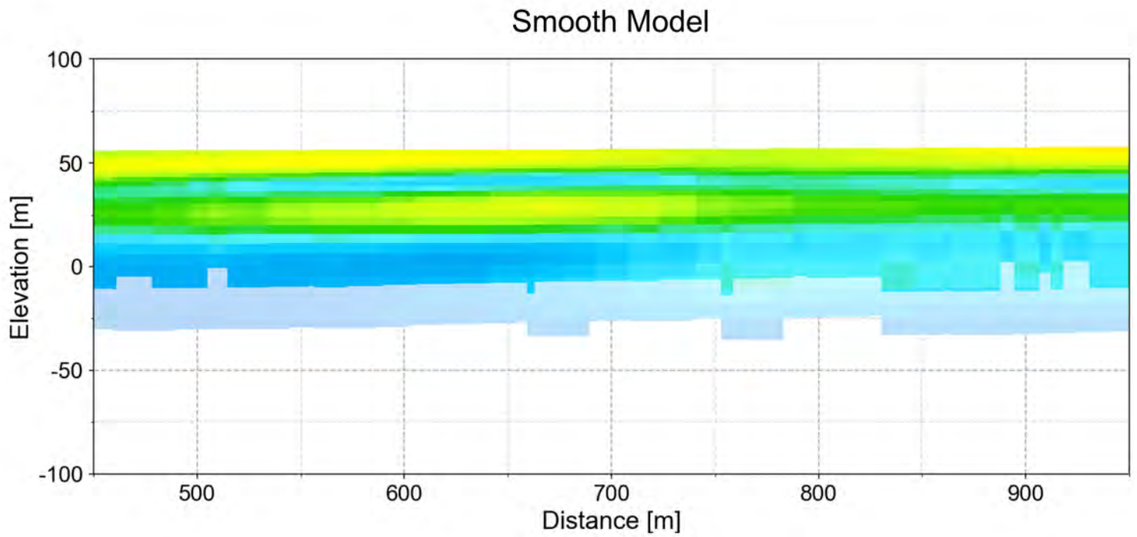
tTEM Model Section





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Legend for Model Sections

Smooth model

Spatially constrained inversion (30 layers)

Above DOI*

Below DOI*

3 10 100 300

Resistivity [ohm-m] *DOI = Depth of investigation

Copeland Creek tTEM Results
Santa Rosa Plain GSA
Sonoma County, CA

RAMBOLL

COLLIER GEOPHYSICS

Sonoma County Water Agency
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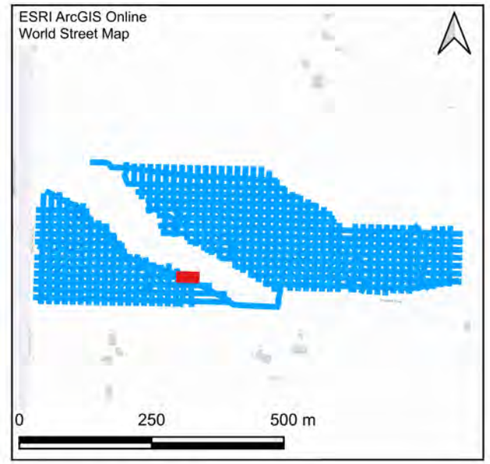
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SCWA GSA tTEM Survey: Line 102200 900-974 m

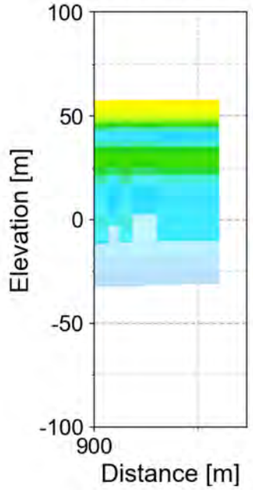
tTEM Model Section







Smooth Model



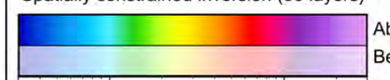
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Legend for Model Sections

Smooth model

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Copeland Creek tTEM Results
Santa Rosa Plain GSA
Sonoma County, CA

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COLLIER GEOPHYSICS

Sonoma County Water Agency
Project #:
1940113846

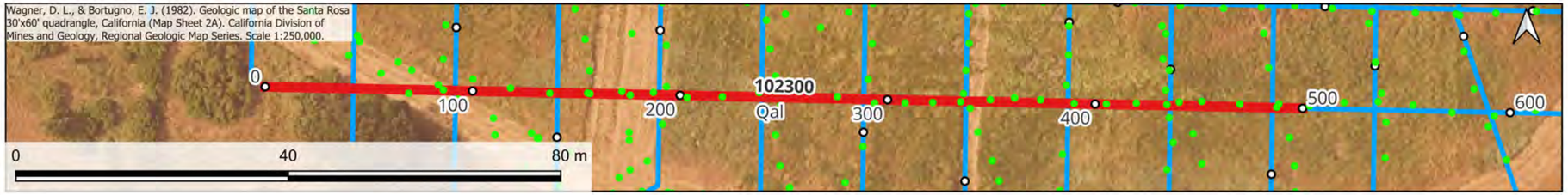
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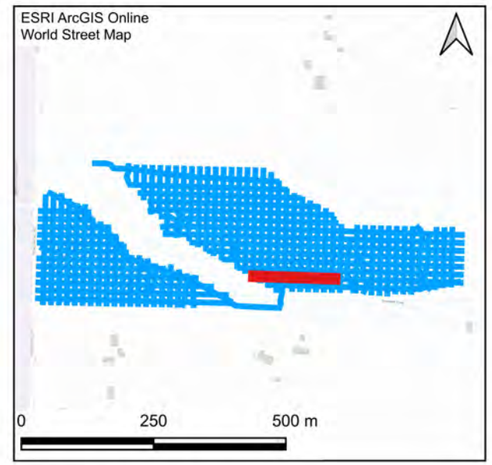
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SCWA GSA tTEM Survey: Line 102300 0-500 m

tTEM Model Section

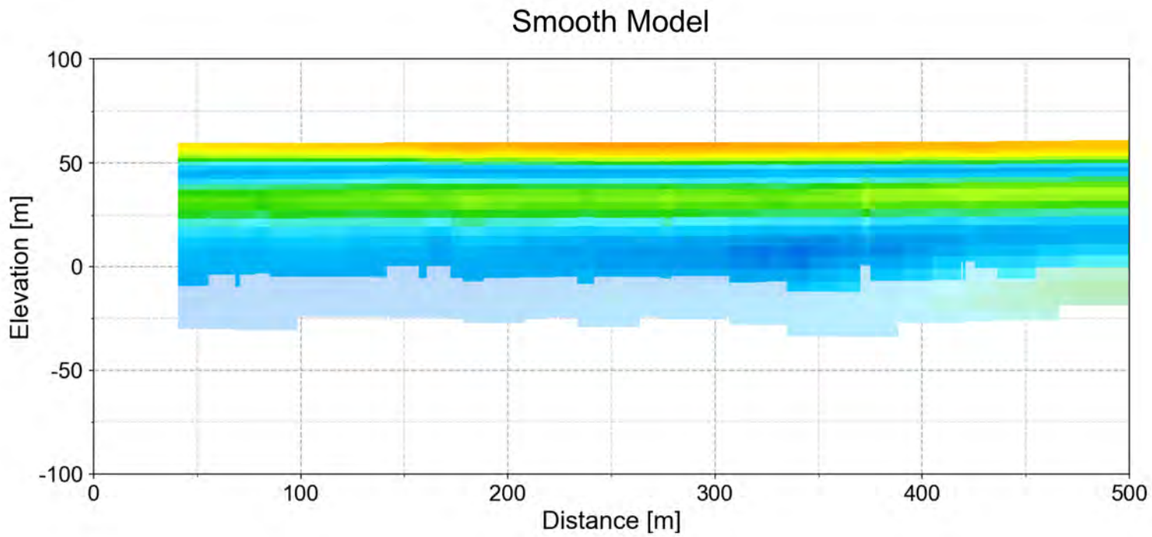






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Above DOI*

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3 10 100 300

Resistivity [ohm-m]

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Copeland Creek tTEM Results
Santa Rosa Plain GSA
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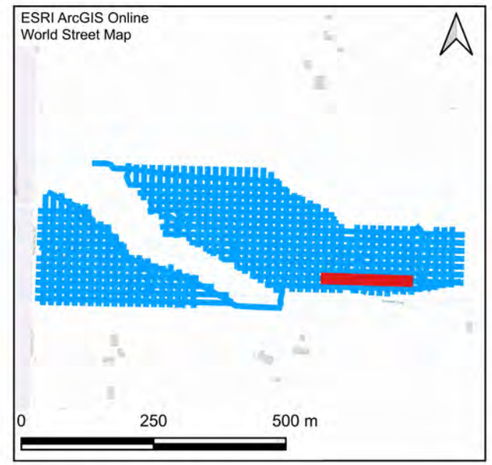
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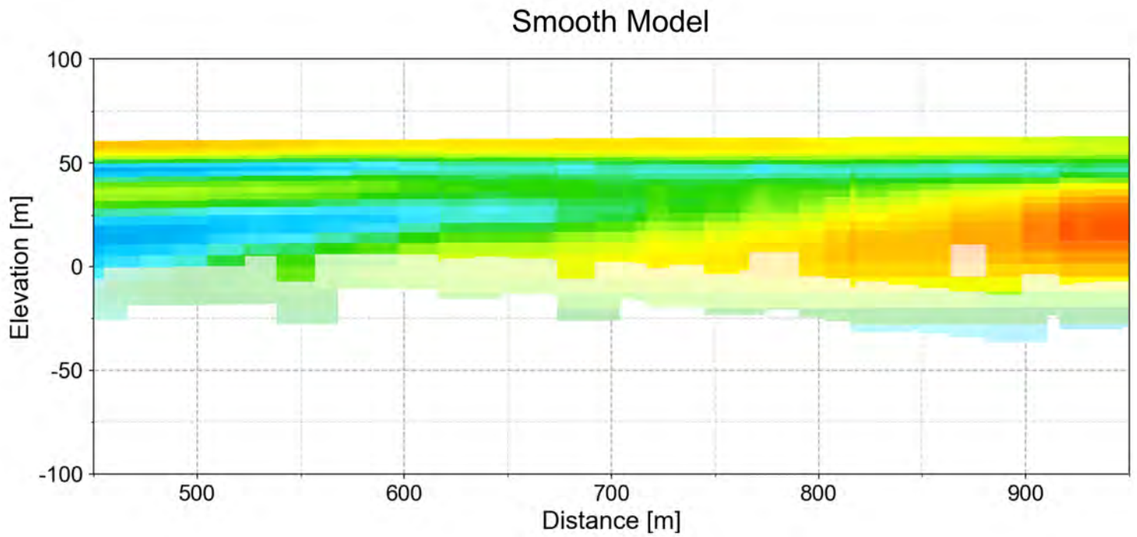
SCWA GSA tTEM Survey: Line 102300 450-950 m

tTEM Model Section









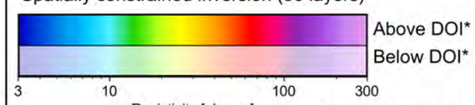
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Santa Rosa Plain GSA
Sonoma County, CA

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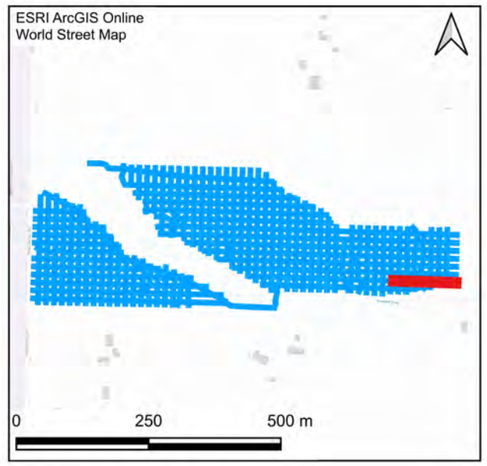
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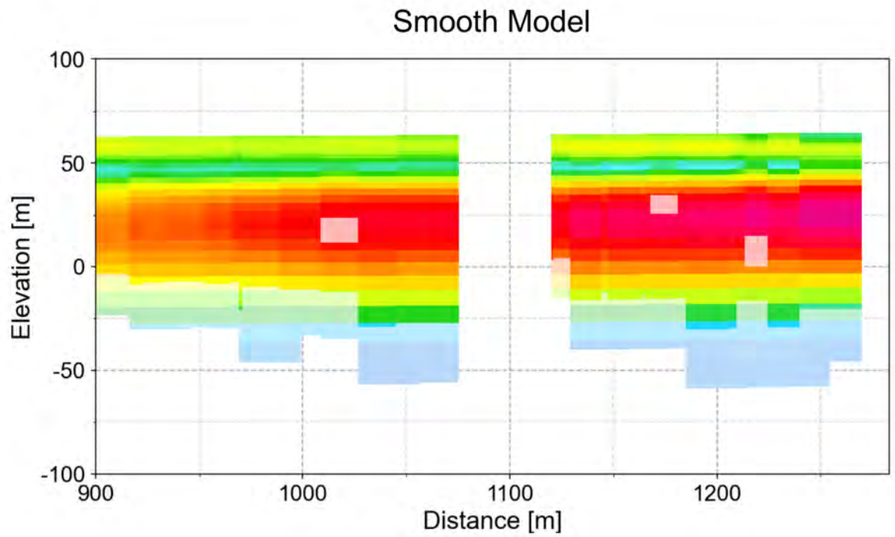
Date: 2025-12-30, Created by: JP, Checked by: JC, Approved by: TPK

SCWA GSA tTEM Survey: Line 102300 900-1283 m

tTEM Model Section







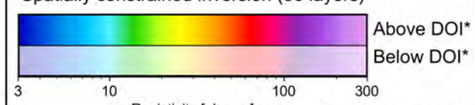
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Santa Rosa Plain GSA
Sonoma County, CA

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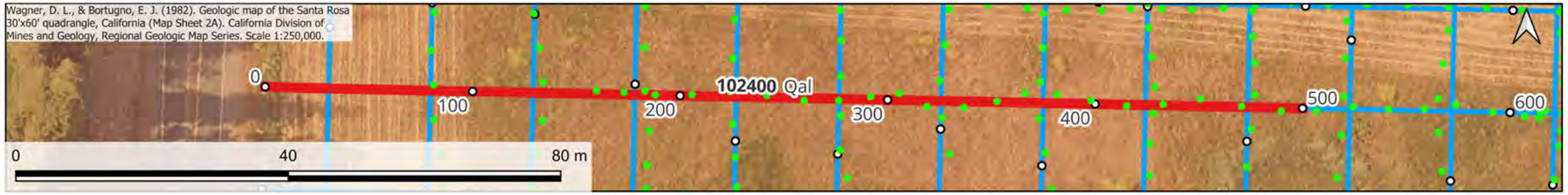
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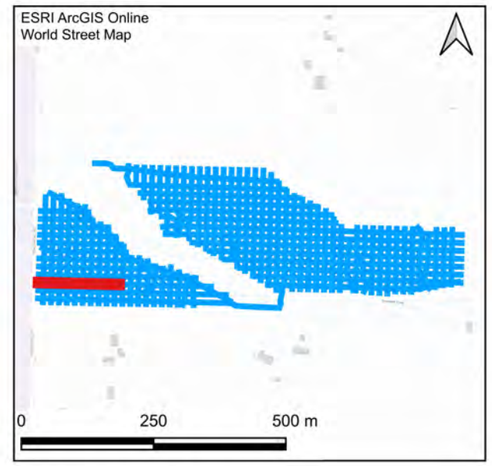
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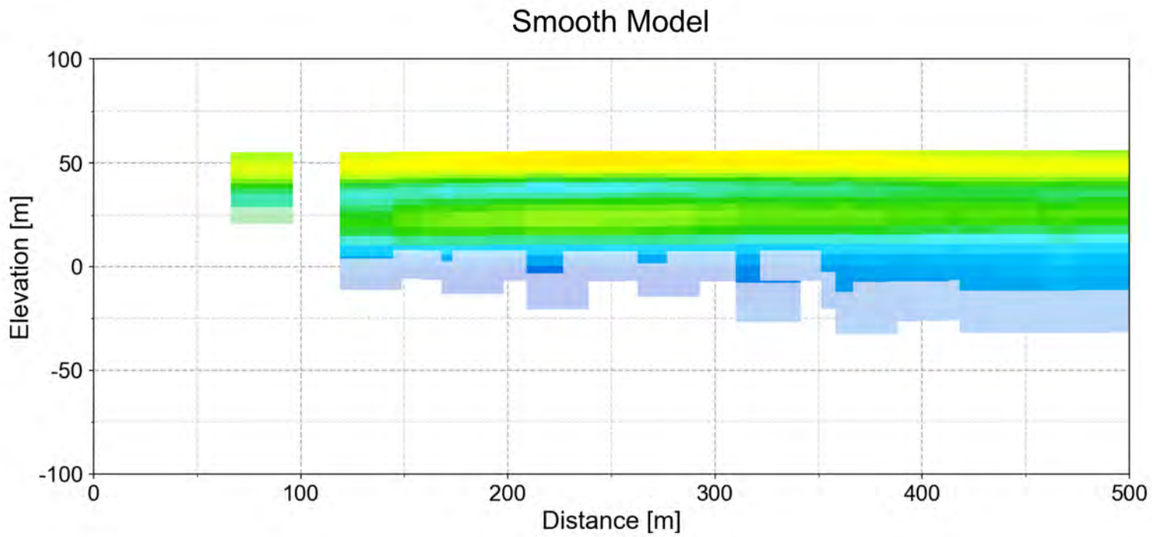
SCWA GSA tTEM Survey: Line 102400 0-500 m

tTEM Model Section









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Legend for Model Sections

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Below DOI*

3 10 100 300

Resistivity [ohm-m]

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Project #: 1940113846

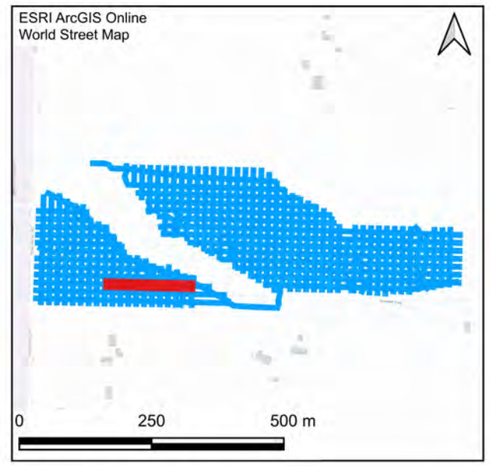
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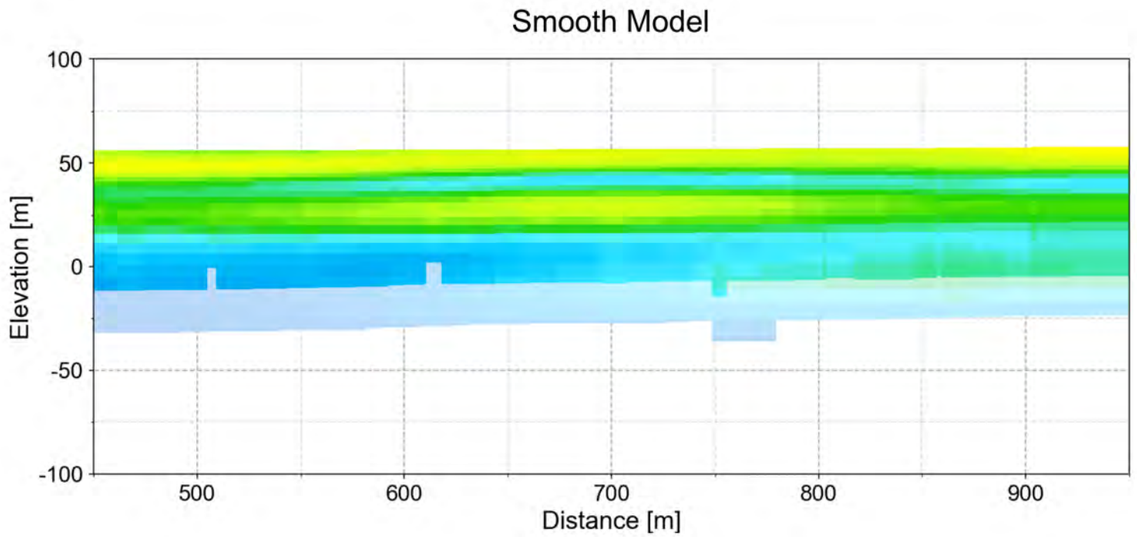
Date: 2025-12-30, Created by: JP, Checked by: JC, Approved by: TPK

SCWA GSA tTEM Survey: Line 102400 450-950 m

tTEM Model Section







Legend for Maps

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Legend for Model Sections

Smooth model

Spatially constrained inversion (30 layers)

Above DOI*

Below DOI*

3 10 100 300

Resistivity [ohm-m]

*DOI = Depth of investigation

Copeland Creek tTEM Results
Santa Rosa Plain GSA
Sonoma County, CA

RAMBOLL

COLLIER GEOPHYSICS

Sonoma County Water Agency
Project #: 1940113846

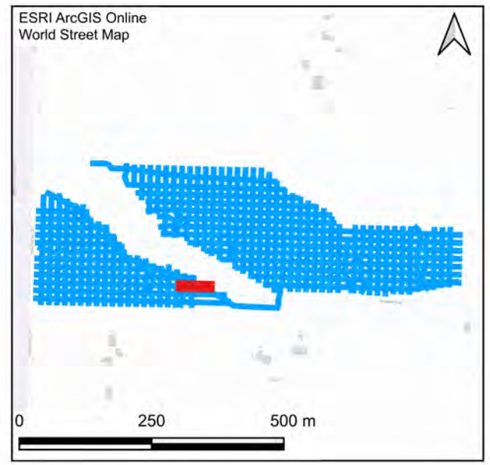
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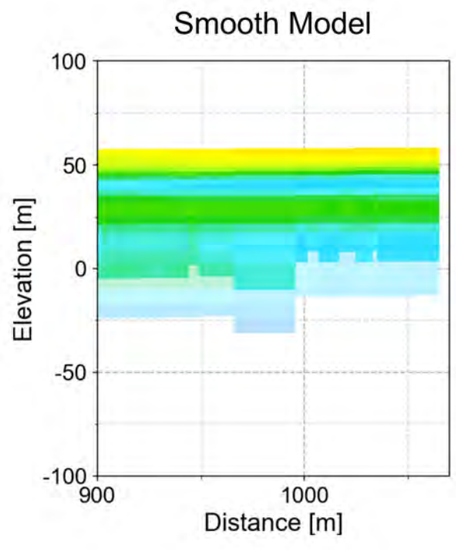
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SCWA GSA tTEM Survey: Line 102400 900-1070 m

tTEM Model Section







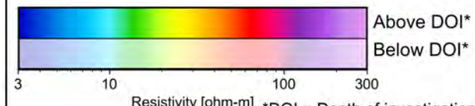
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Legend for Model Sections

Smooth model

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Copeland Creek tTEM Results
Santa Rosa Plain GSA
Sonoma County, CA

RAMBOLL
COLLIER GEOPHYSICS

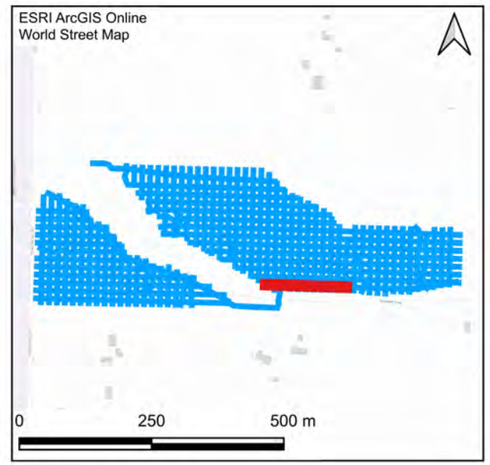
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Project #: 1940113846

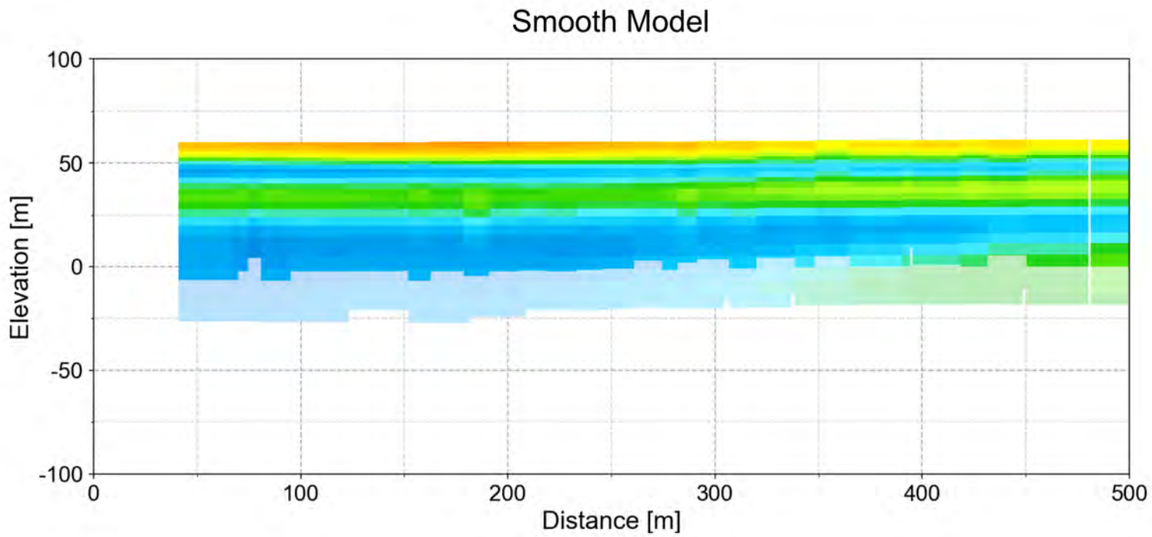
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Date: 2025-12-30, Created by: JP, Checked by: JC, Approved by: TPK

SCWA GSA tTEM Survey: Line 102500 0-500 m

tTEM Model Section







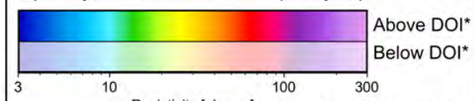
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Smooth model

Spatially constrained inversion (30 layers)



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Santa Rosa Plain GSA
Sonoma County, CA

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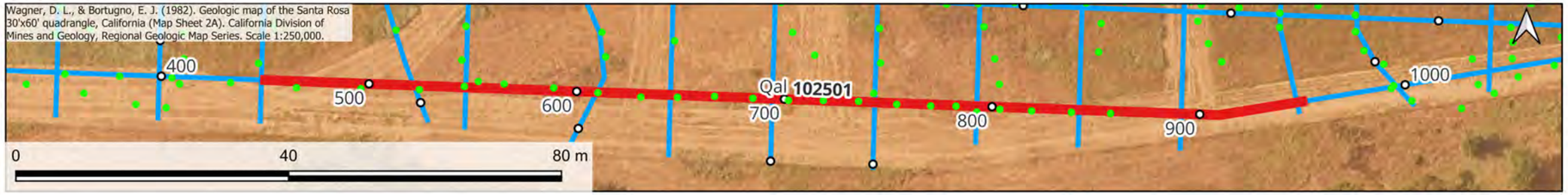
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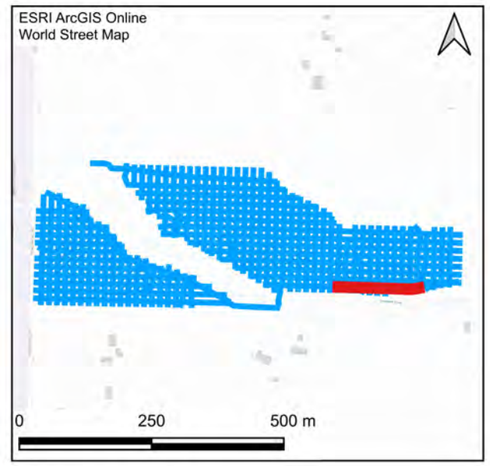
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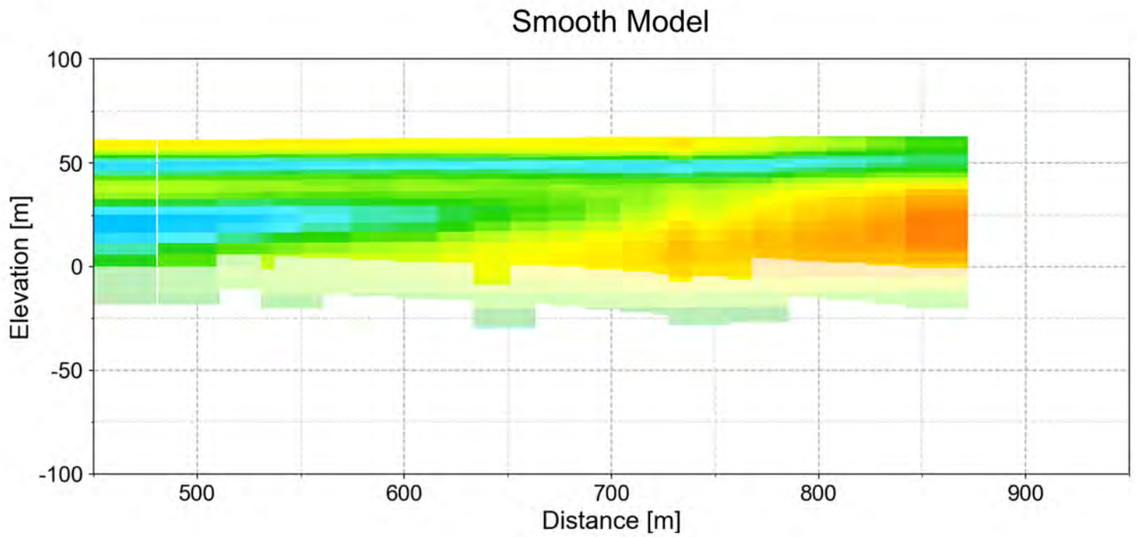
SCWA GSA tTEM Survey: Line 102500 450-950 m

tTEM Model Section









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Spatially constrained inversion (30 layers)

Above DOI*

Below DOI*

3 10 100 300

Resistivity [ohm-m] *DOI = Depth of investigation

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Santa Rosa Plain GSA
Sonoma County, CA

RAMBOLL

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Sonoma County Water Agency
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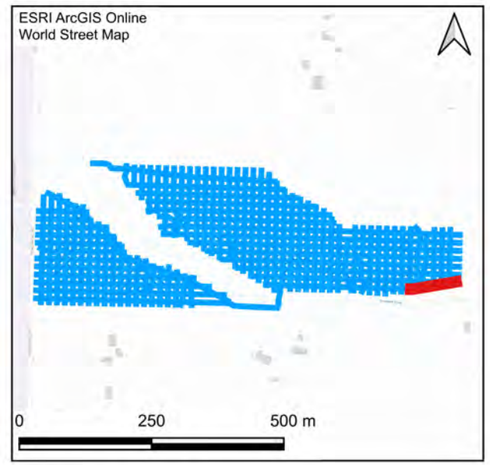
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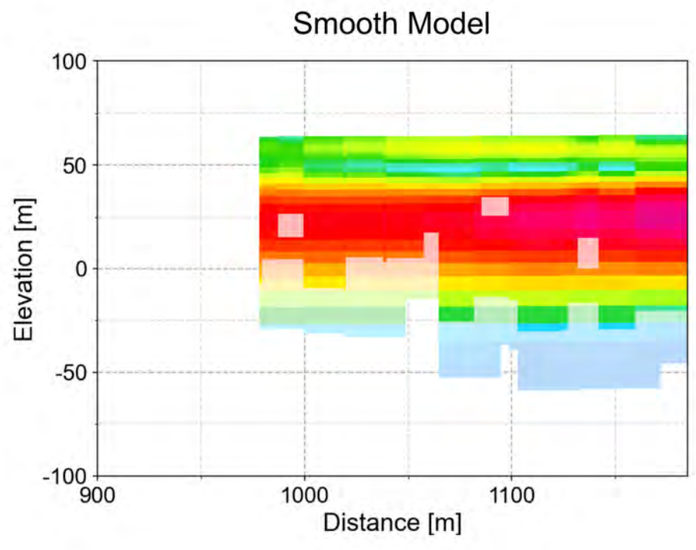
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SCWA GSA tTEM Survey: Line 102500 900-1185 m

tTEM Model Section







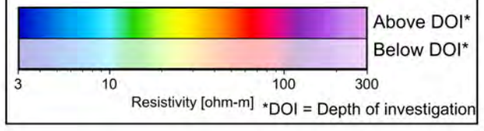
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Copeland Creek tTEM Results
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Sonoma County, CA

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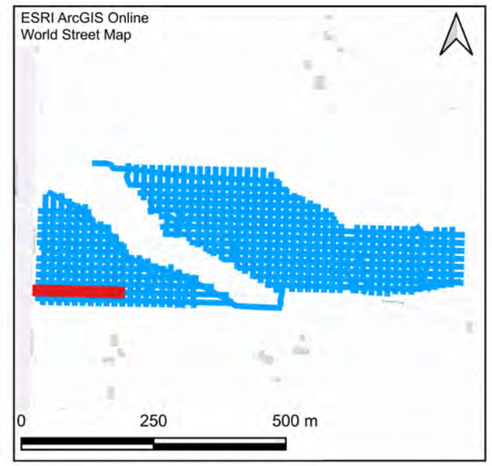
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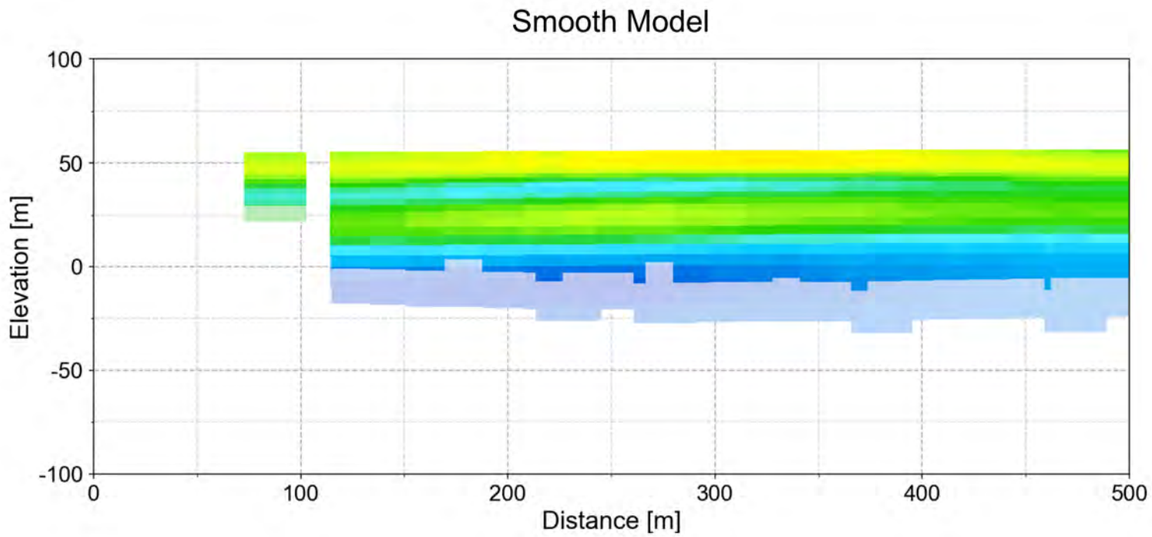
SCWA GSA tTEM Survey: Line 102600 0-500 m

tTEM Model Section









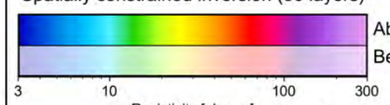
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Copeland Creek tTEM Results
Santa Rosa Plain GSA
Sonoma County, CA

RAMBOLL

COLLIER GEOPHYSICS

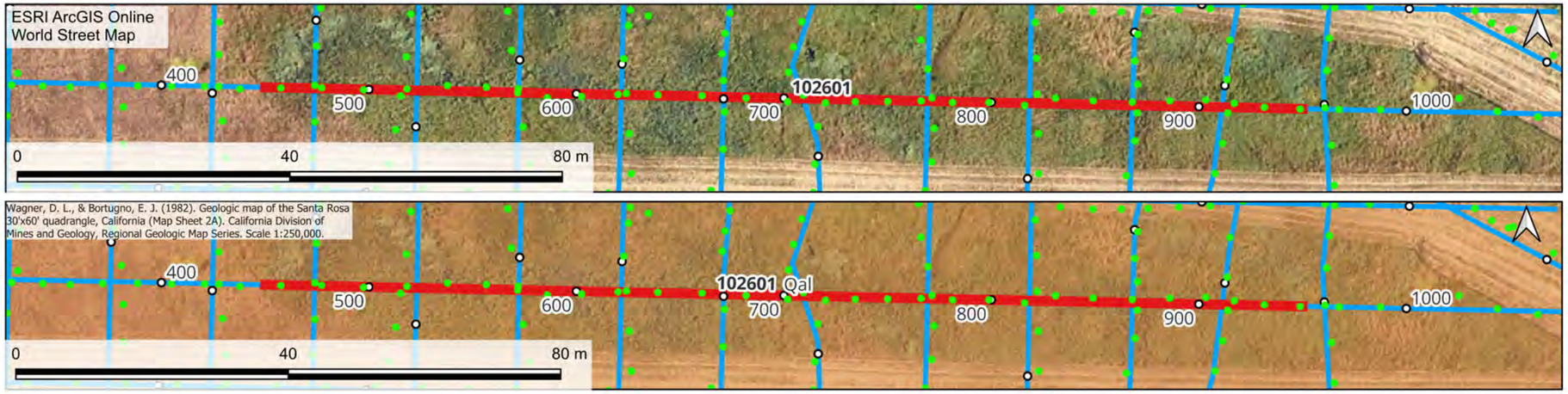
Sonoma County Water Agency
Project #: 1940113846

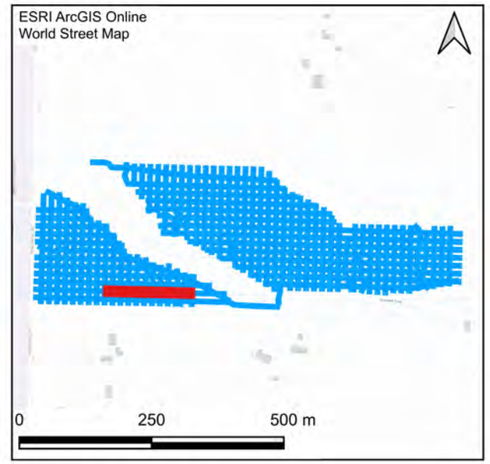
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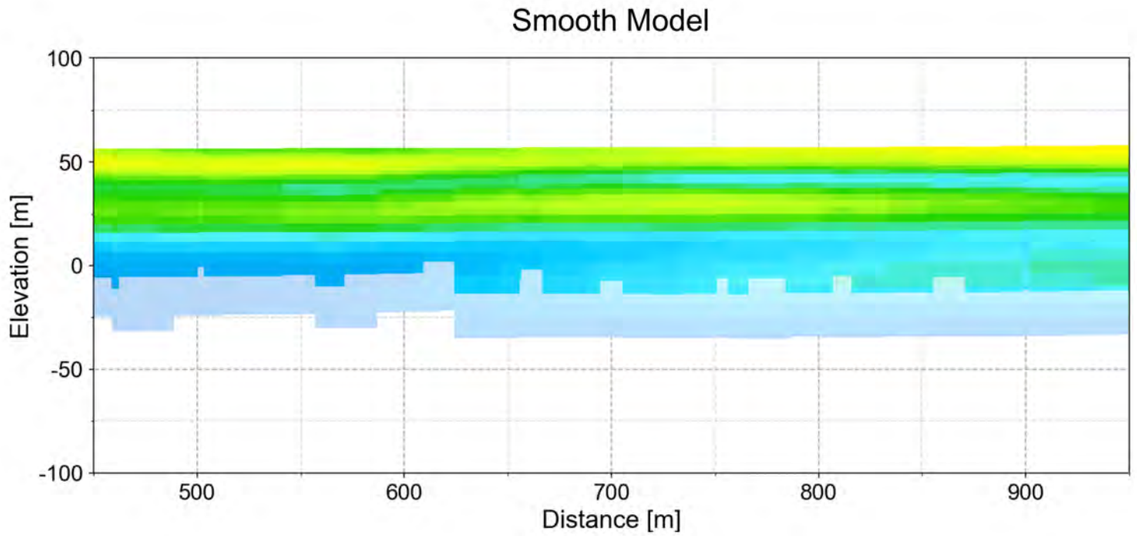
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SCWA GSA tTEM Survey: Line 102600 450-950 m

tTEM Model Section







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Below DOI*

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Resistivity [ohm-m] *DOI = Depth of investigation

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Santa Rosa Plain GSA
Sonoma County, CA

RAMBOLL

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Sonoma County Water Agency
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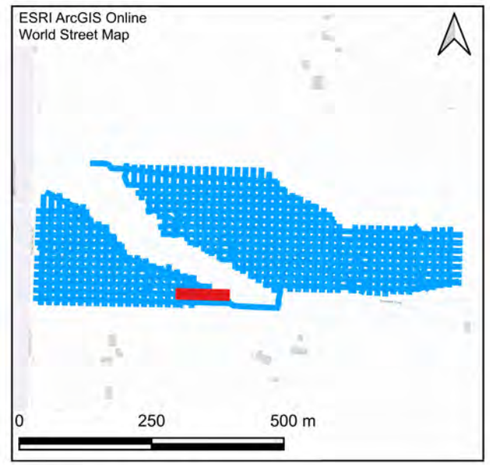
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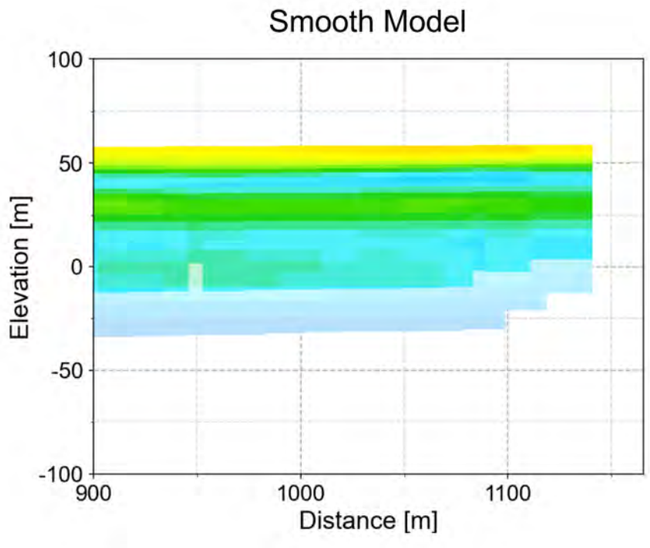
SCWA GSA tTEM Survey: Line 102600 900-1165 m

tTEM Model Section









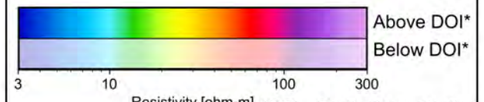
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Spatially constrained inversion (30 layers)



Copeland Creek tTEM Results
Santa Rosa Plain GSA
Sonoma County, CA

RAMBOLL
COLLIER GEOPHYSICS

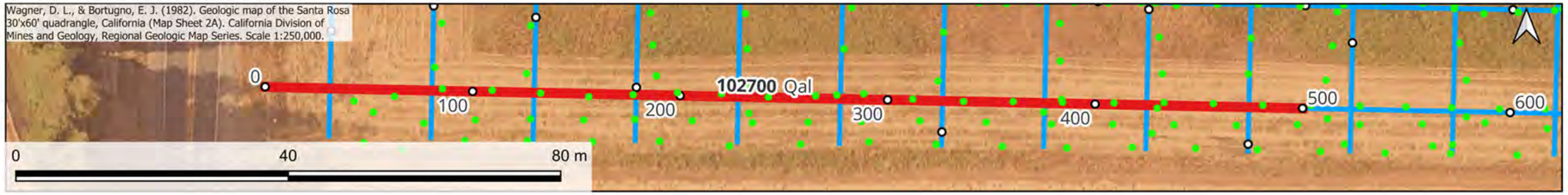
Sonoma County Water Agency
Project #: 1940113846

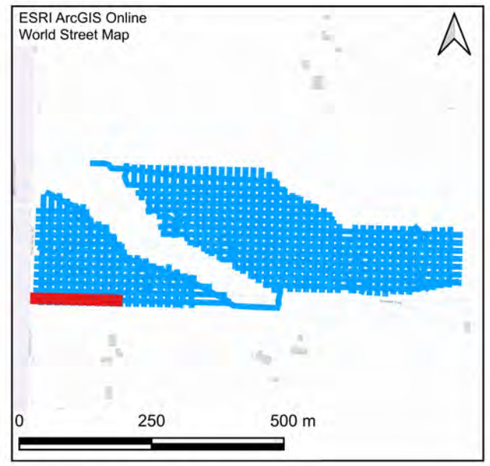
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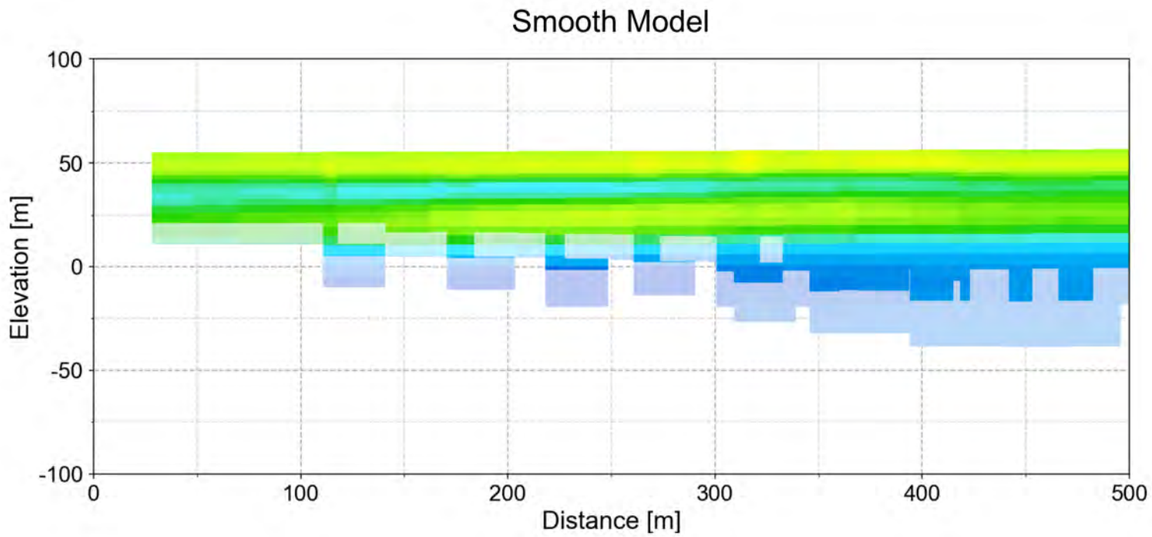
SCWA GSA tTEM Survey: Line 102700 0-500 m

tTEM Model Section









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Smooth model

Spatially constrained inversion (30 layers)

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Resistivity [ohm-m]

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Copeland Creek tTEM Results
Santa Rosa Plain GSA
Sonoma County, CA

RAMBOLL

COLLIER GEOPHYSICS

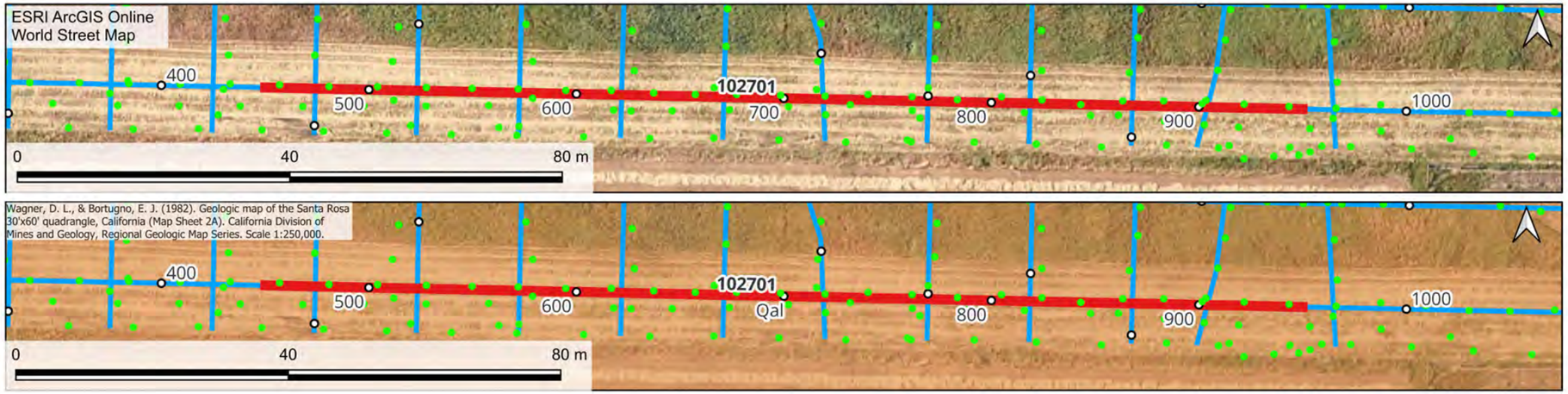
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Project #: 1940113846

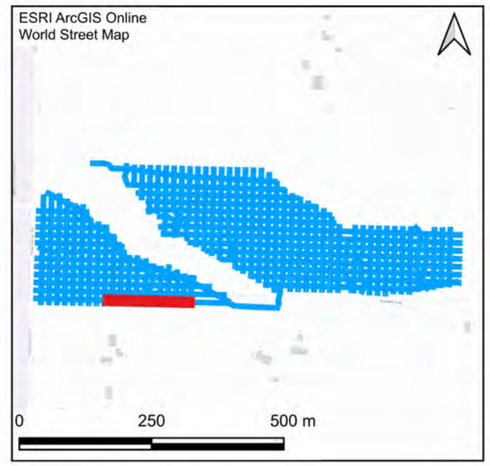
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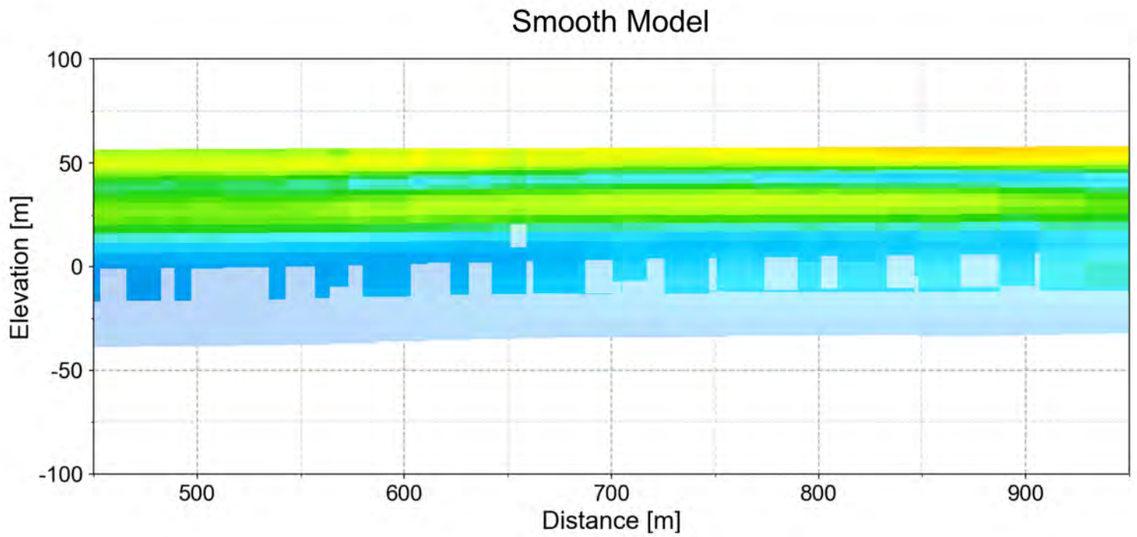
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SCWA GSA tTEM Survey: Line 102700 450-950 m

tTEM Model Section







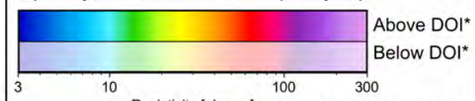
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Sonoma County, CA

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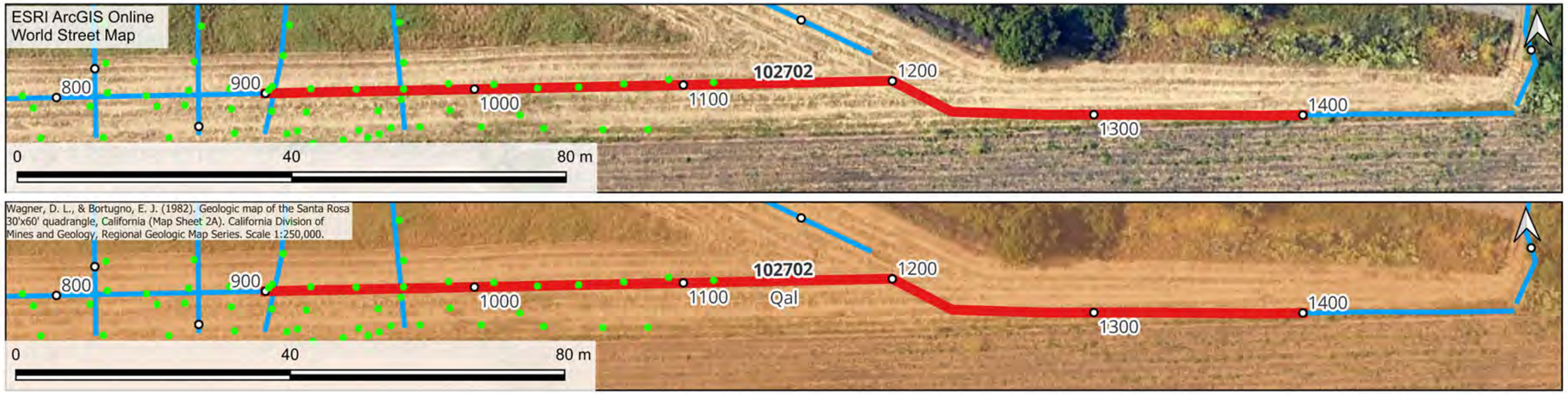
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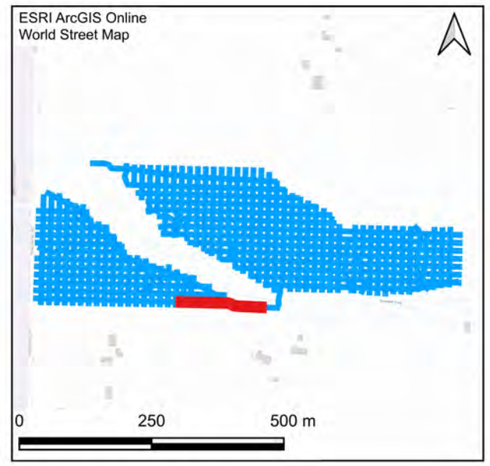
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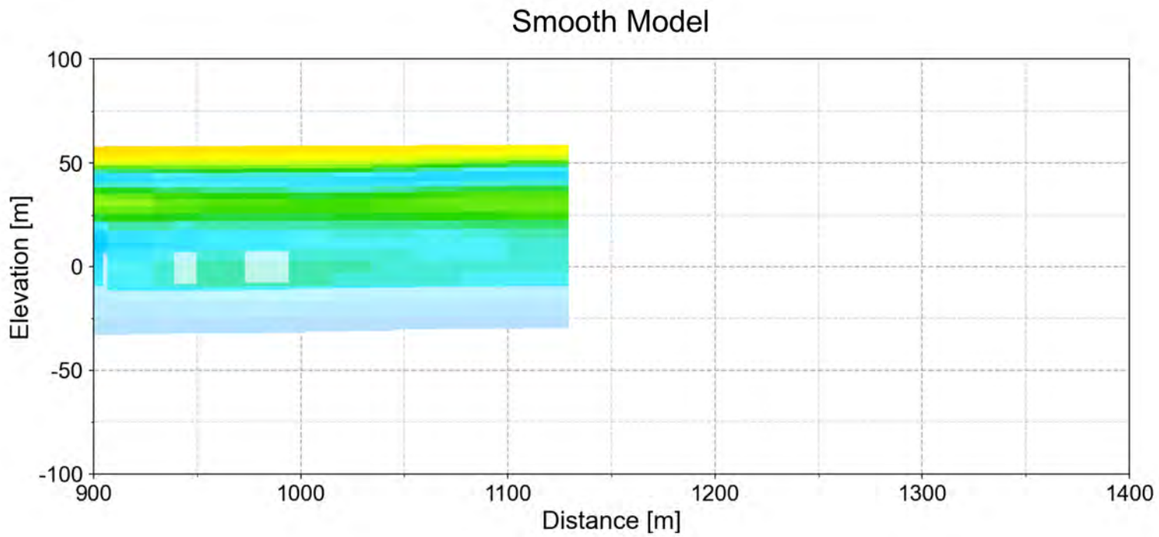
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SCWA GSA tTEM Survey: Line 102700 900-1400 m

tTEM Model Section







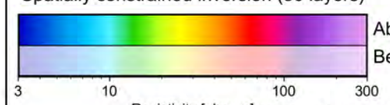
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Sonoma County Water Agency
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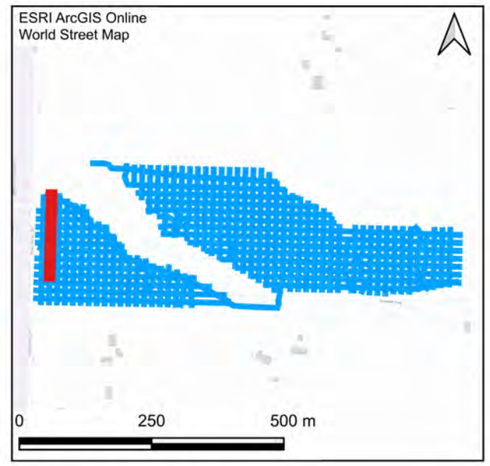
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SCWA GSA tTEM Survey: Line 200200 0-500 m

tTEM Model Section

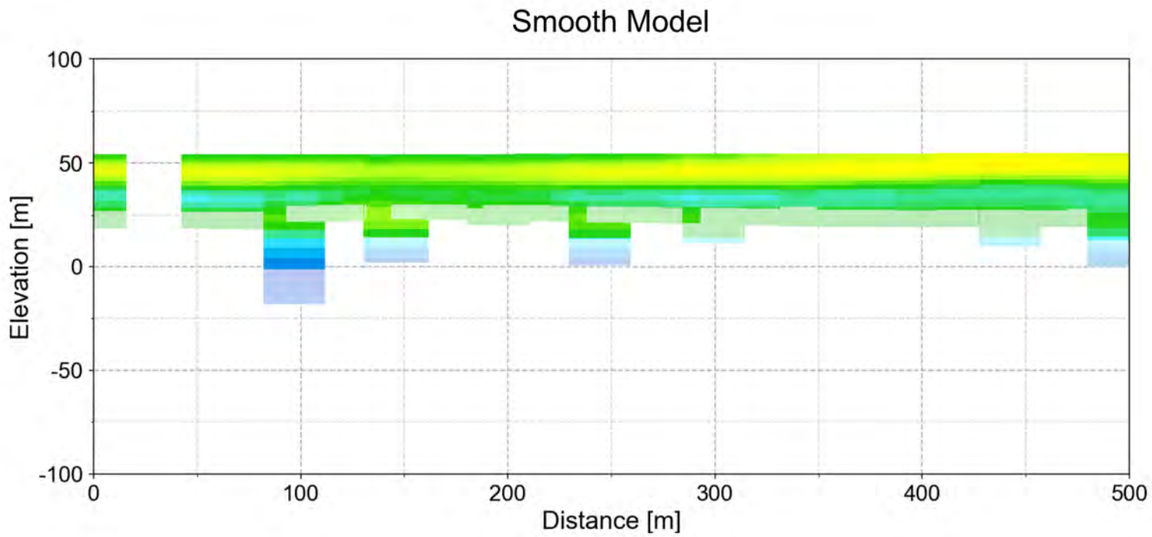






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Legend for Model Sections

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Above DOI*

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3 10 100 300

Resistivity [ohm-m]

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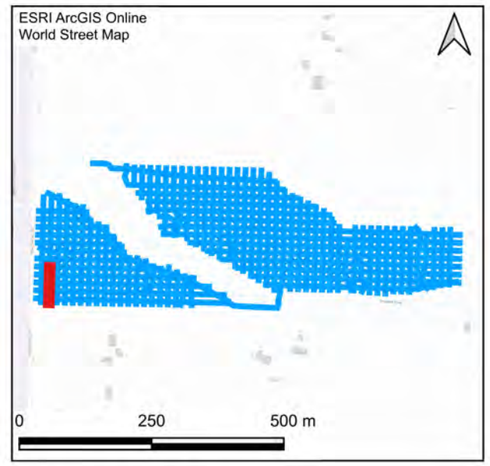
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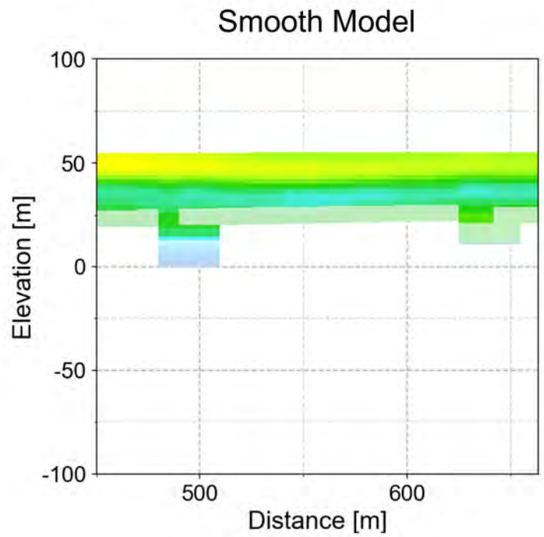
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SCWA GSA tTEM Survey: Line 200200 450-663 m

tTEM Model Section







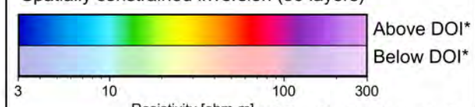
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Sonoma County, CA

RAMBOLL

COLLIER GEOPHYSICS

Sonoma County Water Agency
Project #: 1940113846

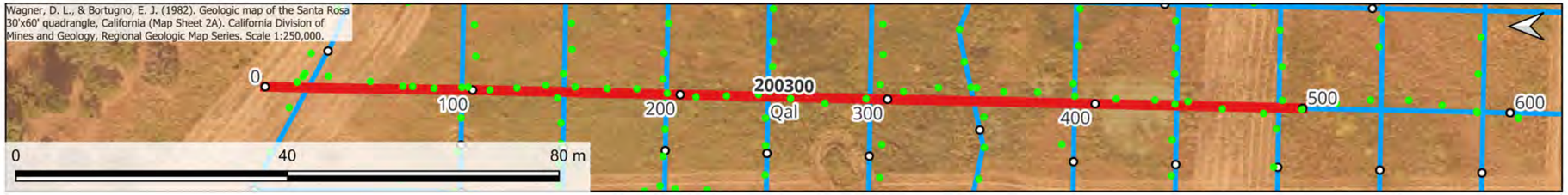
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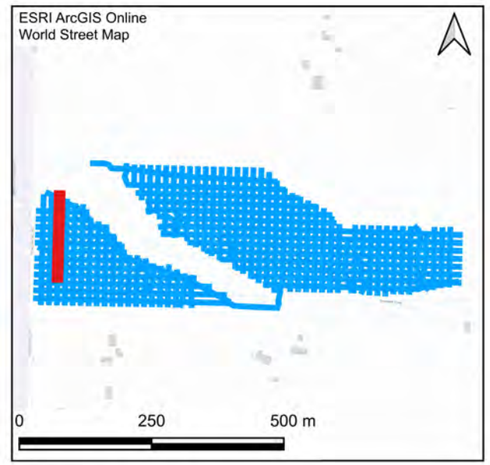
Date: 2025-12-30, Created by: JP, Checked by: JC, Approved by: TPK

SCWA GSA tTEM Survey: Line 200300 0-500 m

tTEM Model Section

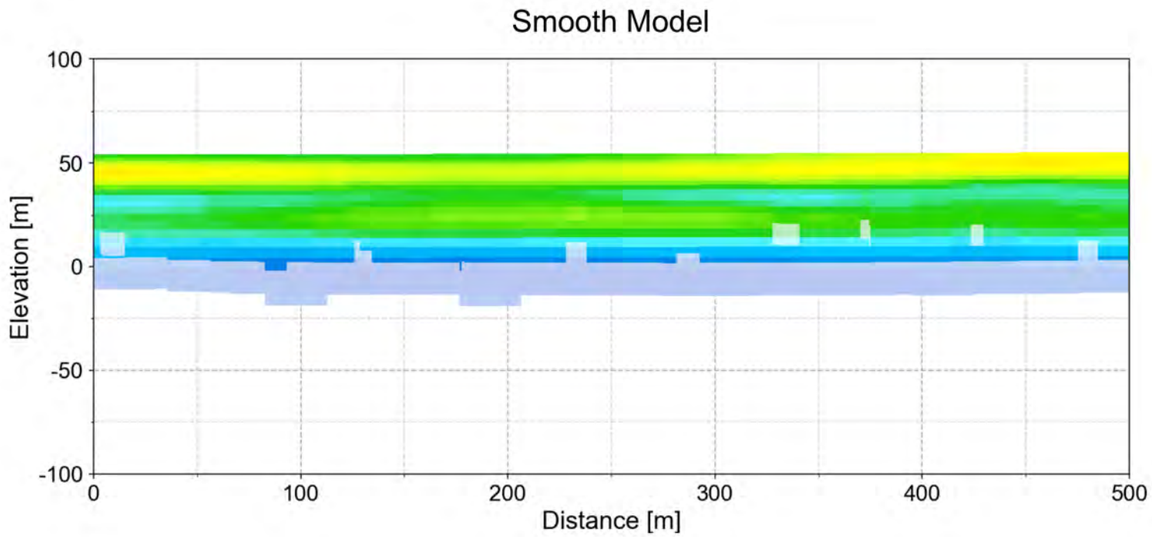






Legend for Maps

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- Quaternary fault (USGS, 2018)



Legend for Model Sections

Smooth model

Spatially constrained inversion (30 layers)

Above DOI*

Below DOI*

3 10 100 300

Resistivity [ohm-m]

*DOI = Depth of investigation

Copeland Creek tTEM Results
Santa Rosa Plain GSA
Sonoma County, CA

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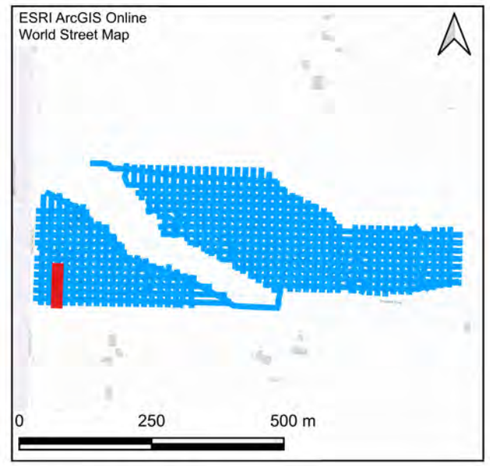
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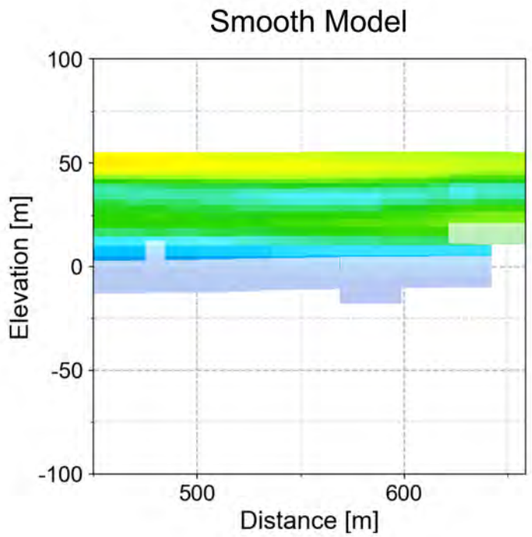
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SCWA GSA tTEM Survey: Line 200300 450-659 m

tTEM Model Section







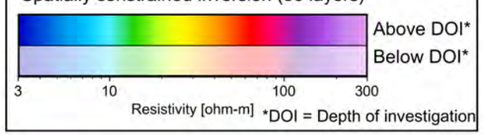
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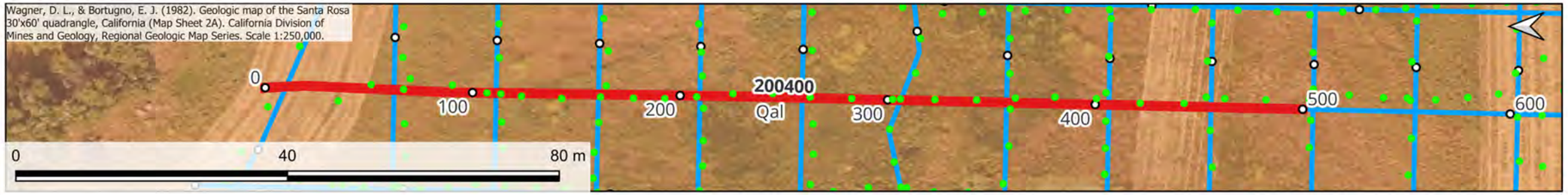
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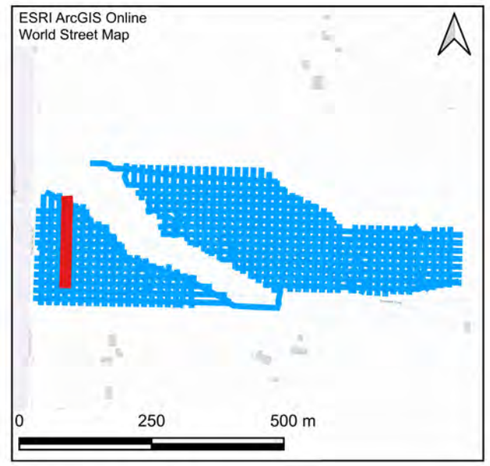
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SCWA GSA tTEM Survey: Line 200400 0-500 m

tTEM Model Section

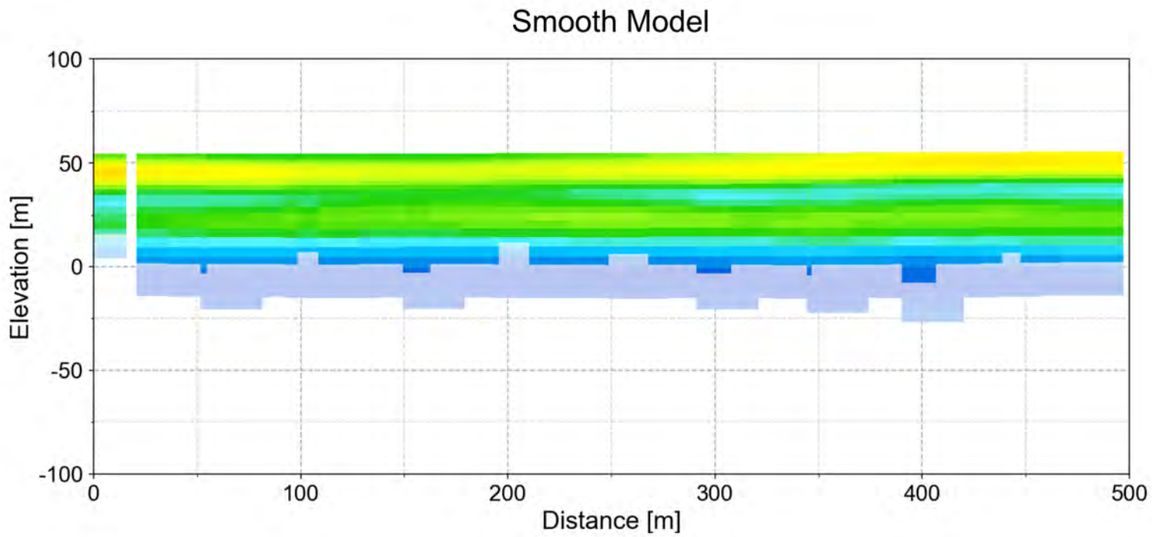






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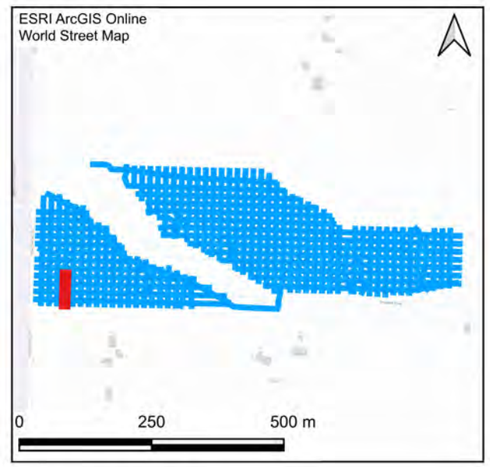
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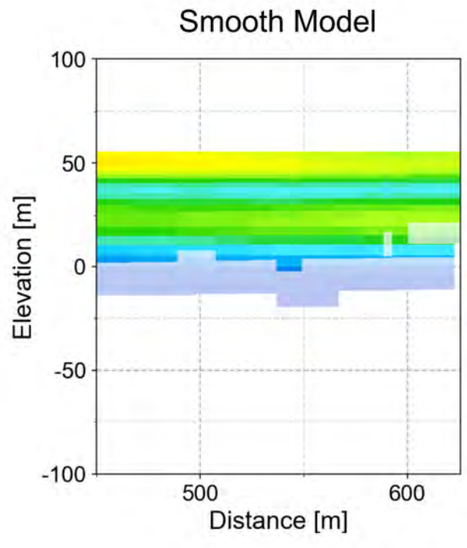
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SCWA GSA tTEM Survey: Line 200400 450-626 m

tTEM Model Section







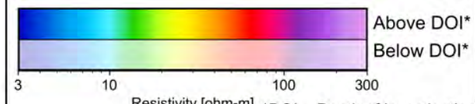
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Sonoma County, CA

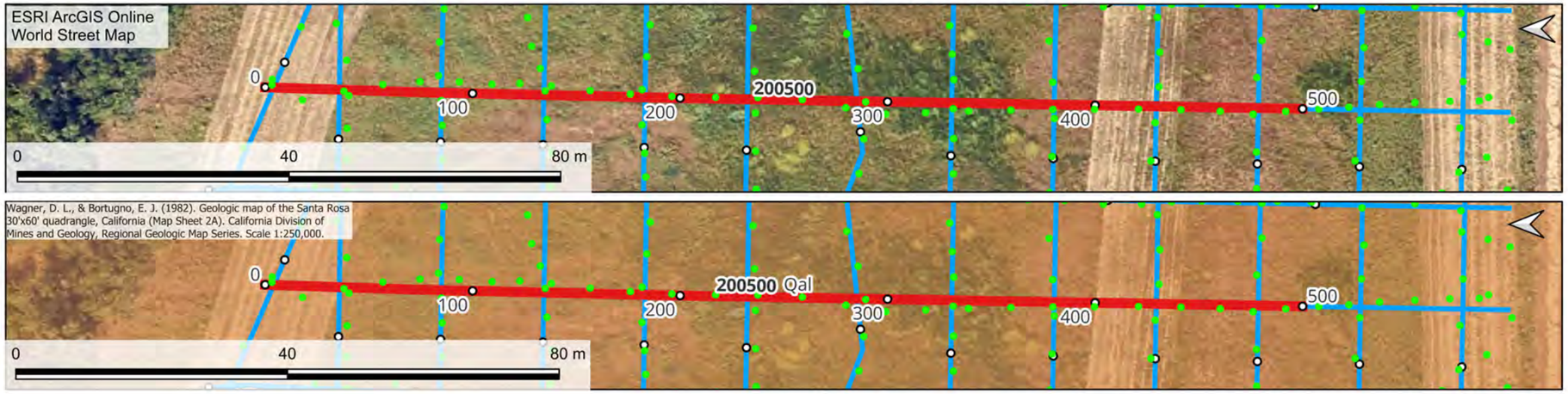
RAMBOLL
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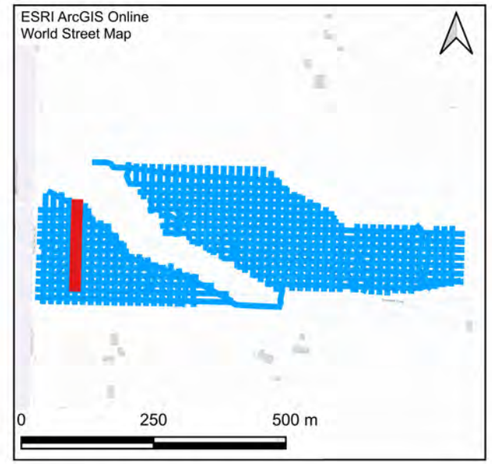
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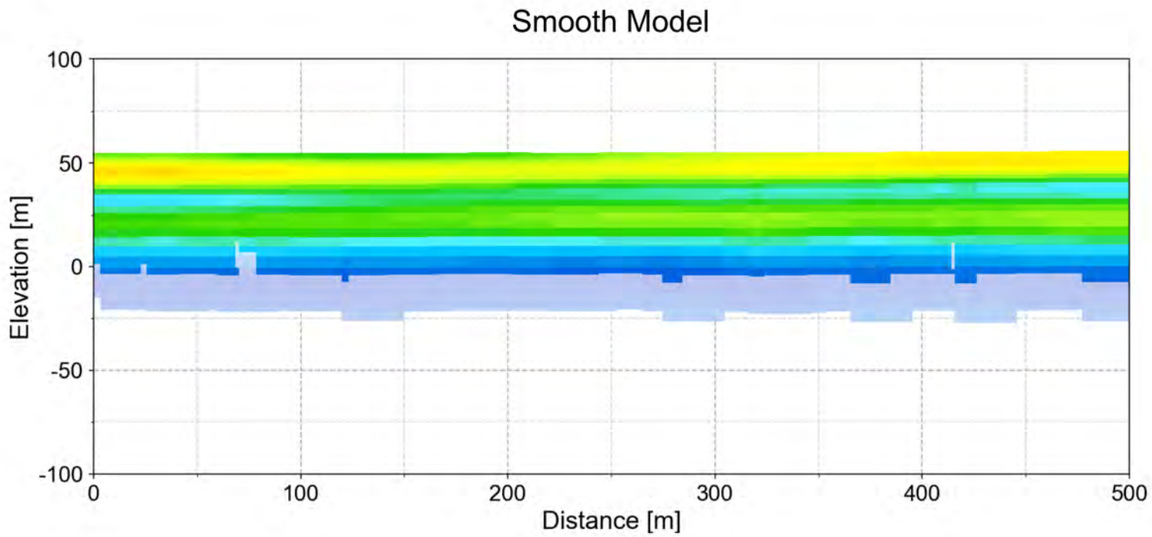
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SCWA GSA tTEM Survey: Line 200500 0-500 m

tTEM Model Section







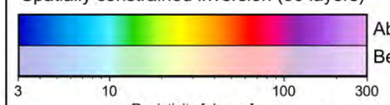
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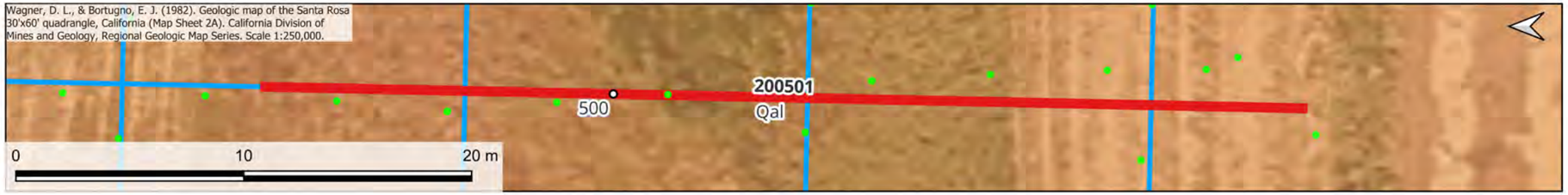
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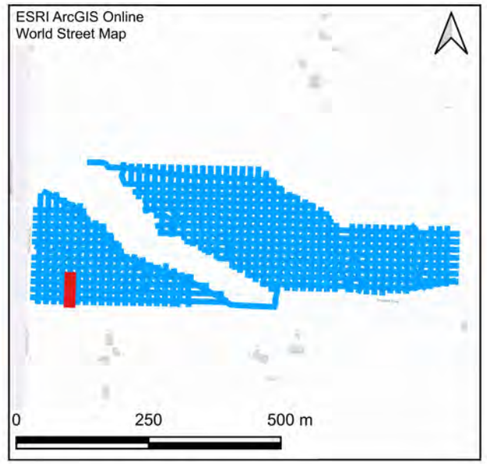
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SCWA GSA tTEM Survey: Line 200500 450-599 m

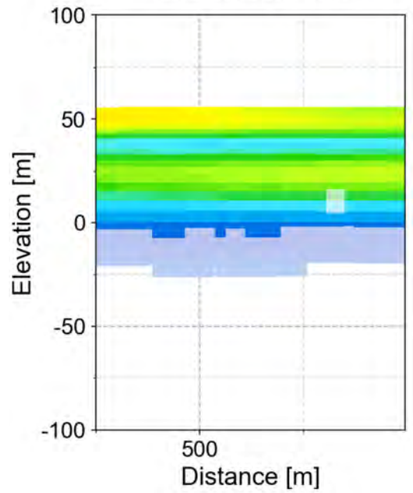
tTEM Model Section







Smooth Model



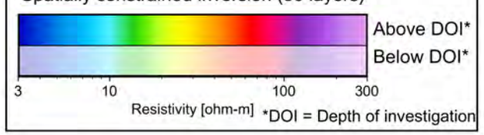
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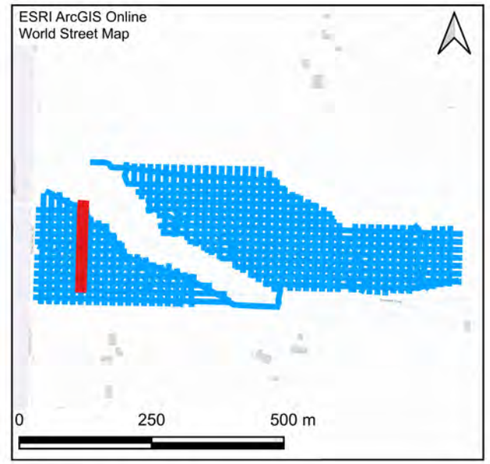
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SCWA GSA tTEM Survey: Line 200600 0-500 m

tTEM Model Section

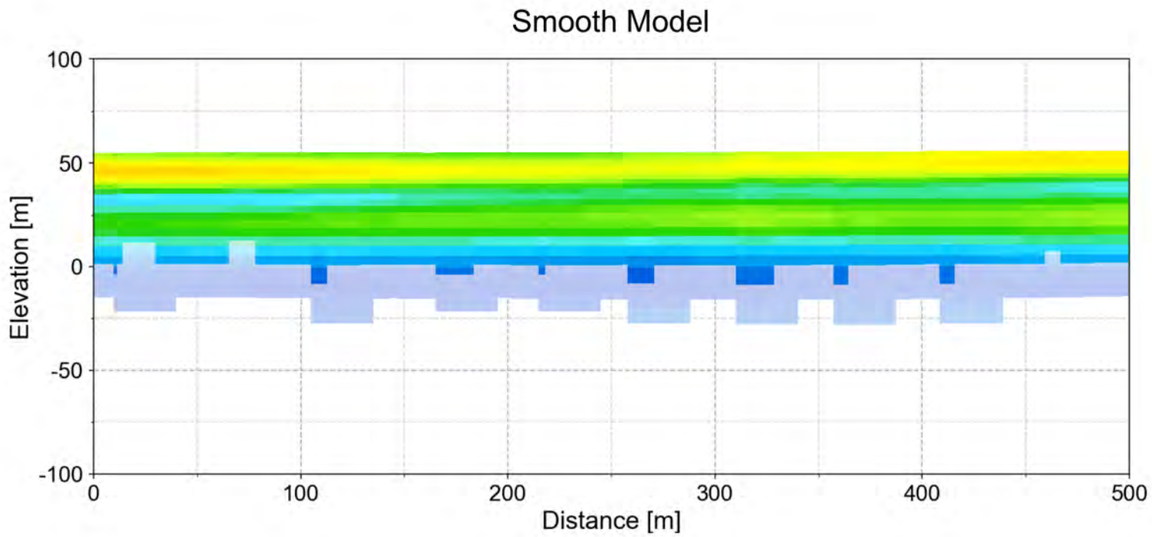






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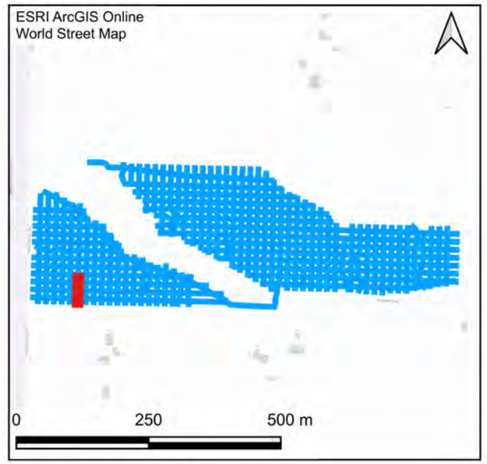
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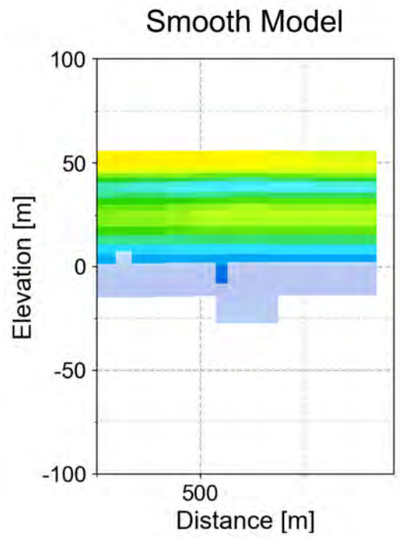
SCWA GSA tTEM Survey: Line 200600 450-593 m

tTEM Model Section









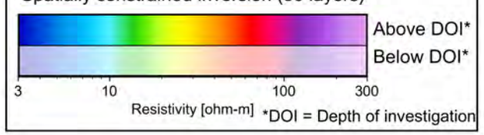
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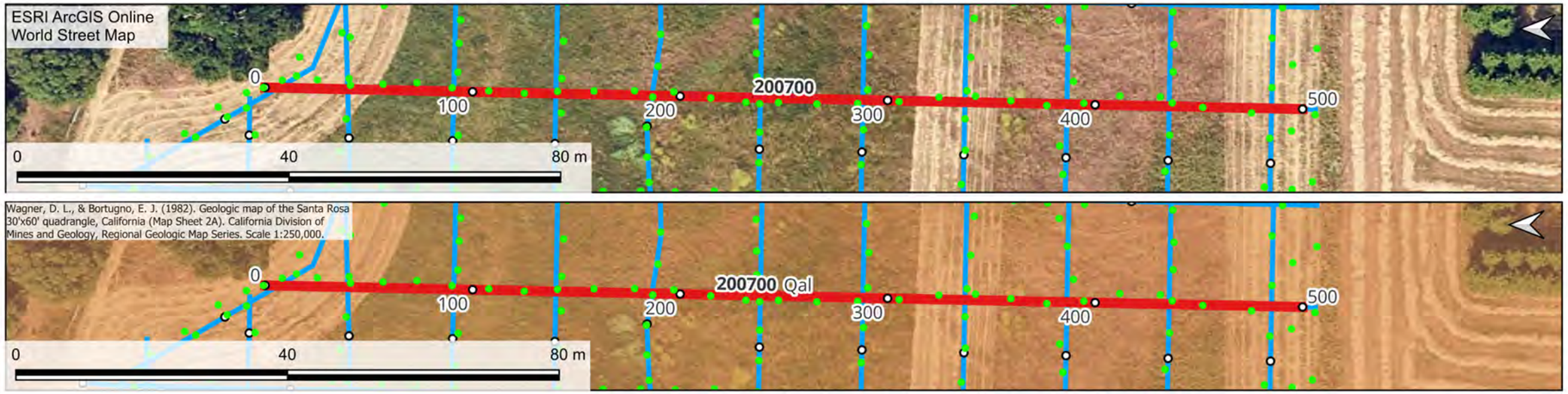
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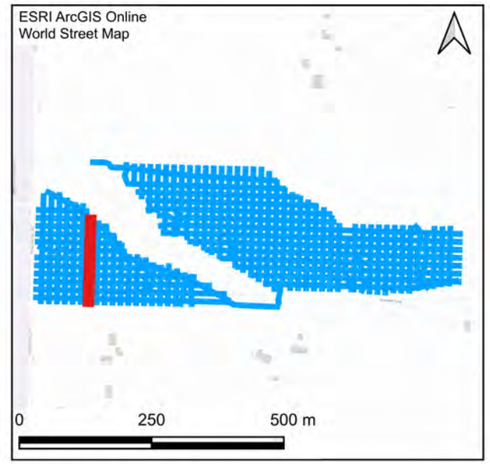
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SCWA GSA tTEM Survey: Line 200700 0-500 m

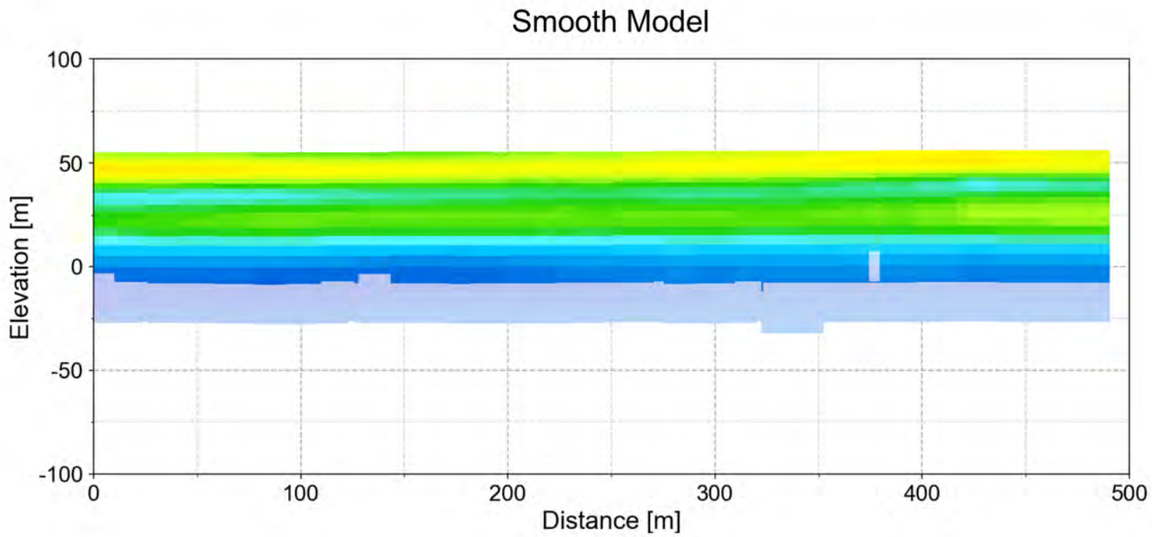
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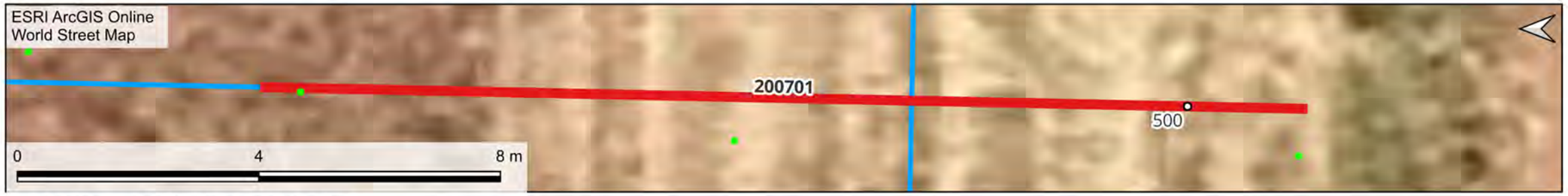
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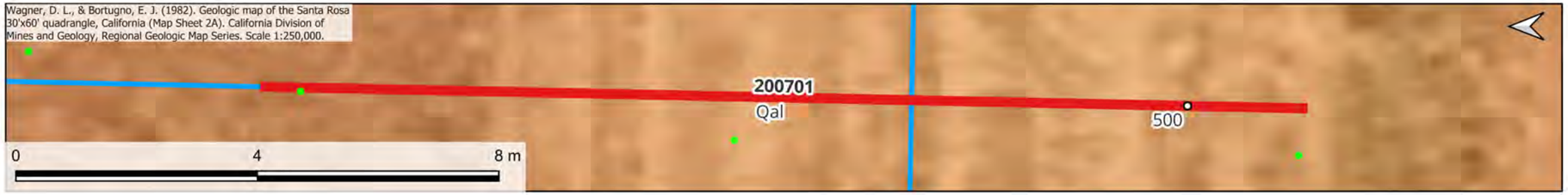
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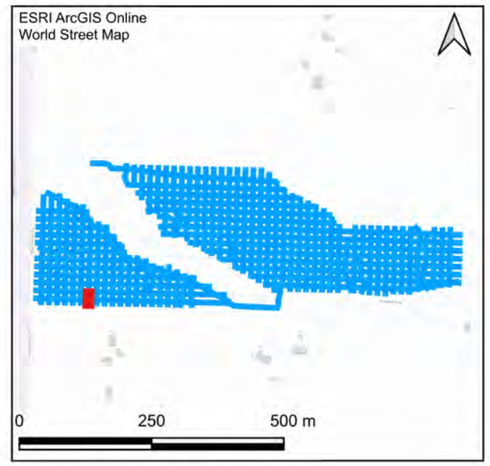
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tTEM Model Section

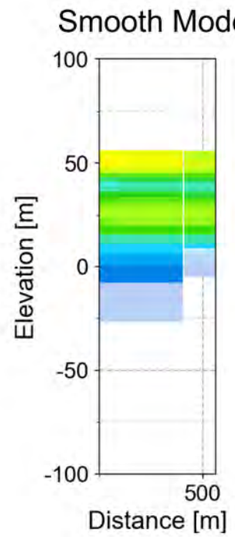






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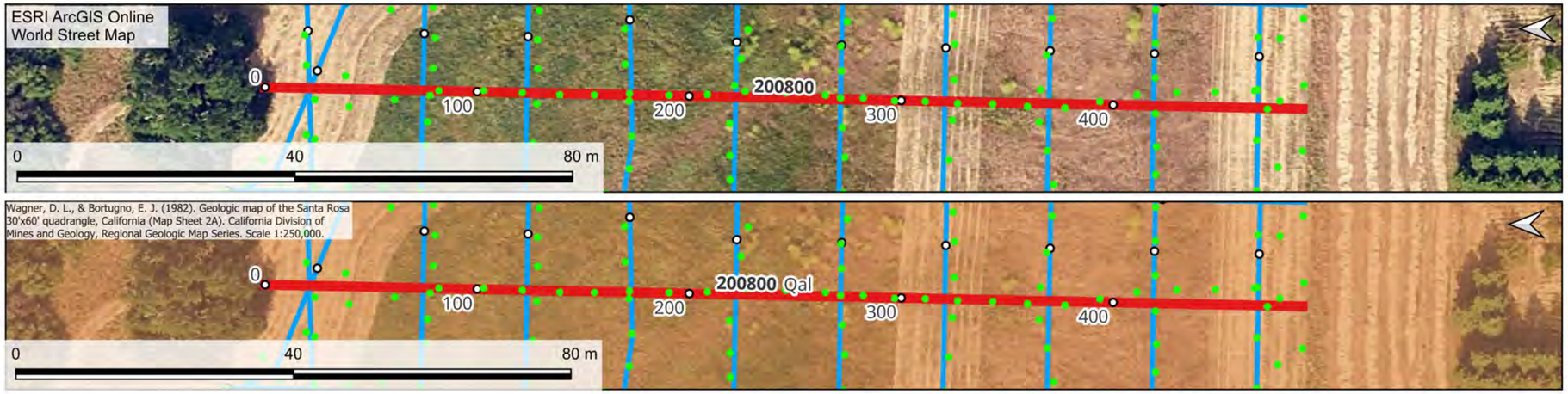
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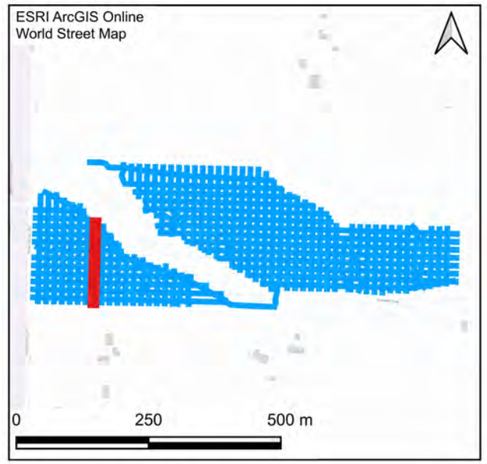
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SCWA GSA tTEM Survey: Line 200800 0-489 m

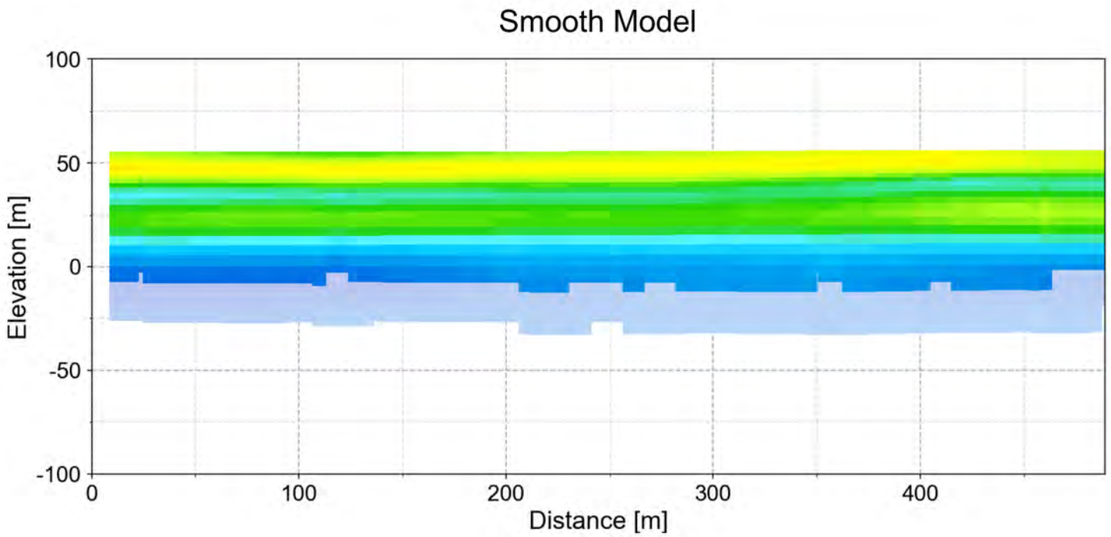
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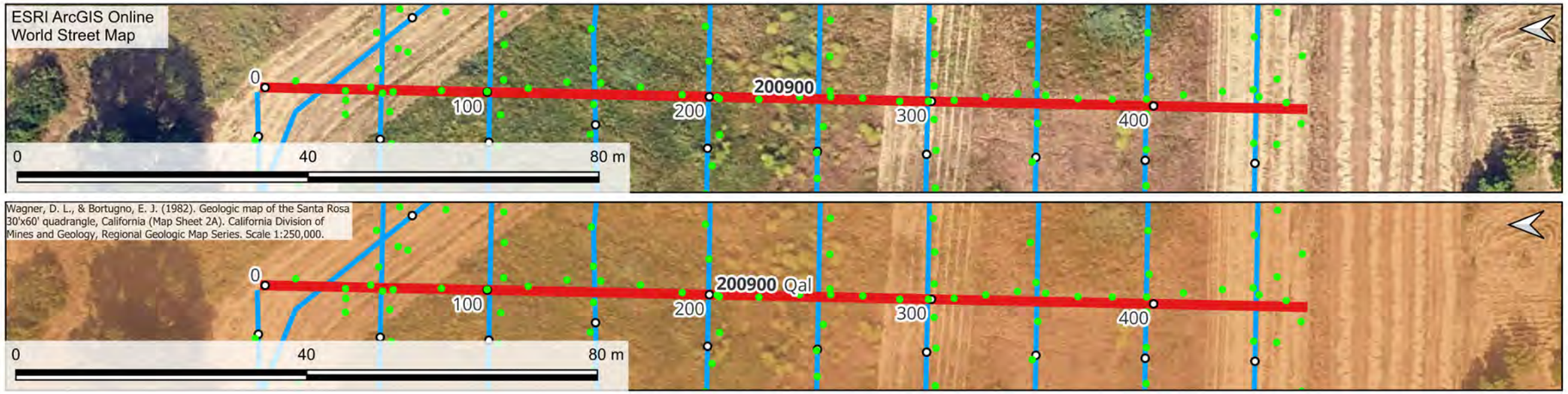
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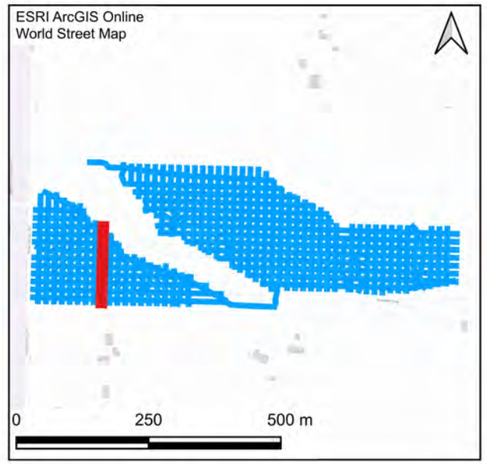
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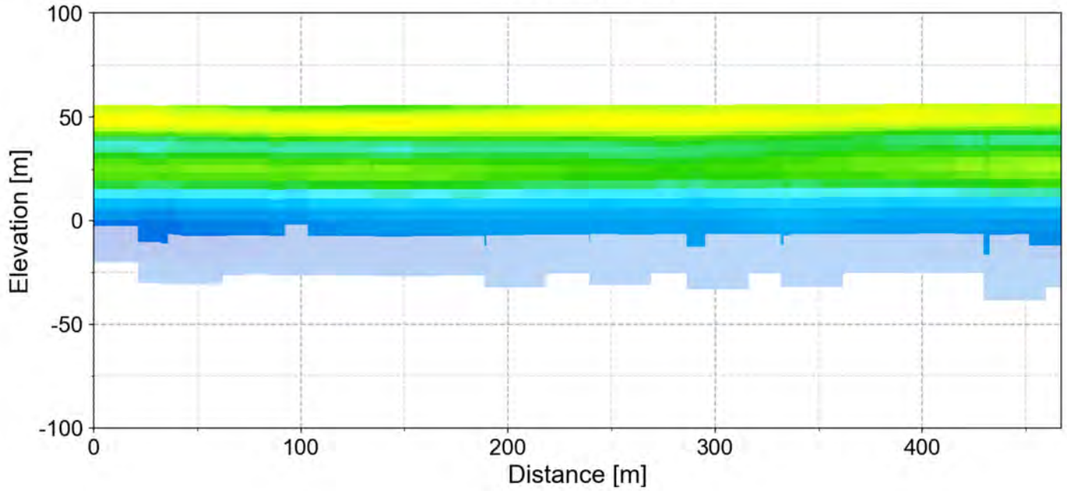
SCWA GSA tTEM Survey: Line 200900 0-467 m

tTEM Model Section





Smooth Model



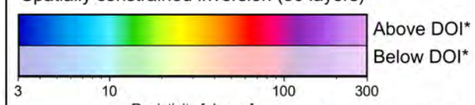
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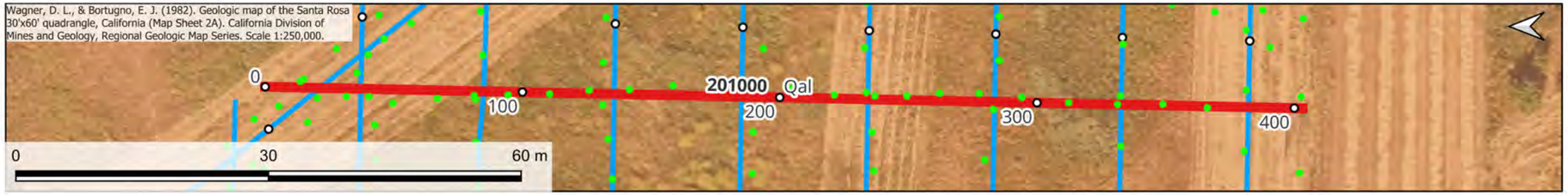
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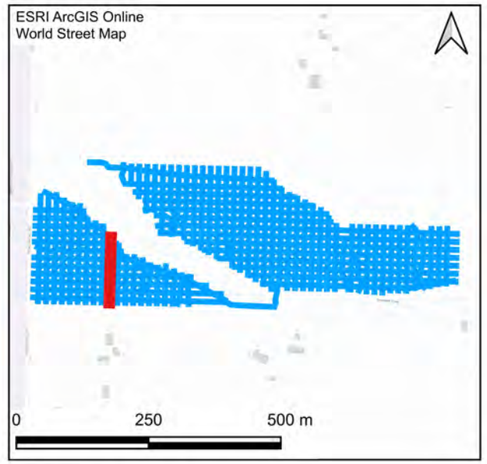
Date: 2025-12-30, Created by: JP, Checked by: JC, Approved by: TPK

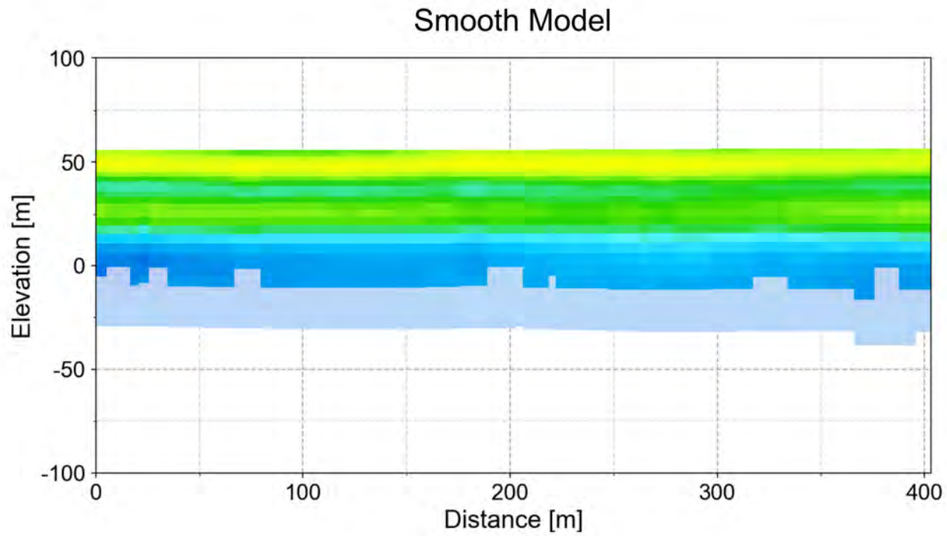
SCWA GSA tTEM Survey: Line 201000 0-403 m

tTEM Model Section









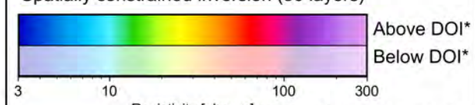
Legend for Maps

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- Pipelines (AmeriGEOSS, 2022)
- Quaternary fault (USGS, 2018)

Legend for Model Sections

Smooth model

Spatially constrained inversion (30 layers)



Copeland Creek tTEM Results
Santa Rosa Plain GSA
Sonoma County, CA

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Sonoma County Water Agency
Project #: 1940113846

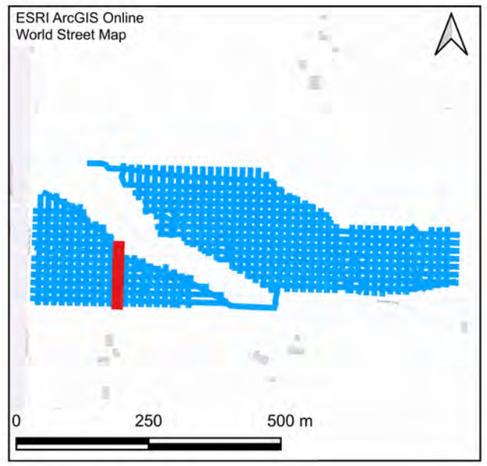
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SCWA GSA tTEM Survey: Line 201100 0-352 m

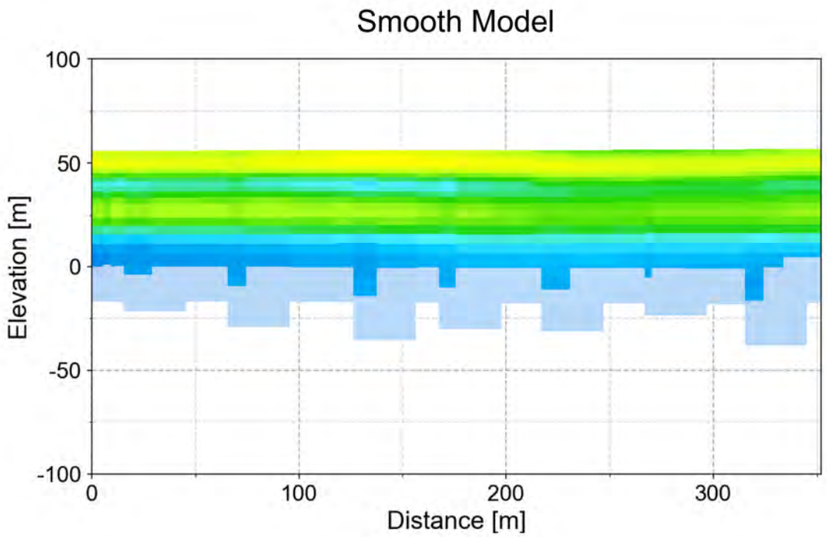
tTEM Model Section





Legend for Maps

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Legend for Model Sections

Smooth model

Spatially constrained inversion (30 layers)

Above DOI*

Below DOI*

3 10 100 300

Resistivity [ohm-m]

*DOI = Depth of investigation

Copeland Creek tTEM Results
Santa Rosa Plain GSA
Sonoma County, CA

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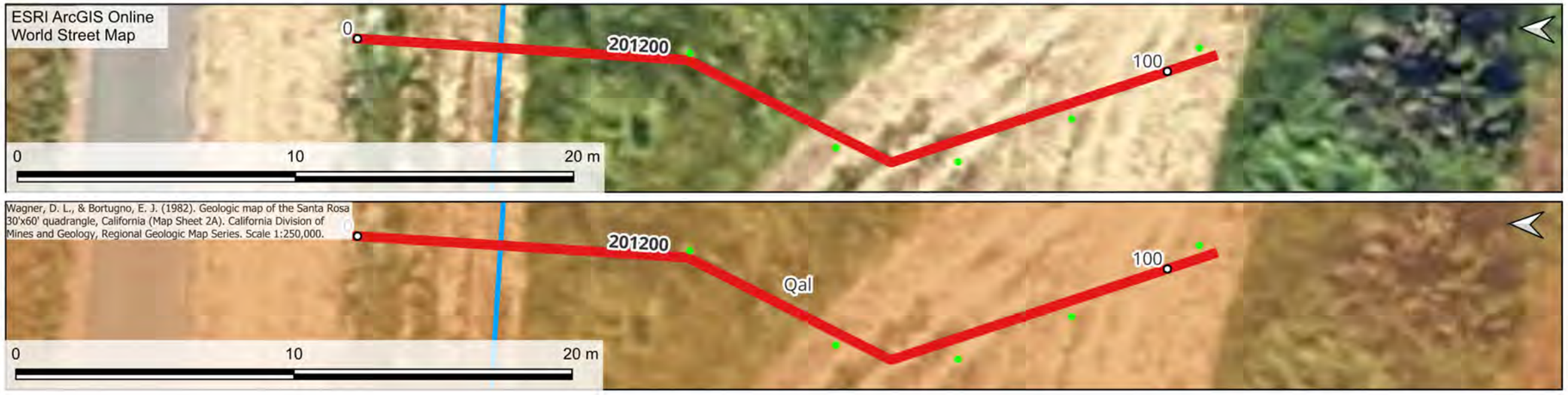
Sonoma County Water Agency
Project #: 1940113846

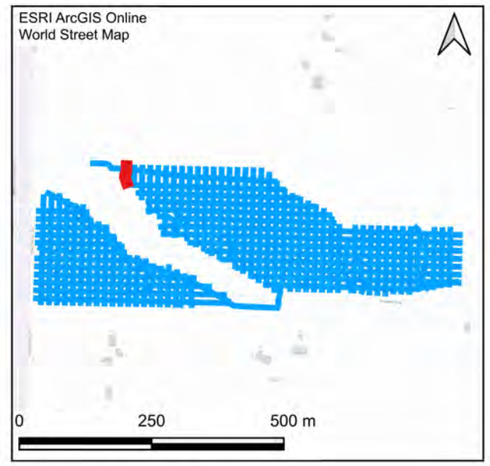
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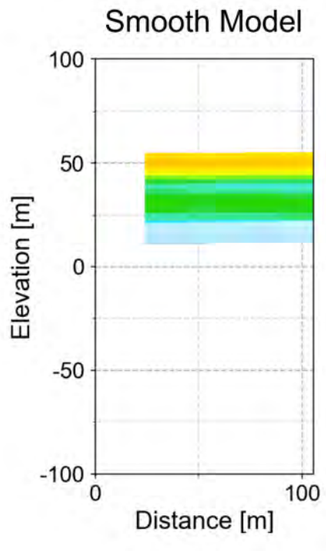
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SCWA GSA tTEM Survey: Line 201200 0-106 m

tTEM Model Section







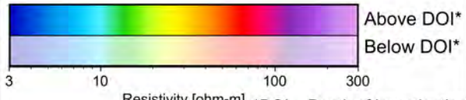
Legend for Maps

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Legend for Model Sections

Smooth model

Spatially constrained inversion (30 layers)



Copeland Creek tTEM Results
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Sonoma County, CA

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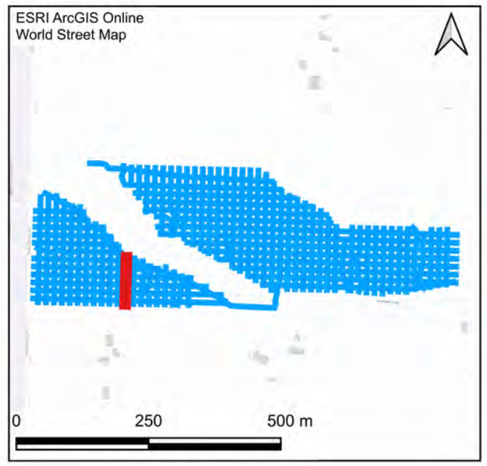
Sonoma County Water Agency
Project #: 1940113846

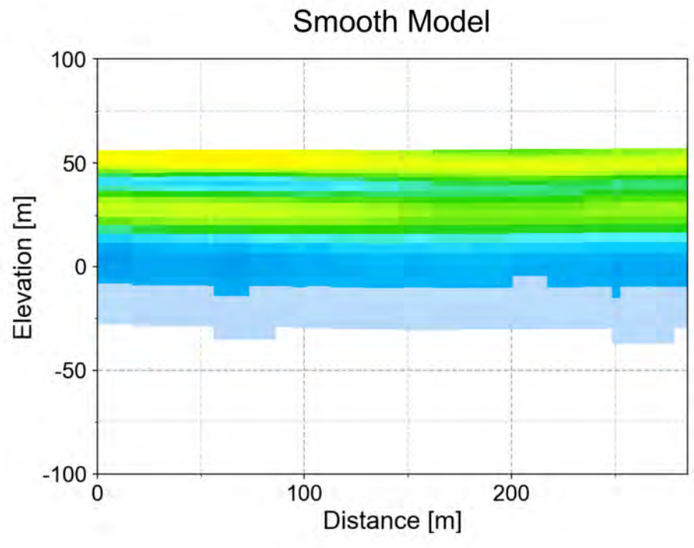
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SCWA GSA tTEM Survey: Line 201300 0-285 m

tTEM Model Section







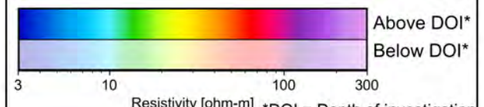
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Legend for Model Sections

Smooth model

Spatially constrained inversion (30 layers)



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Sonoma County Water Agency
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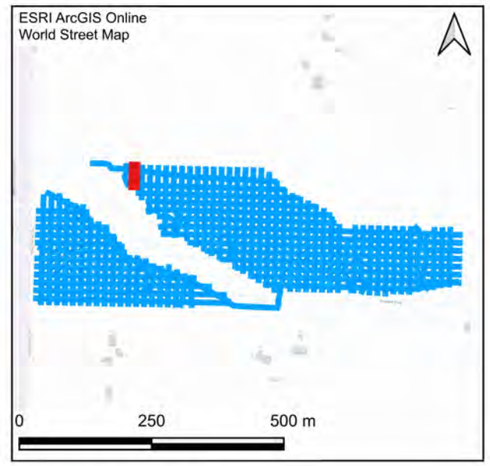
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SCWA GSA tTEM Survey: Line 201400 0-104 m

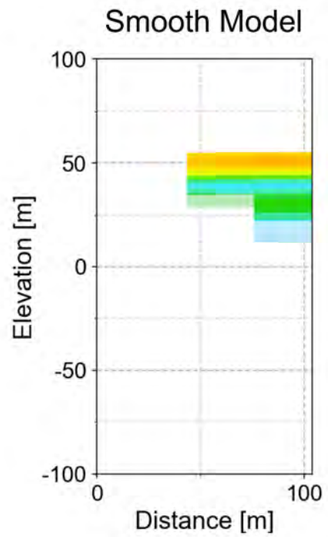
tTEM Model Section





Legend for Maps

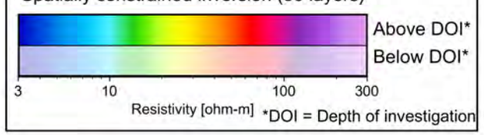
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Legend for Model Sections

Smooth model

Spatially constrained inversion (30 layers)



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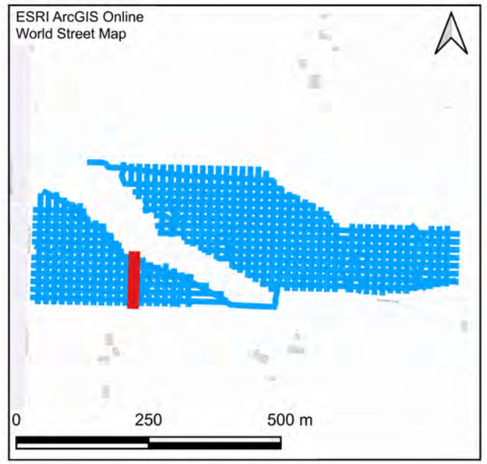
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SCWA GSA tTEM Survey: Line 201500 0-284 m

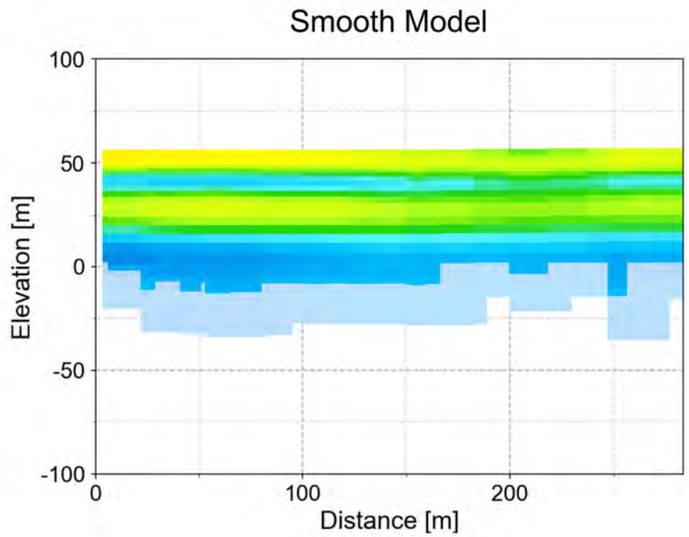
tTEM Model Section





Legend for Maps

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Legend for Model Sections

Smooth model

Spatially constrained inversion (30 layers)

Above DOI*

Below DOI*

3 10 100 300

Resistivity [ohm-m] *DOI = Depth of investigation

Copeland Creek tTEM Results
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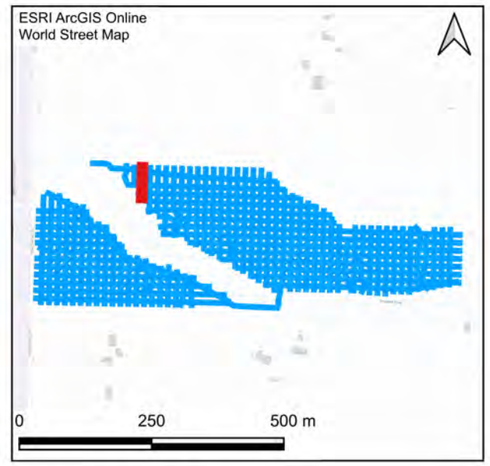
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SCWA GSA tTEM Survey: Line 201600 0-184 m

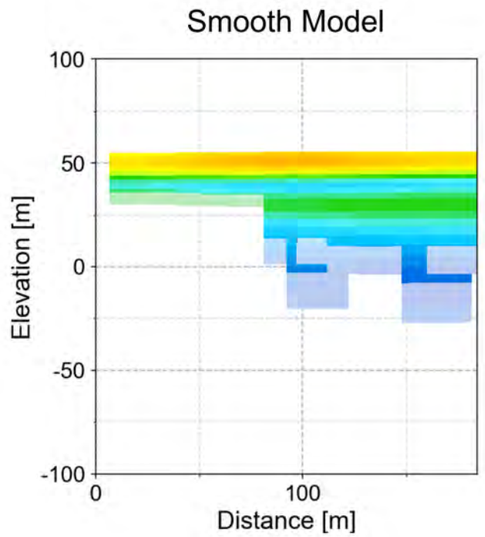
tTEM Model Section





Legend for Maps

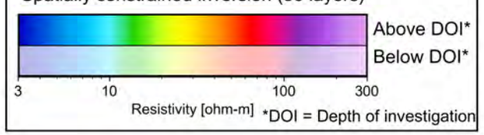
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Legend for Model Sections

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Spatially constrained inversion (30 layers)



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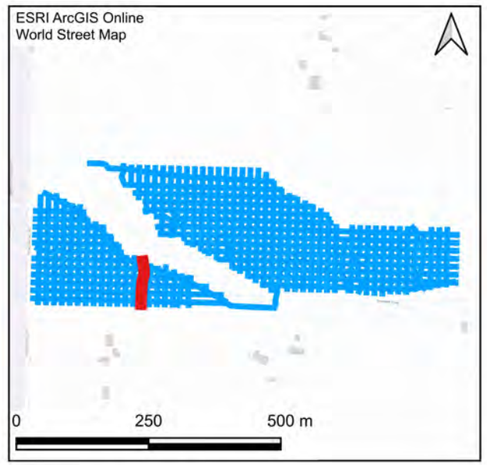
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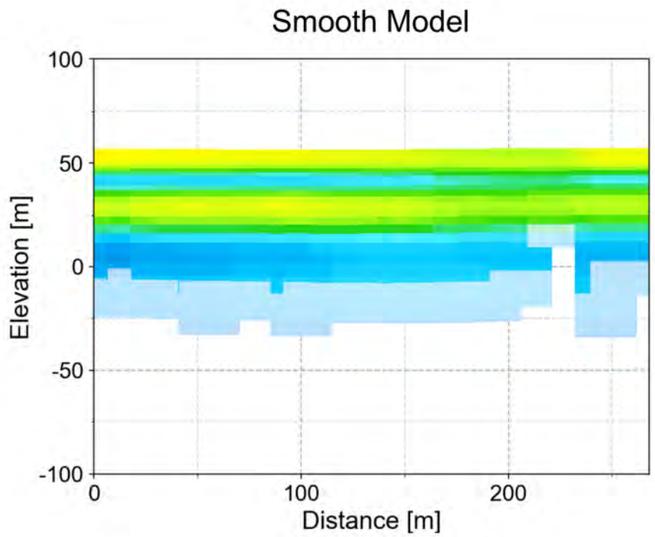
Date: 2025-12-30, Created by: JP, Checked by: JC, Approved by: TPK

SCWA GSA tTEM Survey: Line 201700 0-268 m

tTEM Model Section







Legend for Maps

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Legend for Model Sections

Smooth model

Spatially constrained inversion (30 layers)

Above DOI*

Below DOI*

3 10 100 300

Resistivity [ohm-m] *DOI = Depth of investigation

Copeland Creek tTEM Results
Santa Rosa Plain GSA
Sonoma County, CA

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Sonoma County Water Agency
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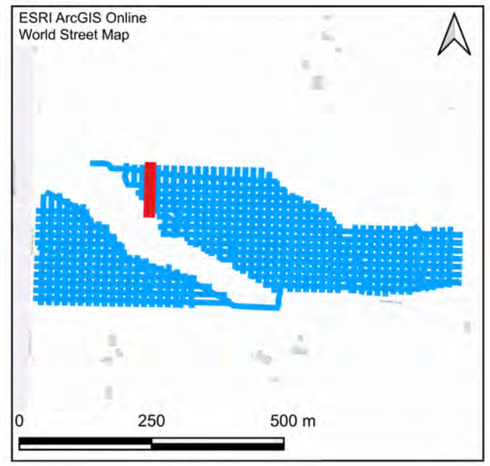
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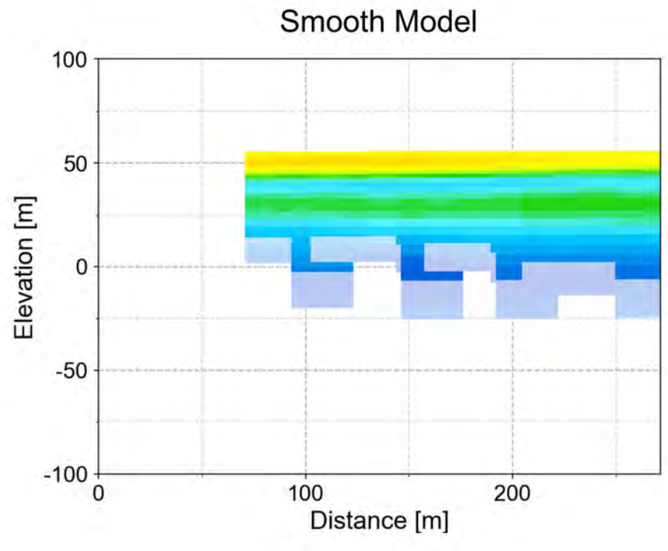
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SCWA GSA tTEM Survey: Line 201800 0-271 m

tTEM Model Section







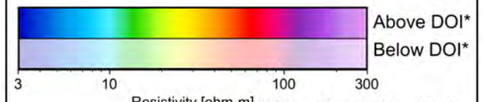
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Legend for Model Sections

Smooth model

Spatially constrained inversion (30 layers)



Copeland Creek tTEM Results
Santa Rosa Plain GSA
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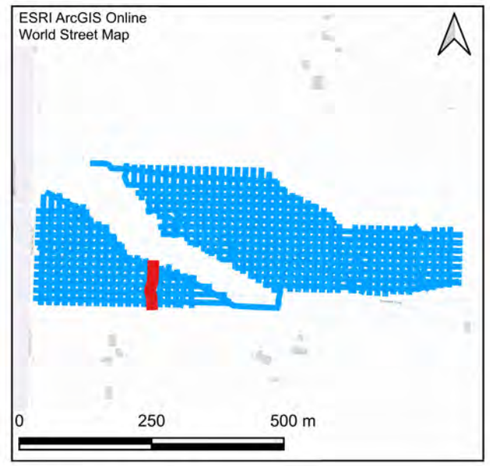
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SCWA GSA tTEM Survey: Line 201900 0-241 m

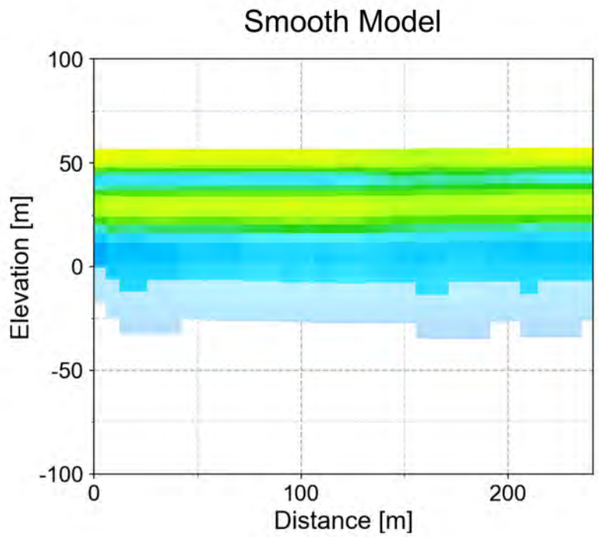
tTEM Model Section





Legend for Maps

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Legend for Model Sections

Smooth model

Spatially constrained inversion (30 layers)

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Below DOI*

3 10 100 300

Resistivity [ohm-m]

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Santa Rosa Plain GSA
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Sonoma County Water Agency
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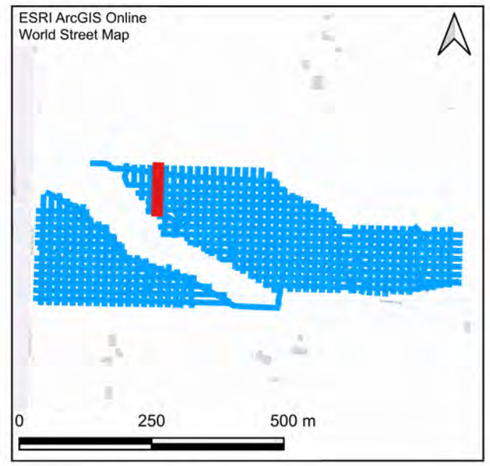
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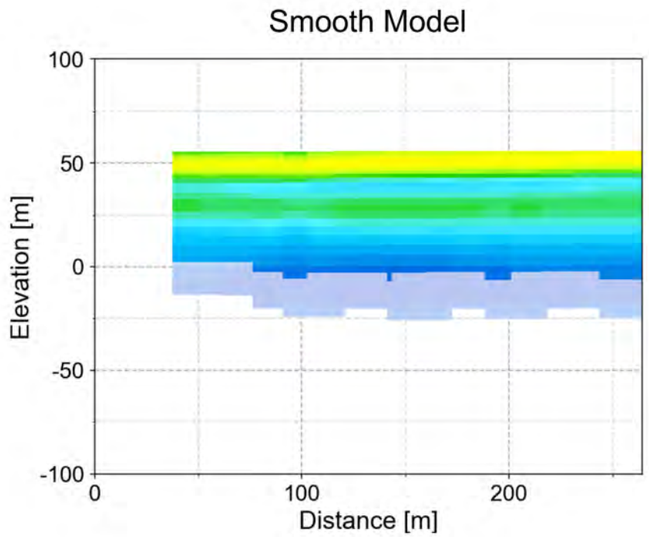
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SCWA GSA tTEM Survey: Line 202000 0-264 m

tTEM Model Section







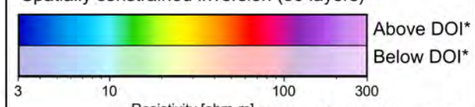
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Legend for Model Sections

Smooth model

Spatially constrained inversion (30 layers)



Copeland Creek tTEM Results
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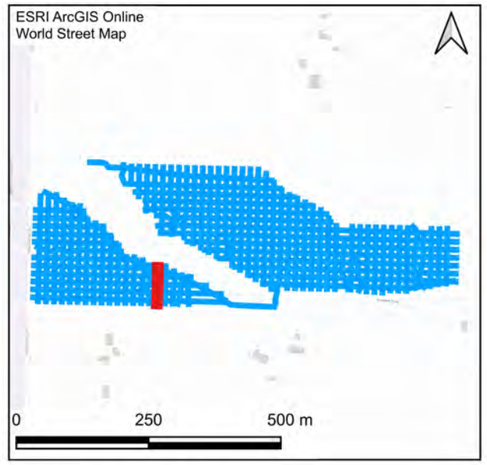
Sonoma County Water Agency
Project #: 1940113846

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Date: 2025-12-30, Created by: JP, Checked by: JC, Approved by: TPK

SCWA GSA tTEM Survey: Line 202100 0-221 m

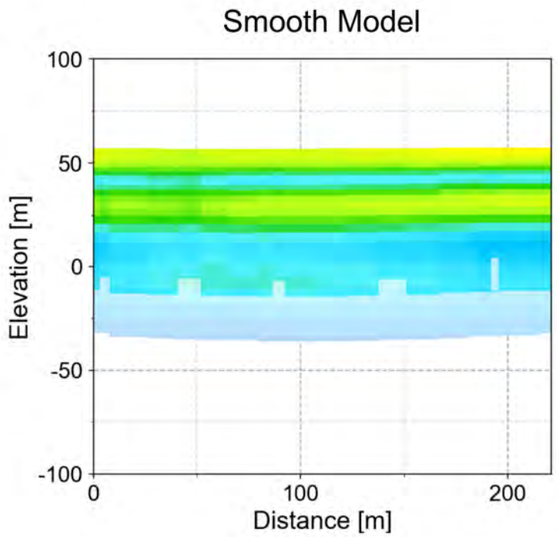
tTEM Model Section





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Legend for Model Sections

Smooth model

Spatially constrained inversion (30 layers)

Above DOI*

Below DOI*

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Resistivity [ohm-m] *DOI = Depth of investigation

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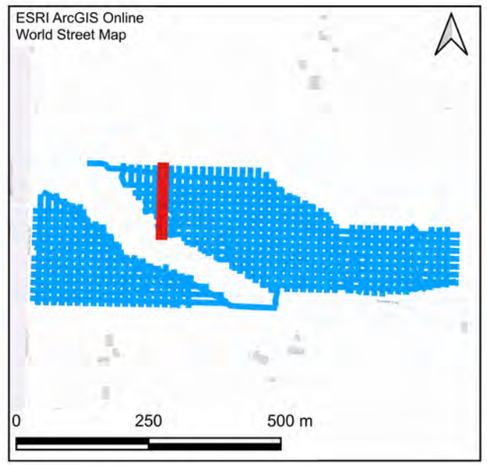
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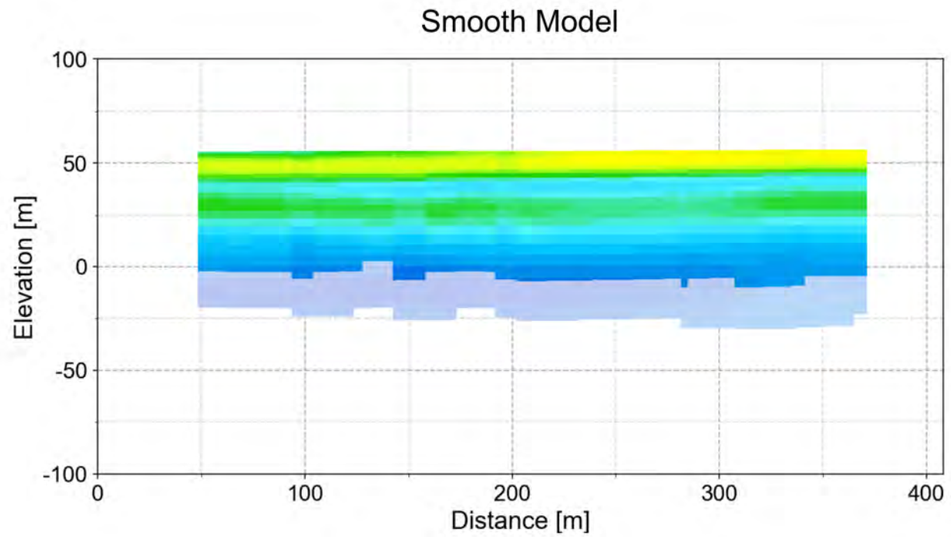
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SCWA GSA tTEM Survey: Line 202200 0-408 m

tTEM Model Section







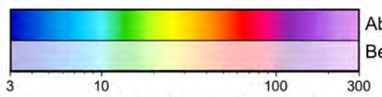
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Sonoma County, CA

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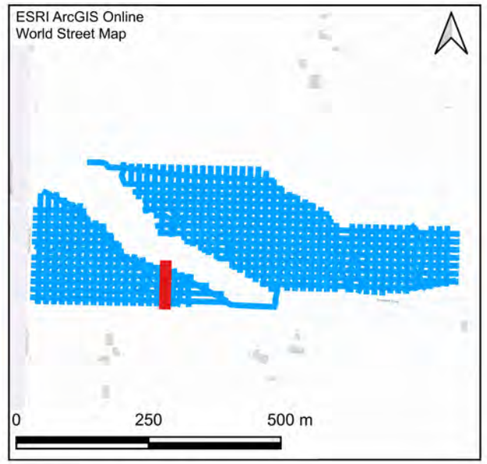
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Date: 2025-12-30, Created by: JP, Checked by: JC, Approved by: TPK

SCWA GSA tTEM Survey: Line 202300 0-232 m

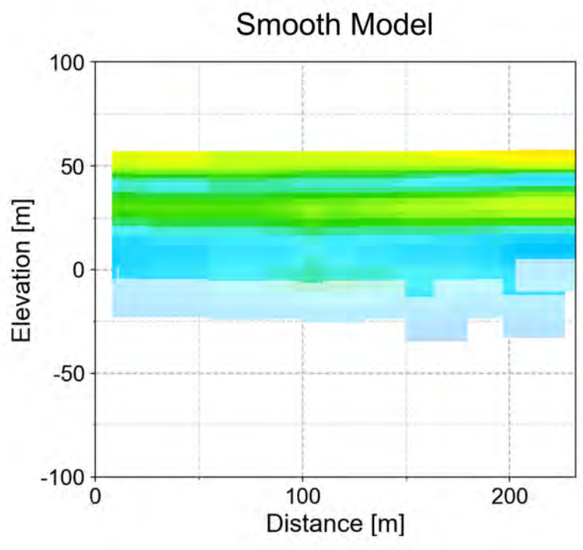
tTEM Model Section





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- Pipelines (AmeriGEOSS, 2022)
- Quaternary fault (USGS, 2018)



Legend for Model Sections

Smooth model

Spatially constrained inversion (30 layers)

Above DOI*

Below DOI*

3 10 100 300

Resistivity [ohm-m]

*DOI = Depth of investigation

Copeland Creek tTEM Results
Santa Rosa Plain GSA
Sonoma County, CA

RAMBOLL

COLLIER GEOPHYSICS

Sonoma County Water Agency
Project #: 1940113846

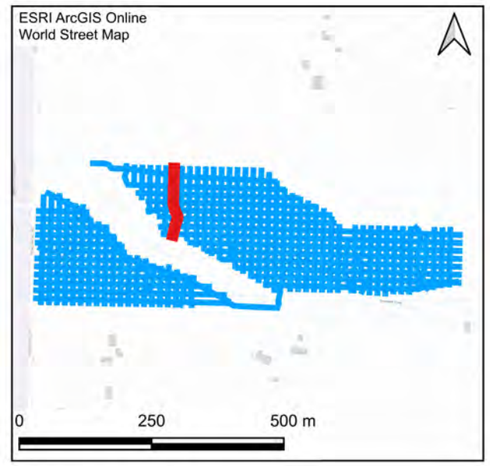
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Date: 2025-12-30, Created by: JP, Checked by: JC, Approved by: TPK

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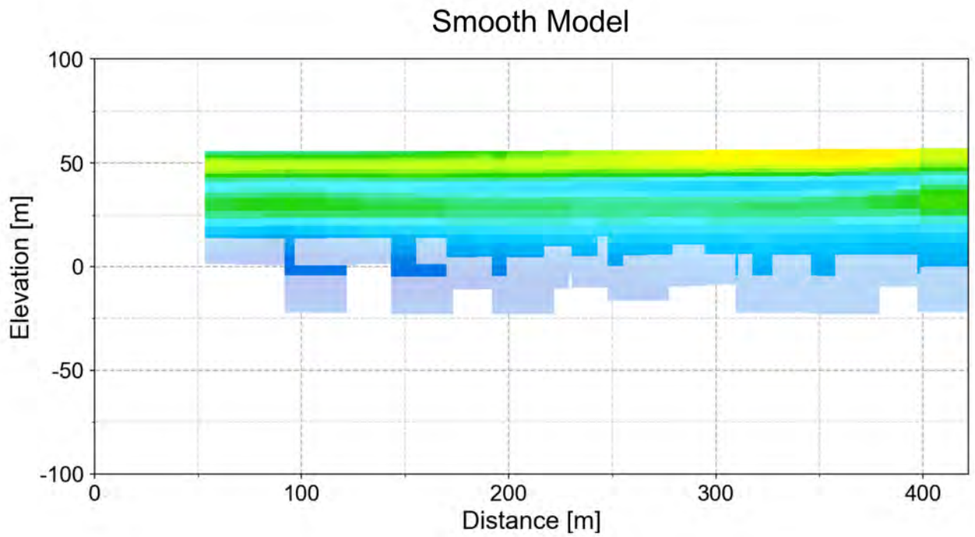
tTEM Model Section





Legend for Maps

- tTEM data used for inversion
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- Pipelines (AmeriGEOSS, 2022)
- Quaternary fault (USGS, 2018)



Legend for Model Sections

Smooth model

Spatially constrained inversion (30 layers)

Above DOI*

Below DOI*

3 10 100 300

Resistivity [ohm-m]

*DOI = Depth of investigation

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Santa Rosa Plain GSA
Sonoma County, CA

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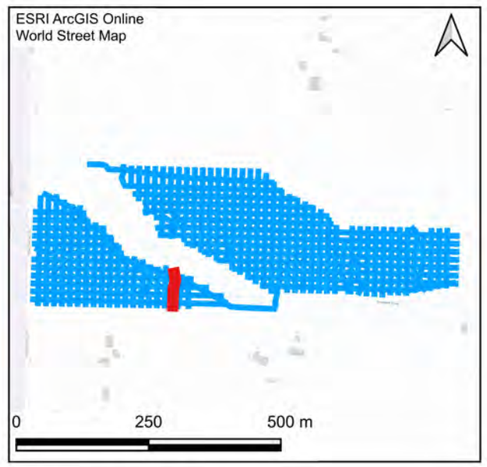
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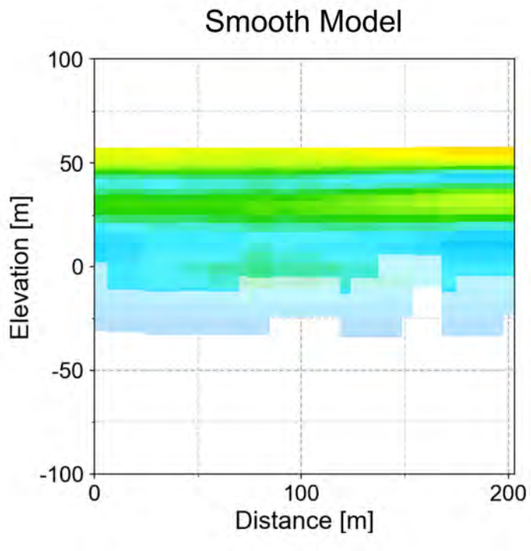
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SCWA GSA tTEM Survey: Line 202500 0-203 m

tTEM Model Section







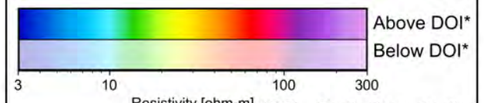
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Legend for Model Sections

Smooth model

Spatially constrained inversion (30 layers)



Copeland Creek tTEM Results
Santa Rosa Plain GSA
Sonoma County, CA

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Sonoma County Water Agency
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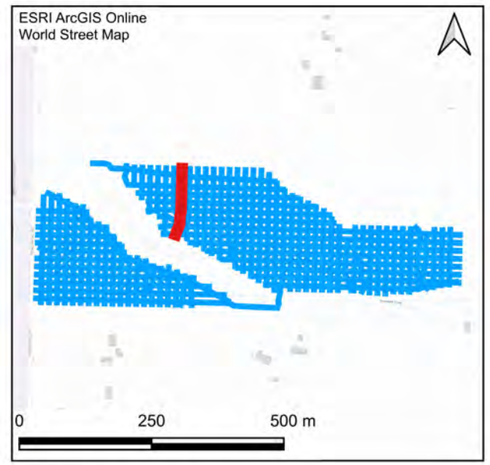
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SCWA GSA tTEM Survey: Line 202600 0-413 m

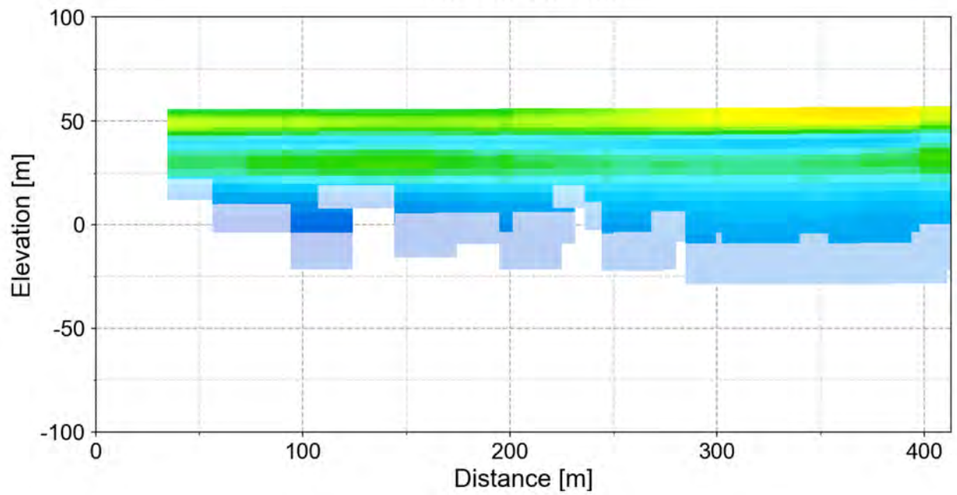
tTEM Model Section







Smooth Model



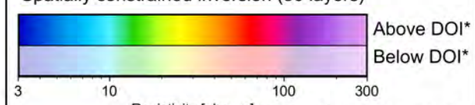
Legend for Maps

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Legend for Model Sections

Smooth model

Spatially constrained inversion (30 layers)



Copeland Creek tTEM Results
Santa Rosa Plain GSA
Sonoma County, CA

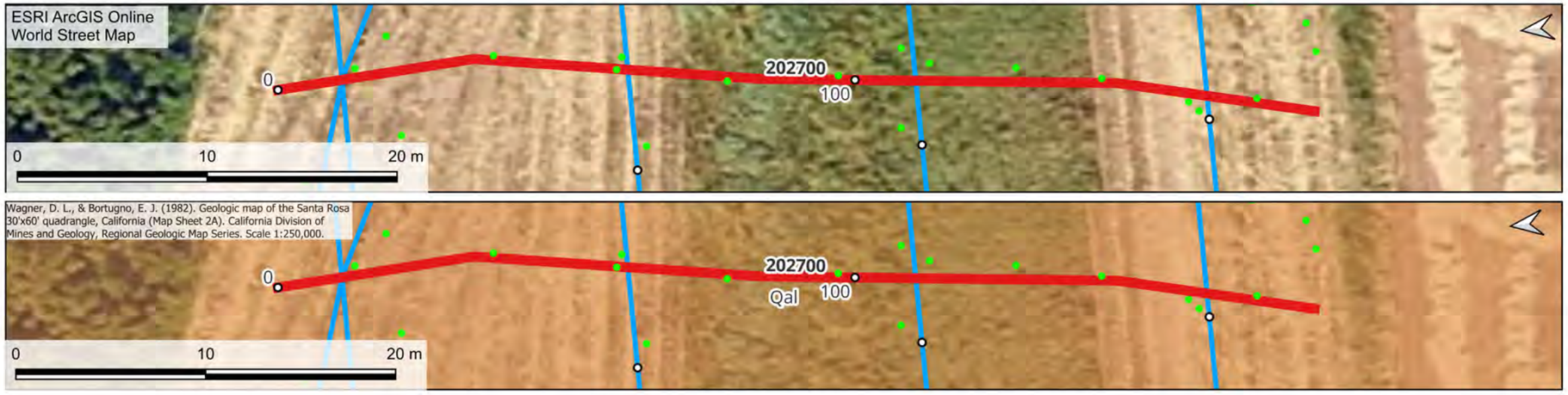
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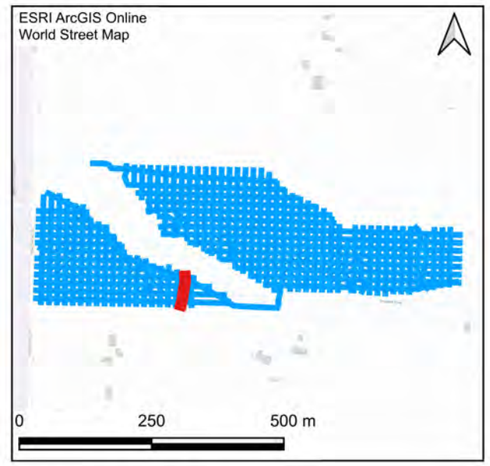
Sonoma County Water Agency
Project #: 1940113846

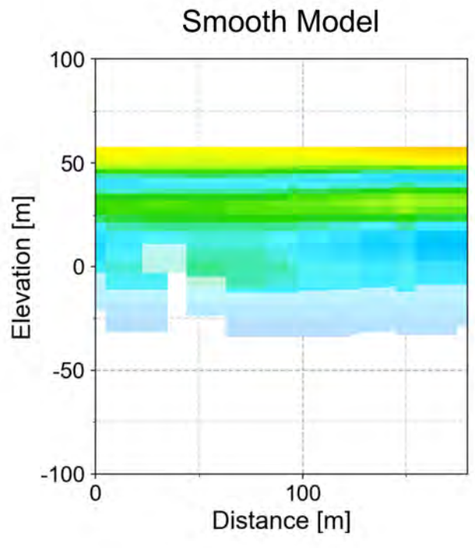
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SCWA GSA tTEM Survey: Line 202700 0-180 m

tTEM Model Section







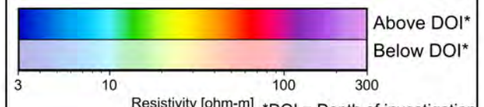
Legend for Maps

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Legend for Model Sections

Smooth model

Spatially constrained inversion (30 layers)



Copeland Creek tTEM Results
Santa Rosa Plain GSA
Sonoma County, CA

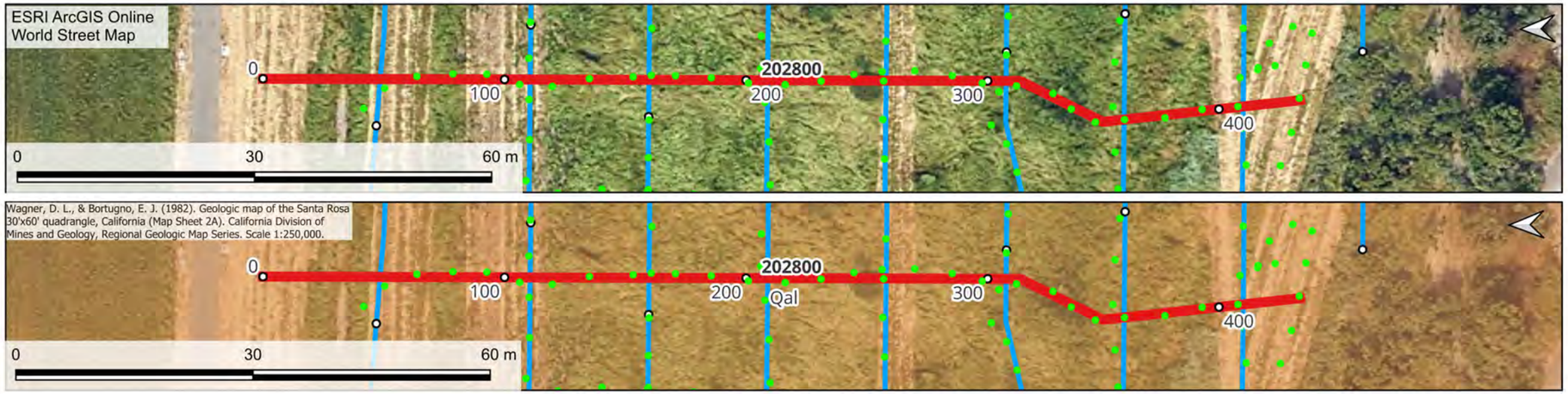
RAMBOLL
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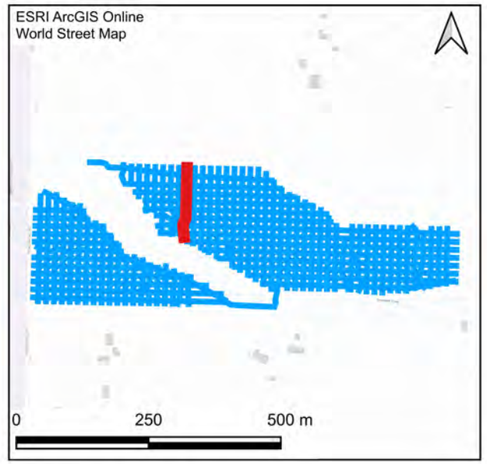
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Project #: 1940113846

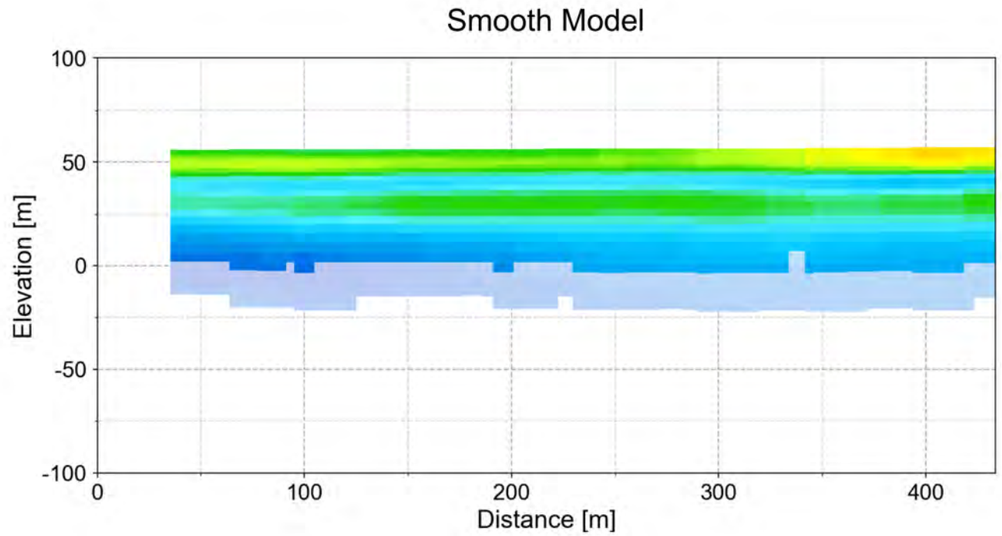
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SCWA GSA tTEM Survey: Line 202800 0-434 m

tTEM Model Section







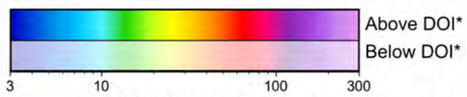
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Legend for Model Sections

Smooth model

Spatially constrained inversion (30 layers)



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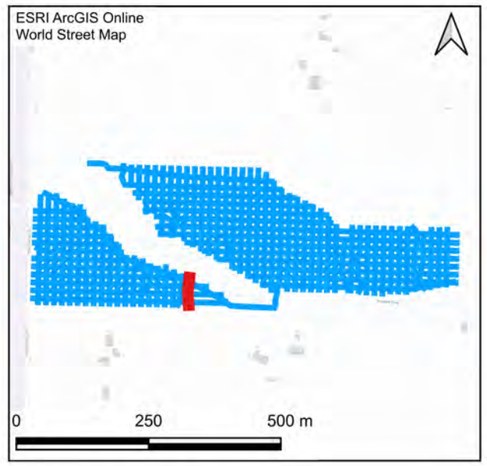
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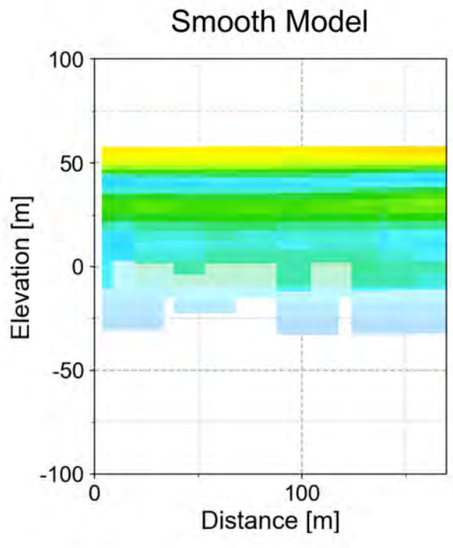
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SCWA GSA tTEM Survey: Line 202900 0-170 m

tTEM Model Section







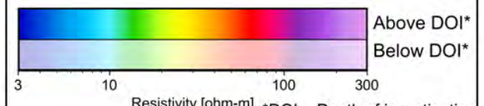
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Legend for Model Sections

Smooth model

Spatially constrained inversion (30 layers)



Copeland Creek tTEM Results
Santa Rosa Plain GSA
Sonoma County, CA

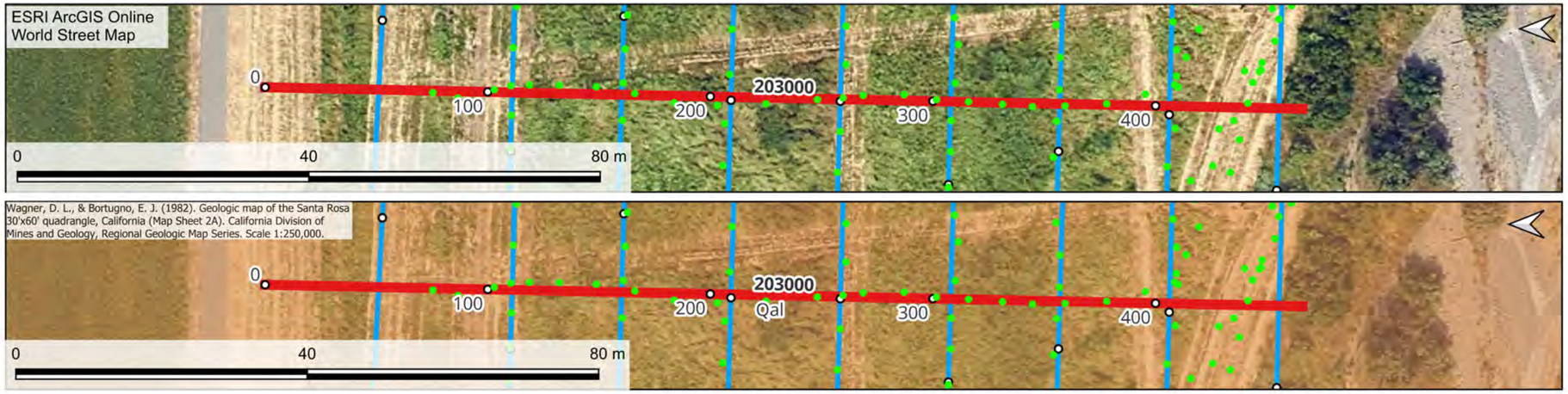
RAMBOLL
COLLIER GEOPHYSICS

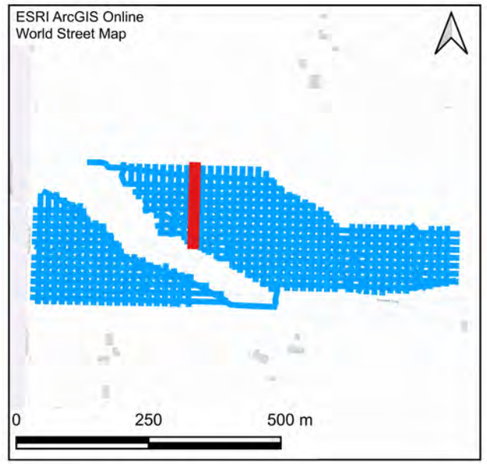
Sonoma County Water Agency
Project #: 1940113846

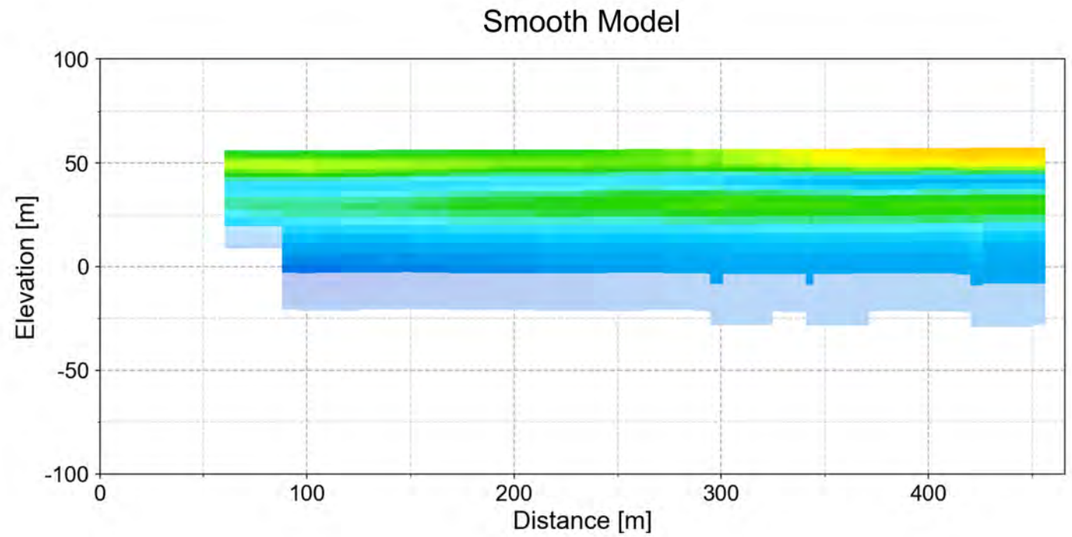
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SCWA GSA tTEM Survey: Line 203000 0-466 m

tTEM Model Section







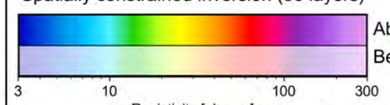
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Legend for Model Sections

Smooth model

Spatially constrained inversion (30 layers)



Copeland Creek tTEM Results
Santa Rosa Plain GSA
Sonoma County, CA

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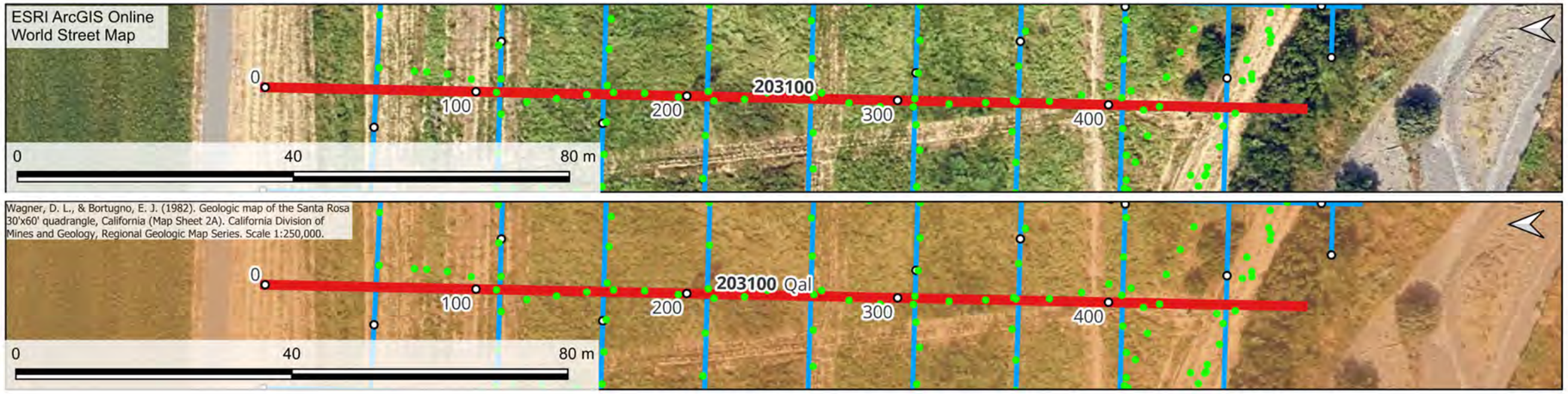
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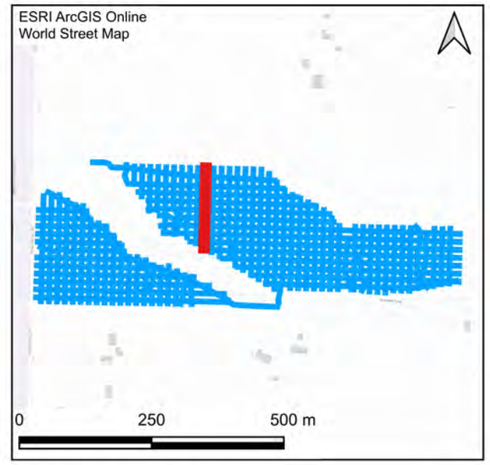
Sonoma County Water Agency
Project #: 1940113846

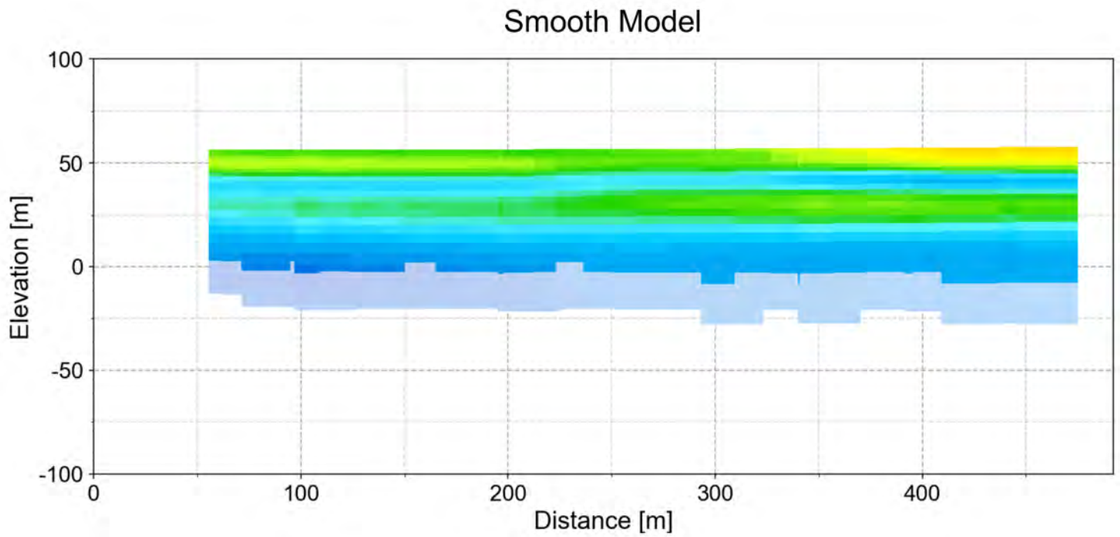
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SCWA GSA tTEM Survey: Line 203100 0-492 m

tTEM Model Section







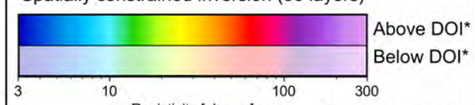
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- Quaternary fault (USGS, 2018)

Legend for Model Sections

Smooth model

Spatially constrained inversion (30 layers)



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Santa Rosa Plain GSA
Sonoma County, CA

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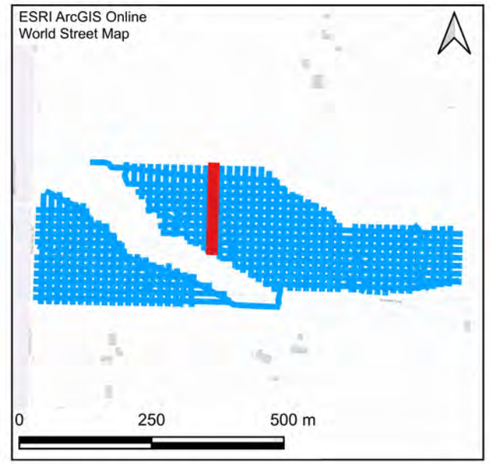
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SCWA GSA tTEM Survey: Line 203200 0-500 m

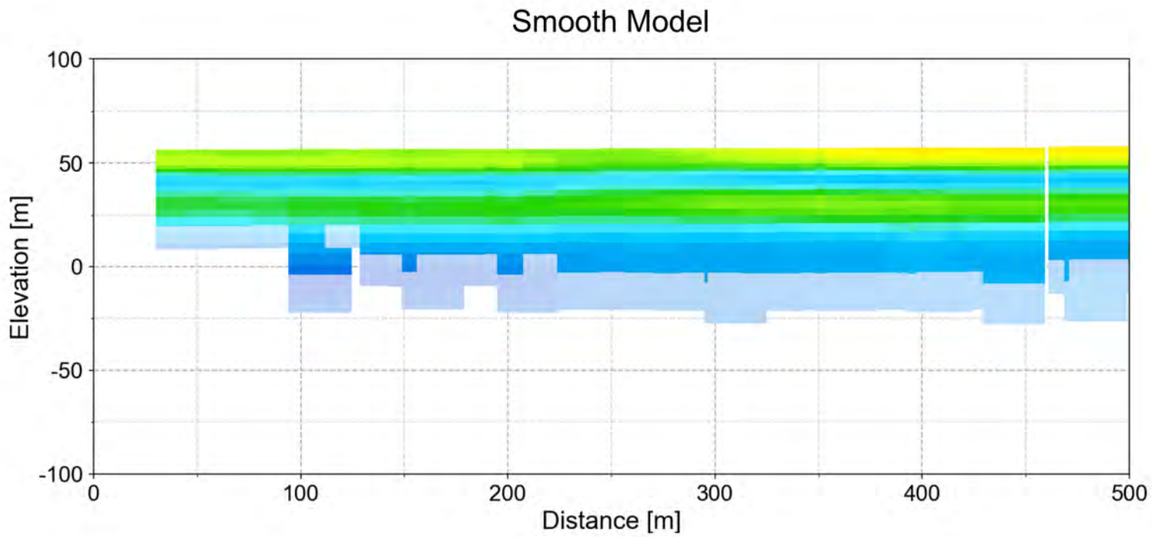
tTEM Model Section





Legend for Maps

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Legend for Model Sections

Smooth model

Spatially constrained inversion (30 layers)

Above DOI*

Below DOI*

3 10 100 300

Resistivity [ohm-m]

*DOI = Depth of investigation

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Santa Rosa Plain GSA
Sonoma County, CA

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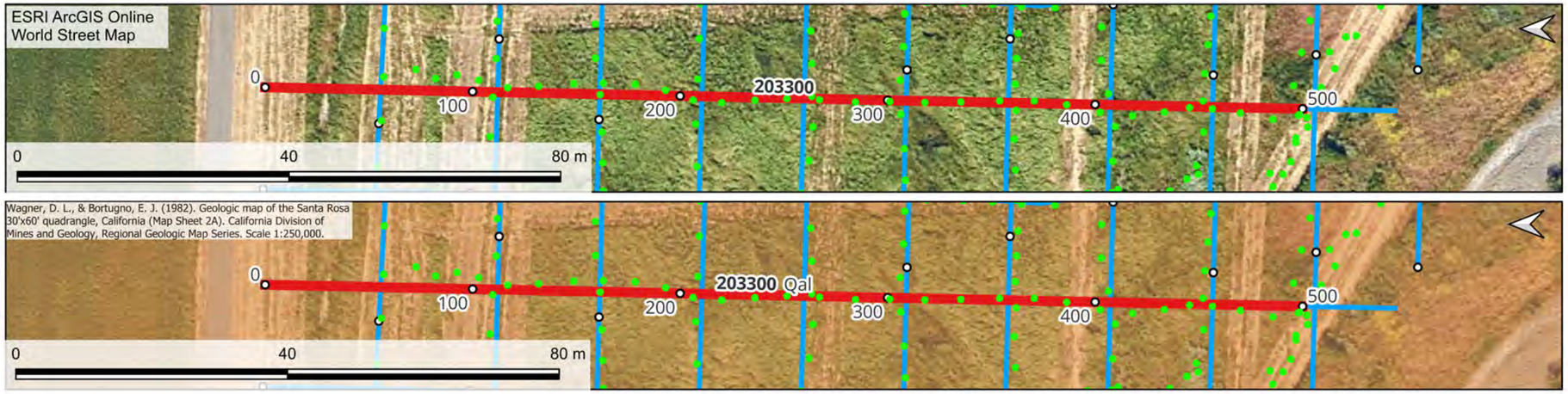
Sonoma County Water Agency
Project #: 1940113846

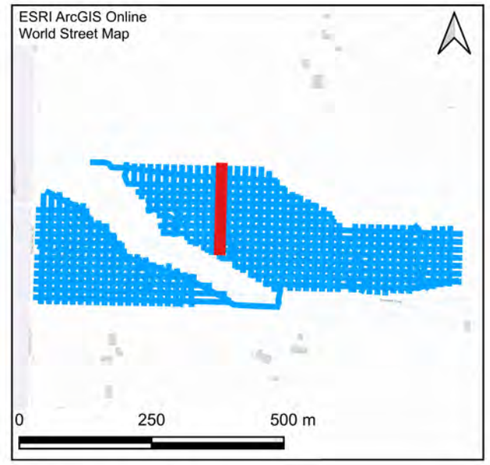
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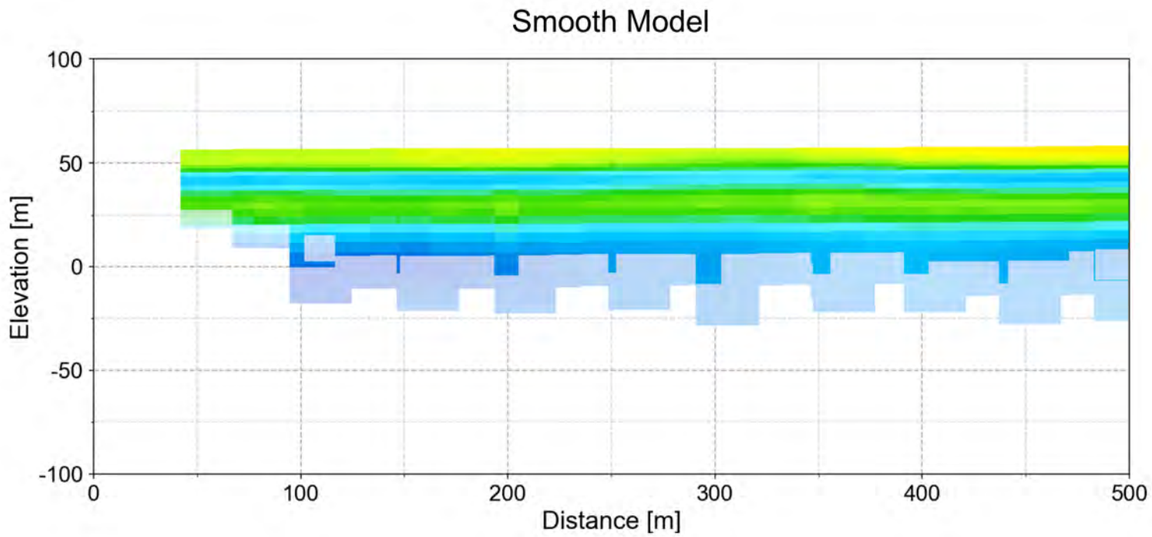
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SCWA GSA tTEM Survey: Line 203300 0-500 m

tTEM Model Section







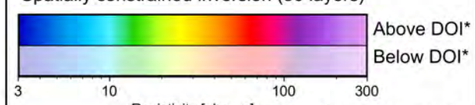
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Legend for Model Sections

Smooth model

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Sonoma County, CA

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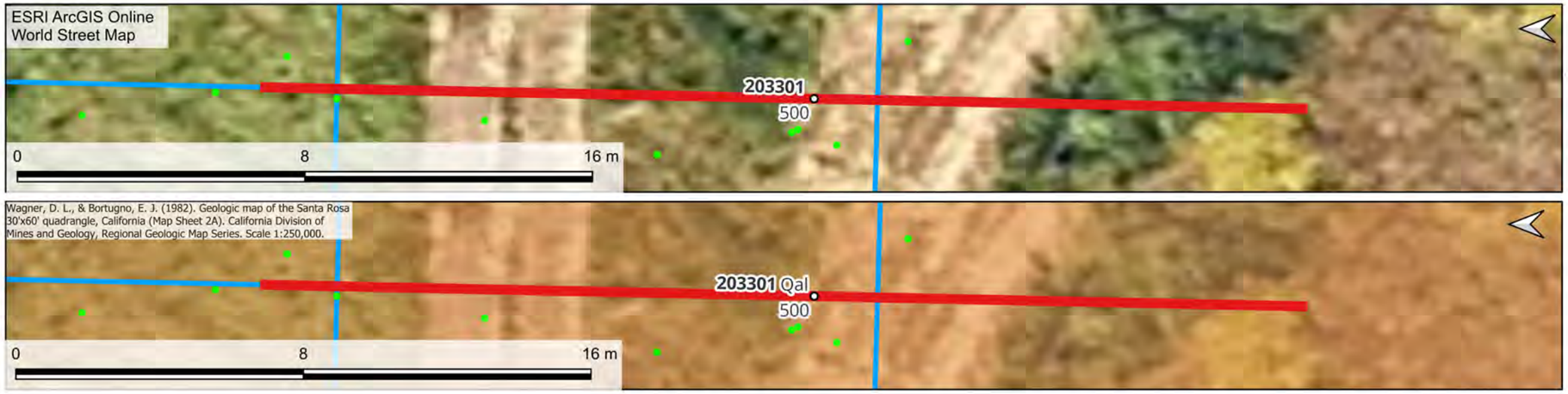
Sonoma County Water Agency
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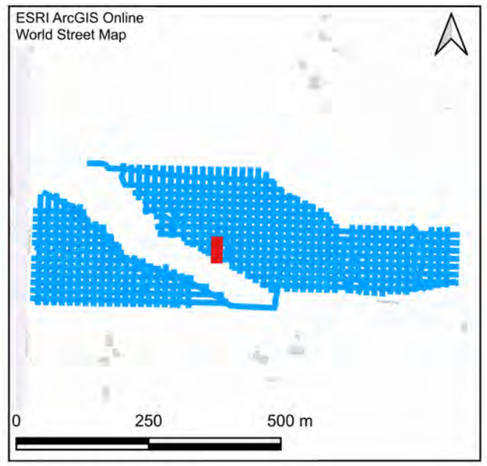
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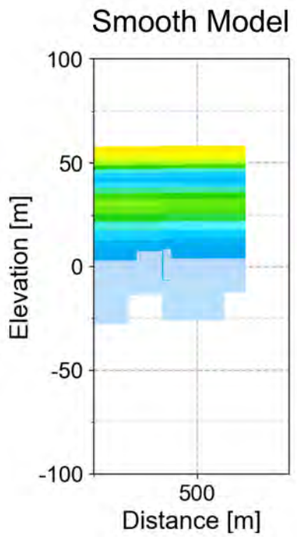
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SCWA GSA tTEM Survey: Line 203300 450-544 m

tTEM Model Section







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Legend for Model Sections

Smooth model

Spatially constrained inversion (30 layers)

Above DOI*

Below DOI*

3 10 100 300

Resistivity [ohm-m] *DOI = Depth of investigation

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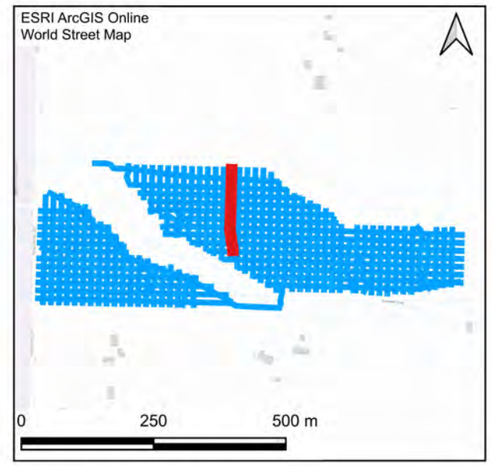
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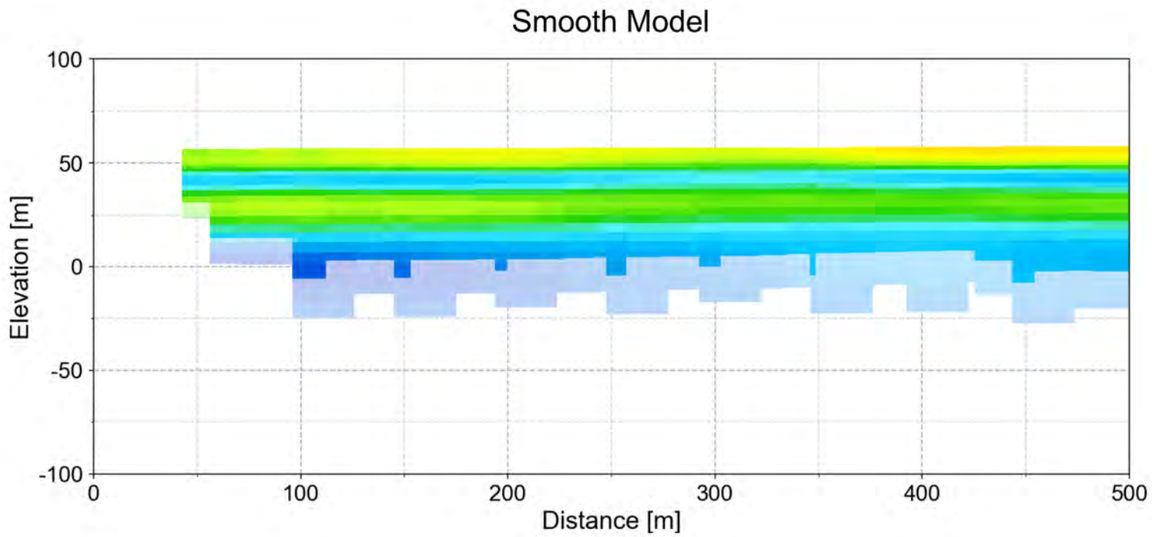
SCWA GSA tTEM Survey: Line 203400 0-500 m

tTEM Model Section









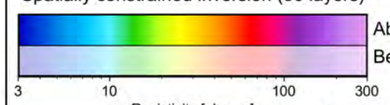
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Legend for Model Sections

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Sonoma County Water Agency
Project #: 1940113846

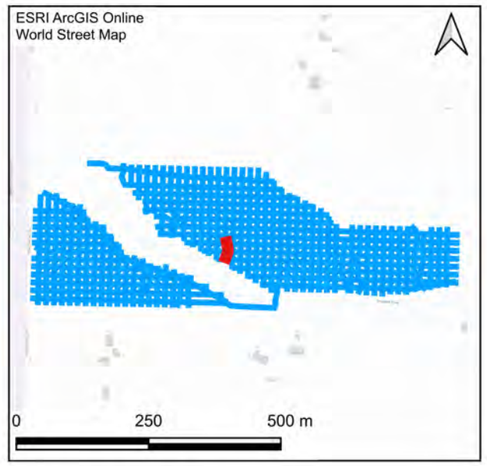
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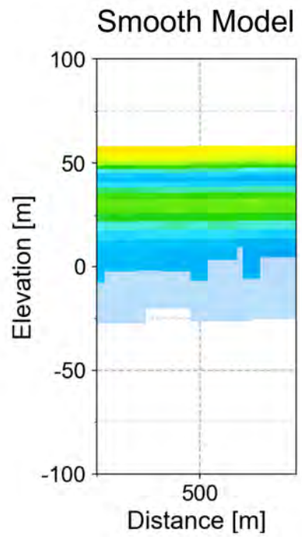
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SCWA GSA tTEM Survey: Line 203400 450-547 m

tTEM Model Section







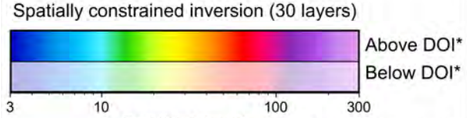
Legend for Maps

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- Quaternary fault (USGS, 2018)

Legend for Model Sections

Smooth model

Spatially constrained inversion (30 layers)



Copeland Creek tTEM Results
Santa Rosa Plain GSA
Sonoma County, CA

RAMBOLL
COLLIER GEOPHYSICS

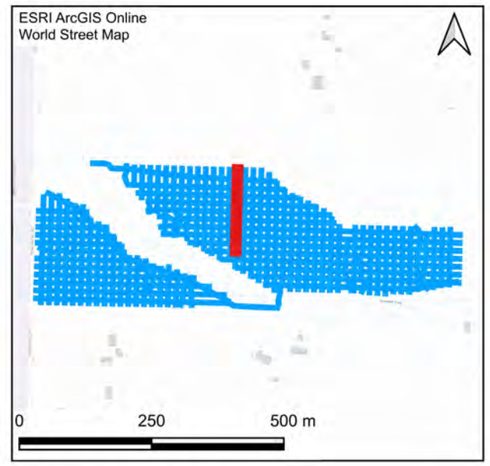
Sonoma County Water Agency
Project #: 1940113846

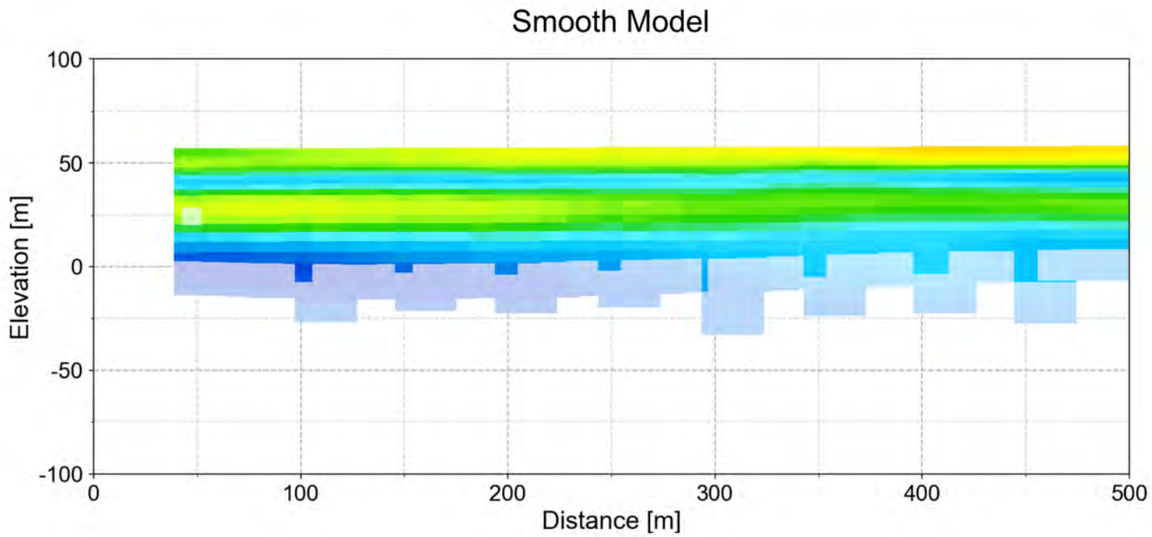
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Date: 2025-12-30, Created by: JP, Checked by: JC, Approved by: TPK

SCWA GSA tTEM Survey: Line 203500 0-500 m

tTEM Model Section







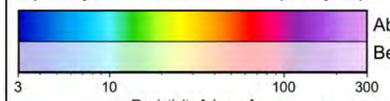
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Legend for Model Sections

Smooth model

Spatially constrained inversion (30 layers)



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Copeland Creek tTEM Results
Santa Rosa Plain GSA
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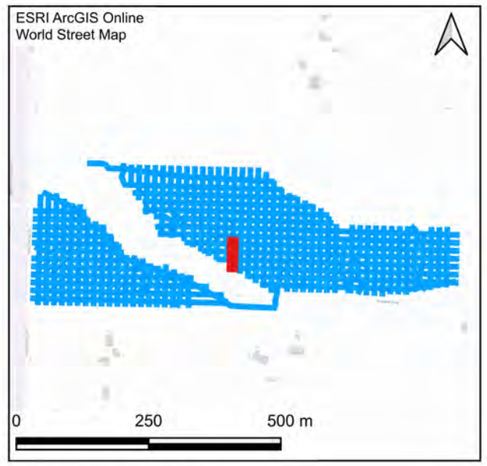
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SCWA GSA tTEM Survey: Line 203500 450-597 m

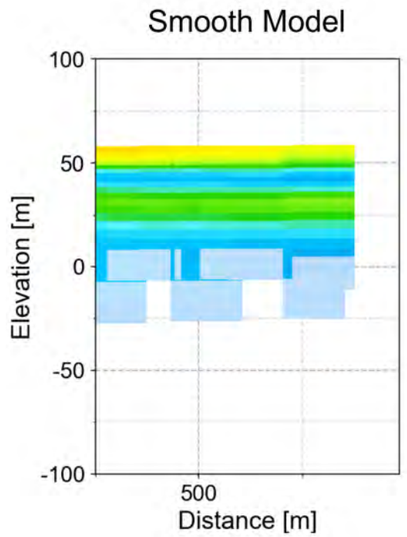
tTEM Model Section





Legend for Maps

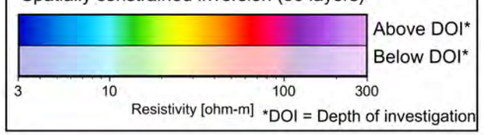
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Legend for Model Sections

Smooth model

Spatially constrained inversion (30 layers)



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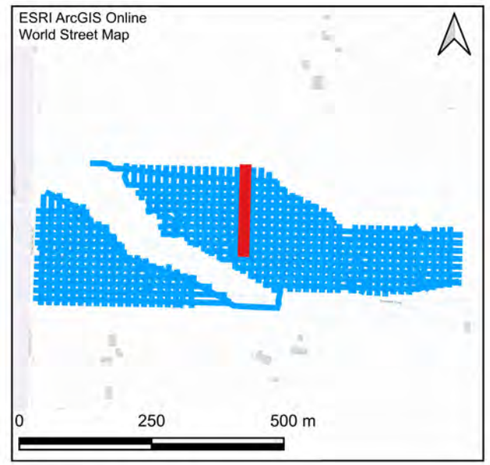
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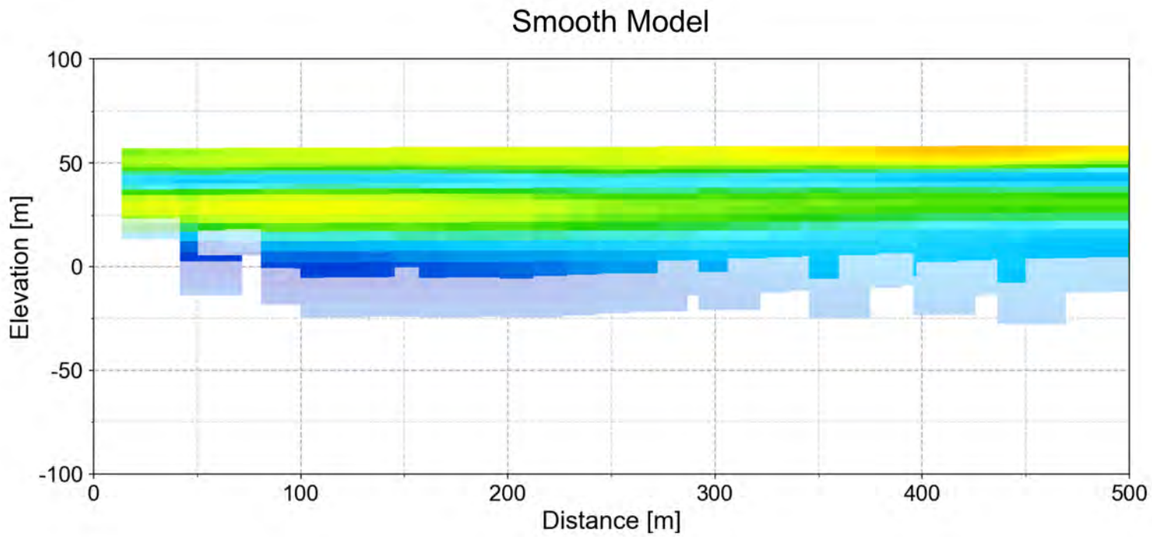
Date: 2025-12-30, Created by: JP, Checked by: JC, Approved by: TPK

SCWA GSA tTEM Survey: Line 203600 0-500 m

tTEM Model Section







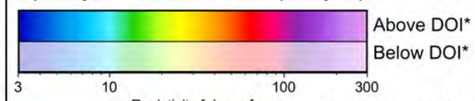
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Legend for Model Sections

Smooth model

Spatially constrained inversion (30 layers)



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Santa Rosa Plain GSA
Sonoma County, CA

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Sonoma County Water Agency
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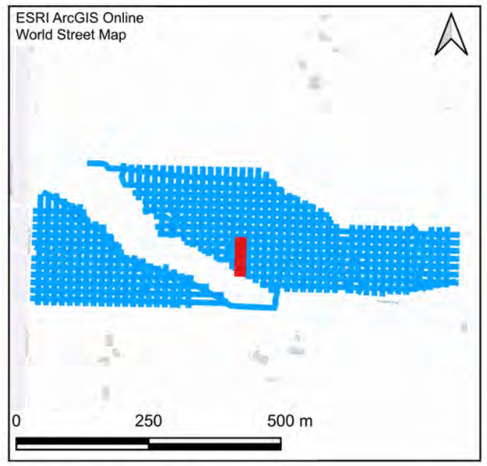
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SCWA GSA tTEM Survey: Line 203600 450-623 m

tTEM Model Section

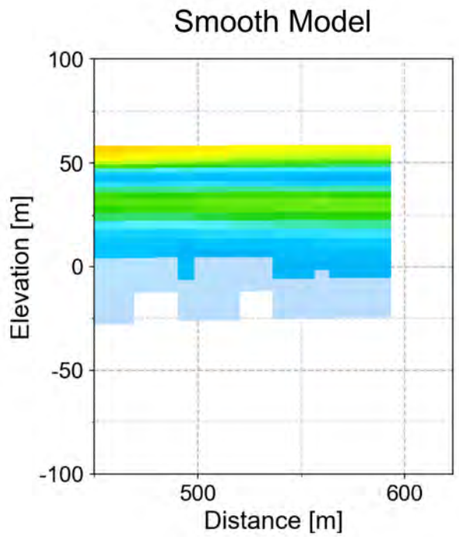






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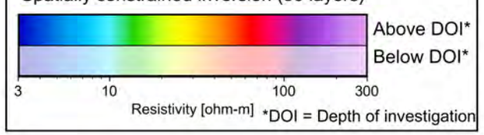
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Legend for Model Sections

Smooth model

Spatially constrained inversion (30 layers)



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Sonoma County, CA

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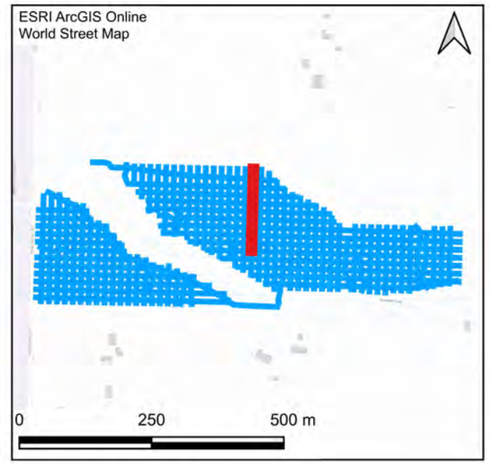
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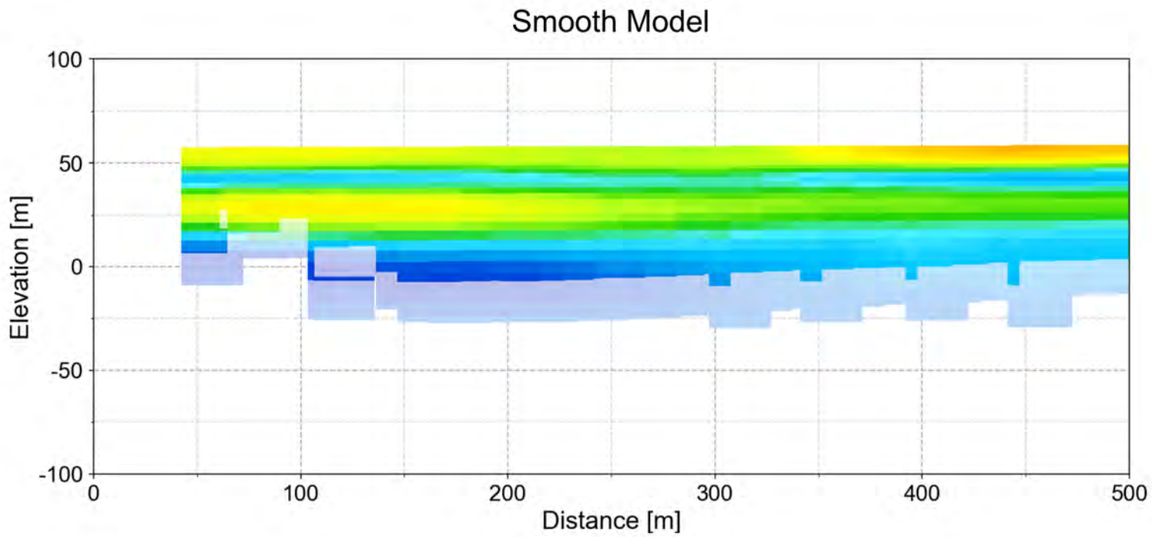
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SCWA GSA tTEM Survey: Line 203700 0-500 m

tTEM Model Section







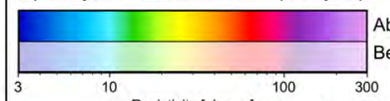
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Legend for Model Sections

Smooth model

Spatially constrained inversion (30 layers)



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Sonoma County, CA

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Sonoma County Water Agency
Project #: 1940113846

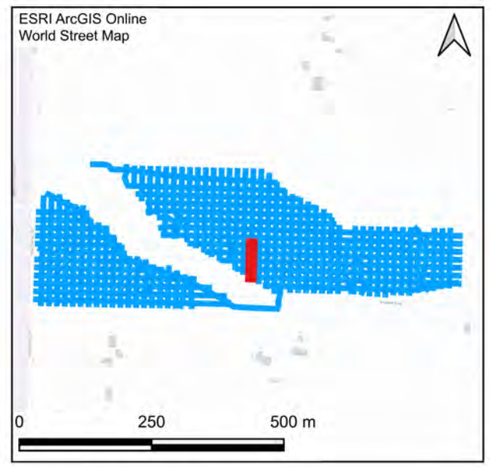
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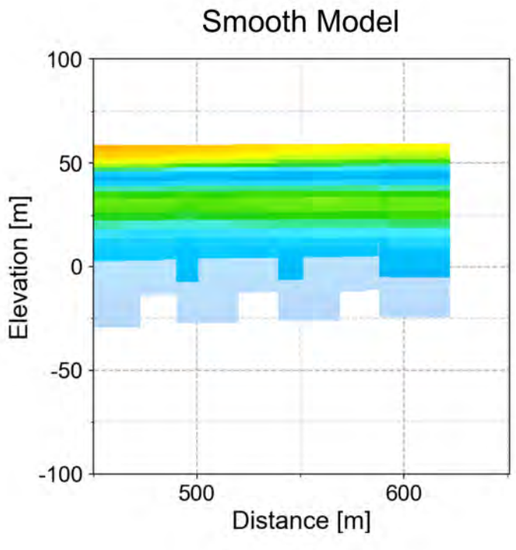
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SCWA GSA tTEM Survey: Line 203700 450-651 m

tTEM Model Section







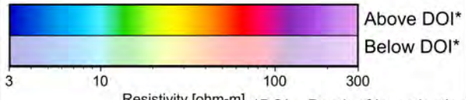
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Legend for Model Sections

Smooth model

Spatially constrained inversion (30 layers)



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Copeland Creek tTEM Results
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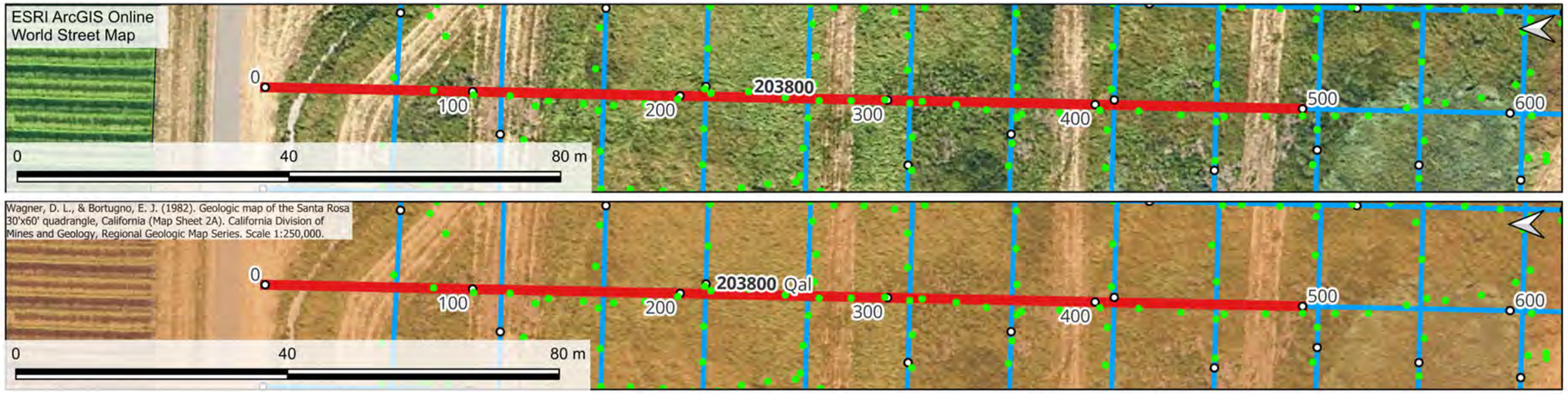
Sonoma County Water Agency
Project #: 1940113846

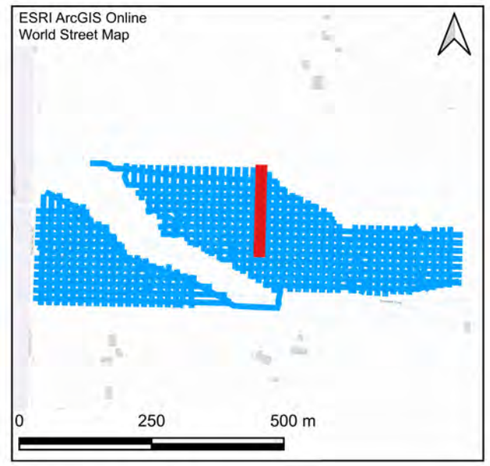
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Date: 2025-12-30, Created by: JP, Checked by: JC, Approved by: TPK

SCWA GSA tTEM Survey: Line 203800 0-500 m

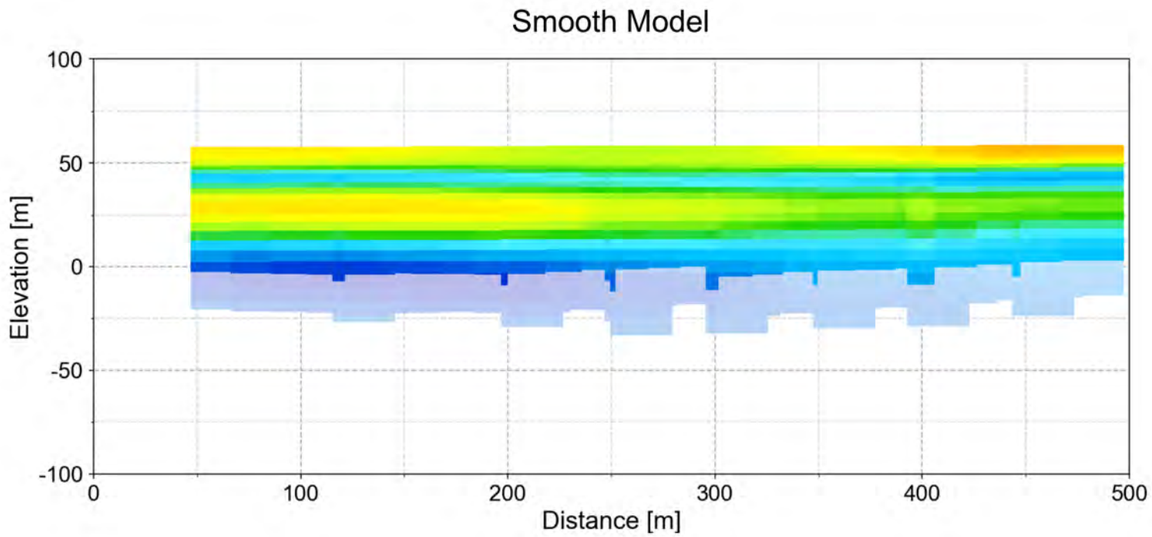
tTEM Model Section





Legend for Maps

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- Quaternary fault (USGS, 2018)



Legend for Model Sections

Smooth model

Spatially constrained inversion (30 layers)

Above DOI*

Below DOI*

3 10 100 300

Resistivity [ohm-m]

*DOI = Depth of investigation

Copeland Creek tTEM Results
Santa Rosa Plain GSA
Sonoma County, CA

RAMBOLL

COLLIER GEOPHYSICS

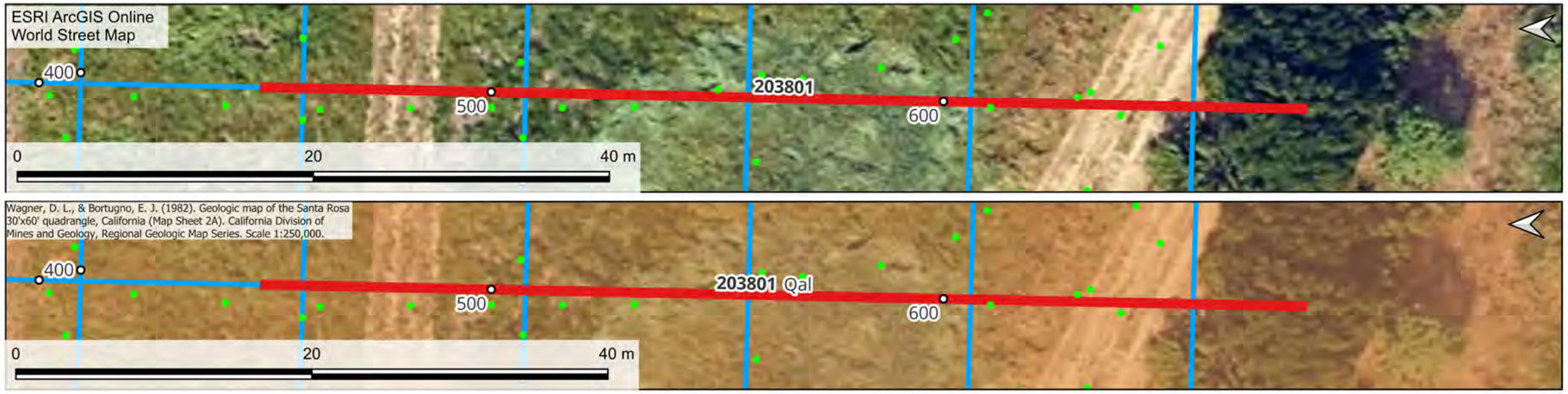
Sonoma County Water Agency
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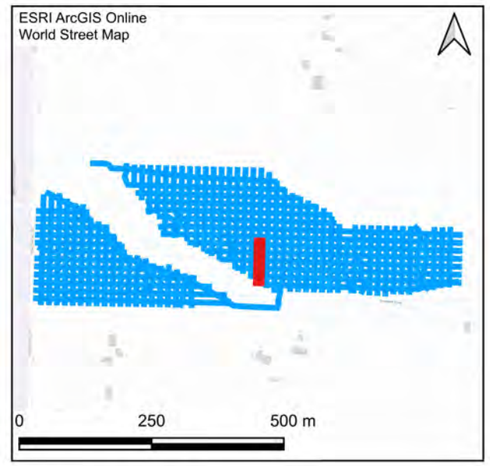
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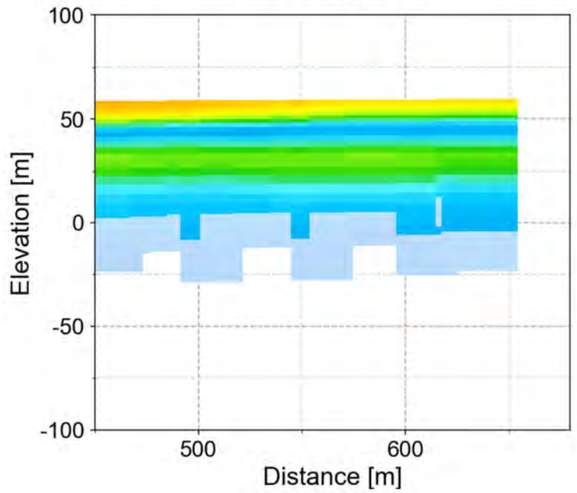
SCWA GSA tTEM Survey: Line 203800 450-679 m

tTEM Model Section





Smooth Model



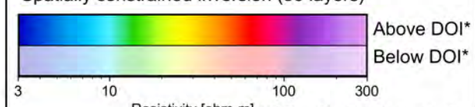
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Legend for Model Sections

Smooth model

Spatially constrained inversion (30 layers)



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Sonoma County Water Agency
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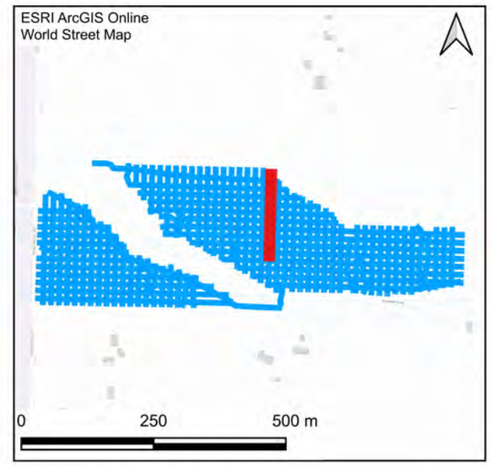
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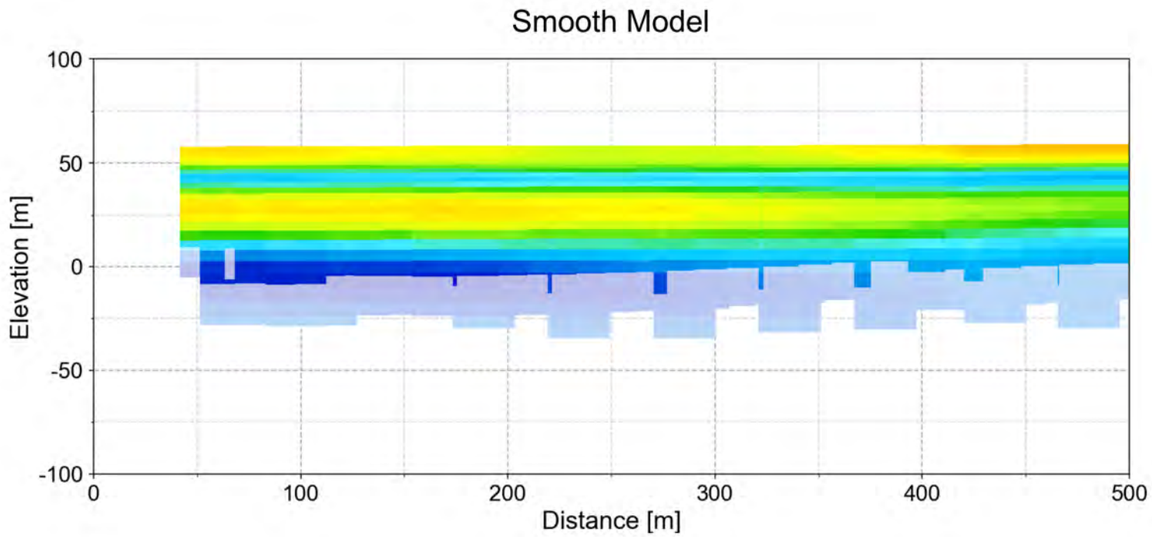
SCWA GSA tTEM Survey: Line 203900 0-500 m

tTEM Model Section









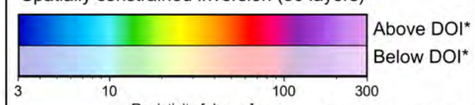
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Legend for Model Sections

Smooth model

Spatially constrained inversion (30 layers)



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Sonoma County, CA

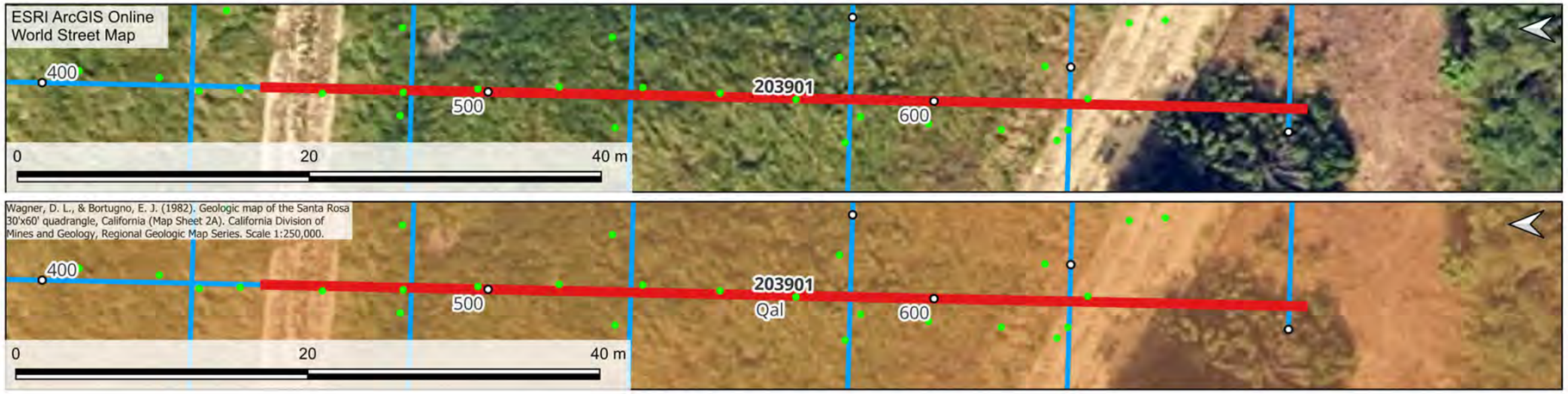
RAMBOLL
COLLIER GEOPHYSICS

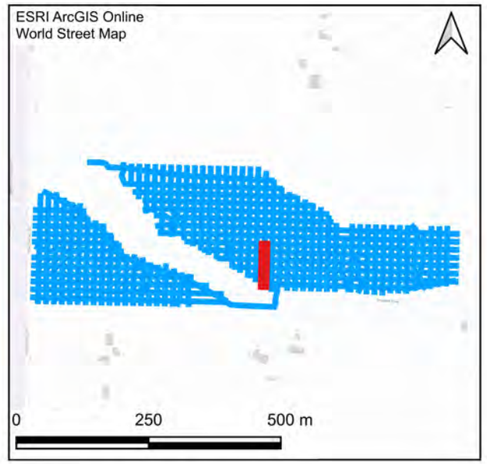
Sonoma County Water Agency
Project #: 1940113846

Coordinate Reference System: EPSG 2226 - NAD83 / California zone 2 (ftUS)
Date: 2025-12-30, Created by: JP, Checked by: JC, Approved by: TPK

SCWA GSA tTEM Survey: Line 203900 450-683 m

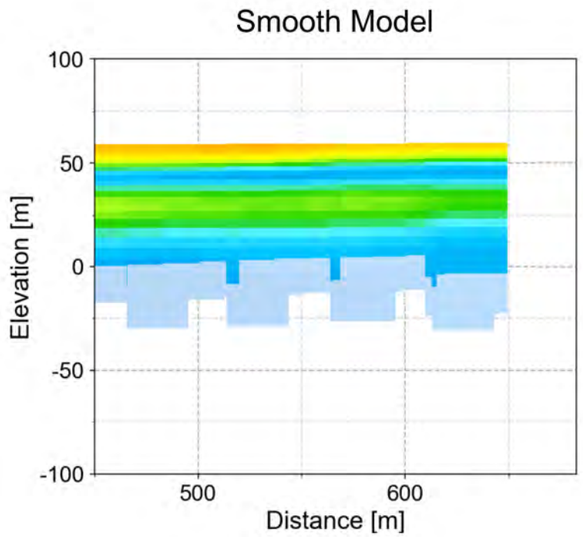
tTEM Model Section





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Legend for Model Sections

Smooth model

Spatially constrained inversion (30 layers)

Above DOI*

Below DOI*

3 10 100 300

Resistivity [ohm-m]

*DOI = Depth of investigation

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Sonoma County, CA

RAMBOLL

COLLIER GEOPHYSICS

Sonoma County Water Agency
Project #: 1940113846

Coordinate Reference System: EPSG 2226 - NAD83 / California zone 2 (ftUS)

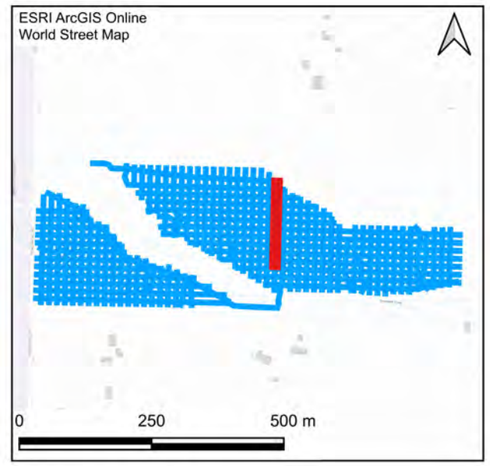
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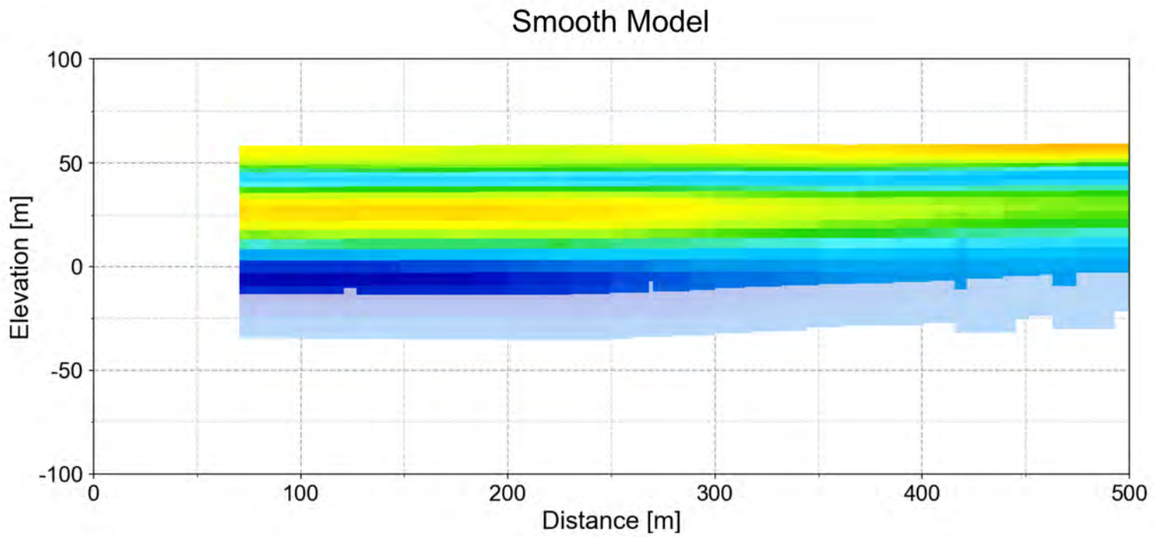
SCWA GSA tTEM Survey: Line 204000 0-500 m

tTEM Model Section









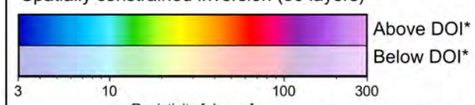
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Legend for Model Sections

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Santa Rosa Plain GSA
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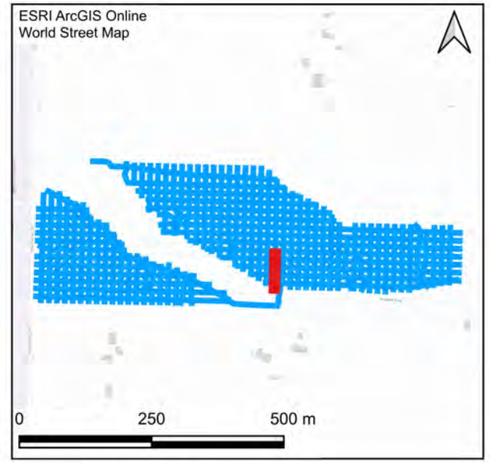
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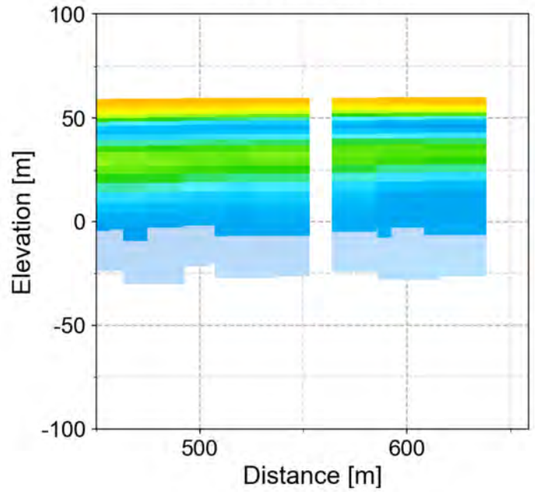
SCWA GSA tTEM Survey: Line 204000 450-659 m

tTEM Model Section





Smooth Model



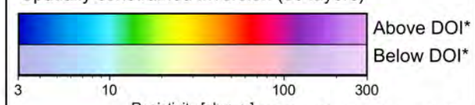
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Legend for Model Sections

Smooth model

Spatially constrained inversion (30 layers)



*DOI = Depth of investigation

Copeland Creek tTEM Results
Santa Rosa Plain GSA
Sonoma County, CA

RAMBOLL

COLLIER GEOPHYSICS

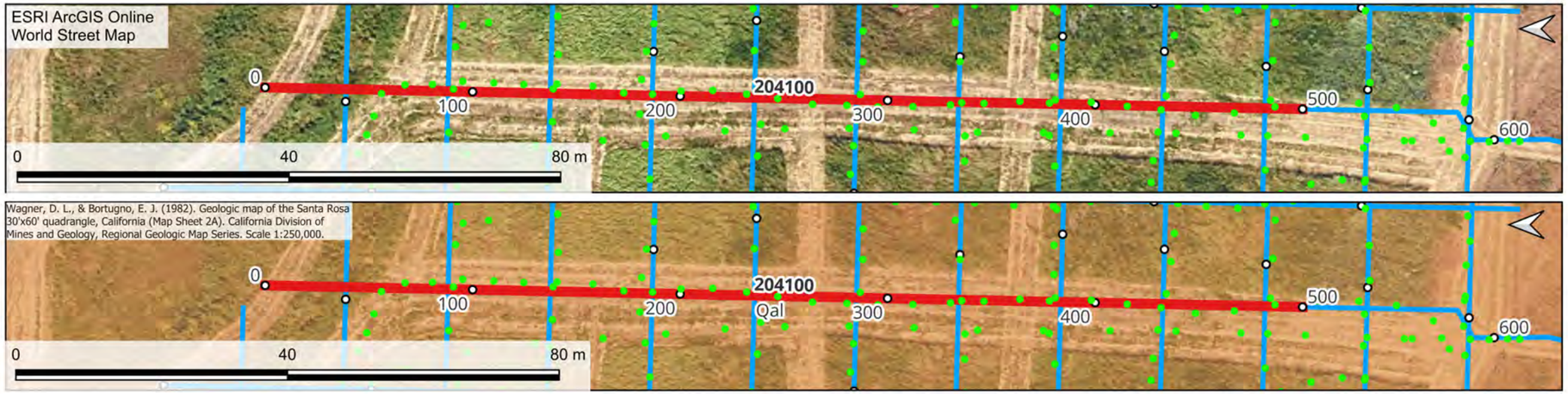
Sonoma County Water Agency
Project #: 1940113846

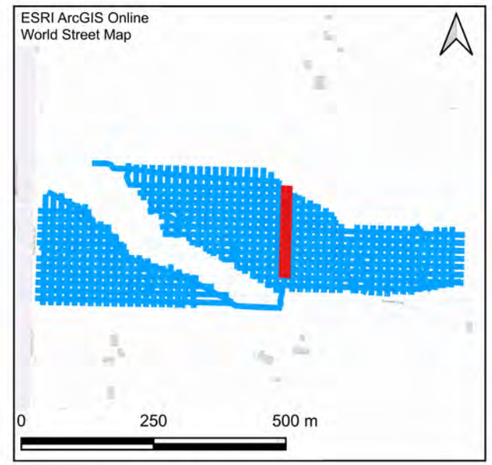
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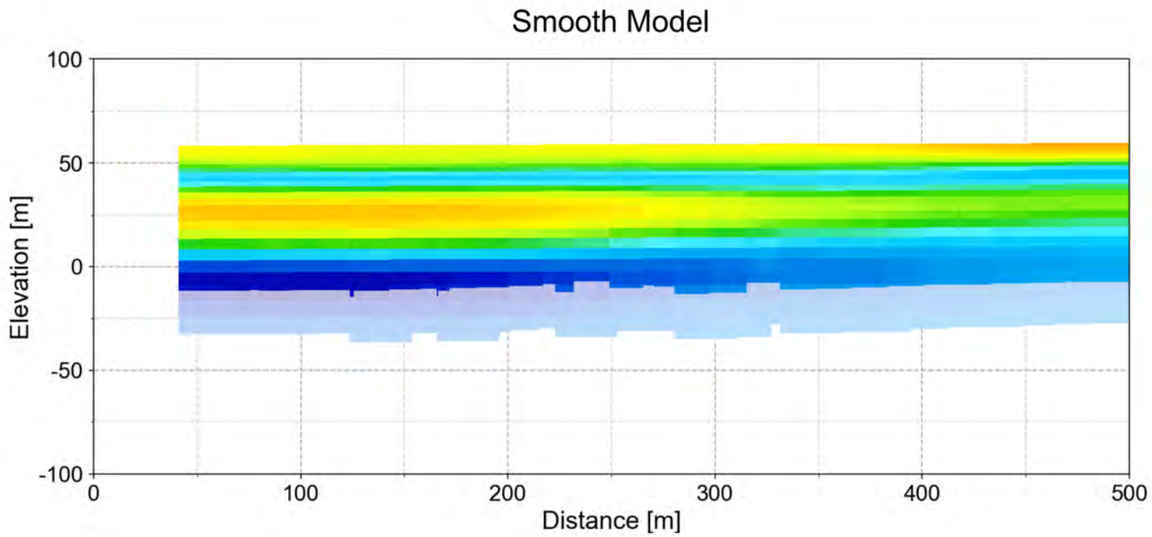
Date: 2025-12-30, Created by: JP, Checked by: JC, Approved by: TPK

SCWA GSA tTEM Survey: Line 204100 0-500 m

tTEM Model Section







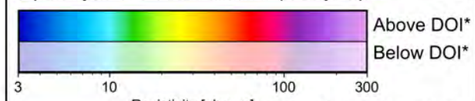
Legend for Maps

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Legend for Model Sections

Smooth model

Spatially constrained inversion (30 layers)



Copeland Creek tTEM Results
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Sonoma County, CA

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COLLIER GEOPHYSICS

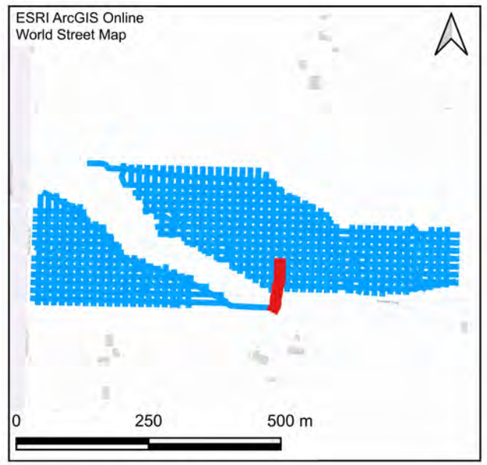
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Project #: 1940113846

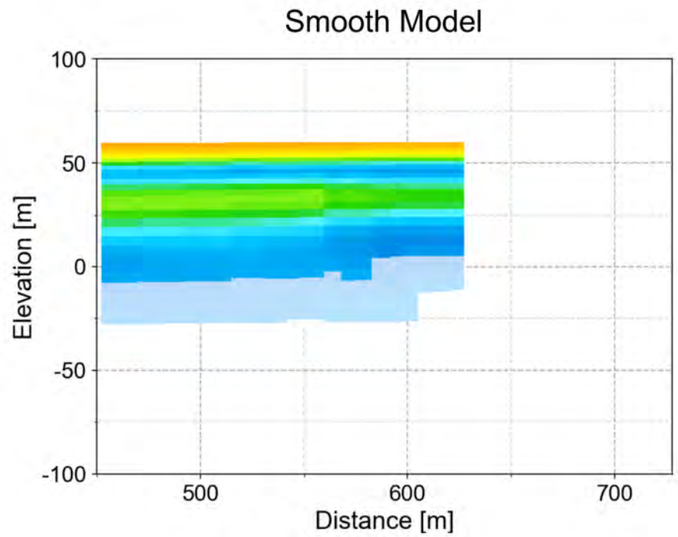
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SCWA GSA tTEM Survey: Line 204100 450-728 m

tTEM Model Section







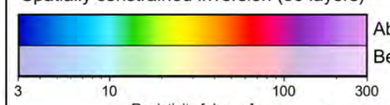
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Legend for Model Sections

Smooth model

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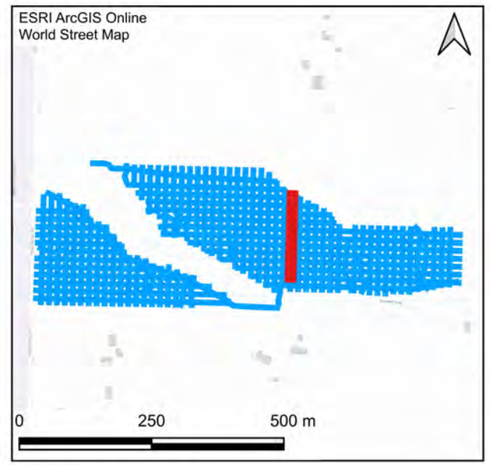
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Date: 2025-12-30, Created by: JP, Checked by: JC, Approved by: TPK

SCWA GSA tTEM Survey: Line 204200 0-500 m

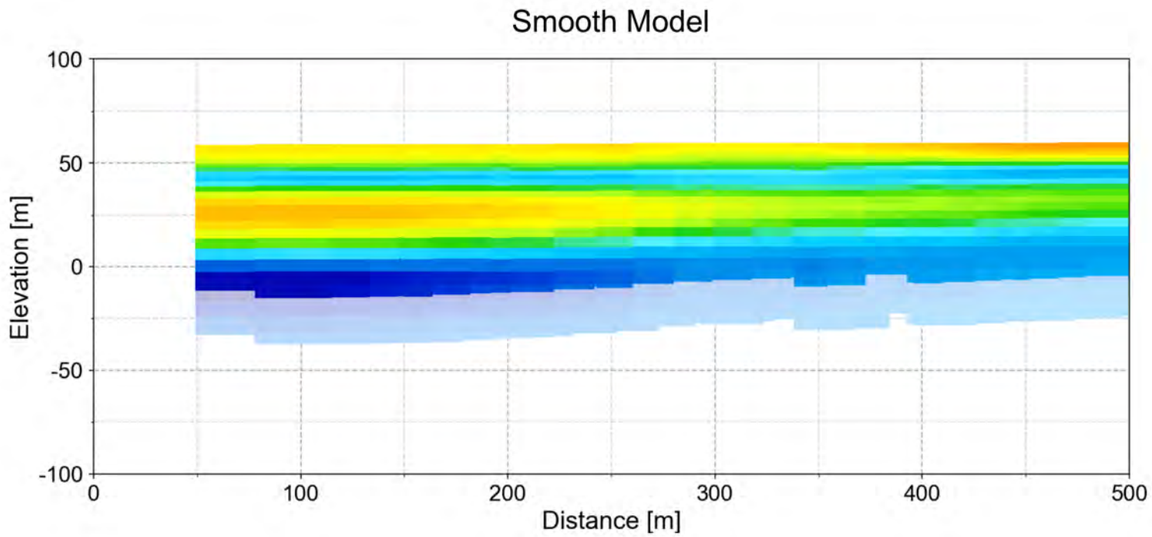
tTEM Model Section





Legend for Maps

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- Quaternary fault (USGS, 2018)



Legend for Model Sections

Smooth model

Spatially constrained inversion (30 layers)

Above DOI*

Below DOI*

3 10 100 300

Resistivity [ohm-m]

*DOI = Depth of investigation

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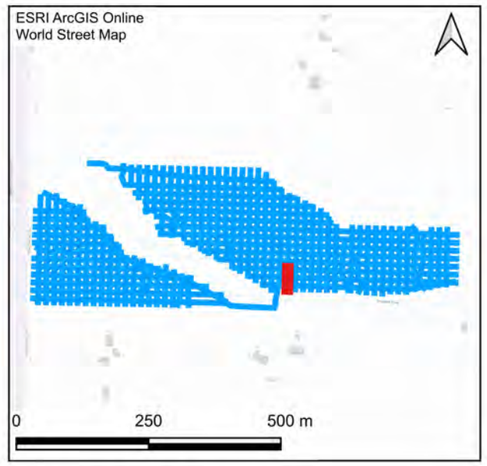
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SCWA GSA tTEM Survey: Line 204200 450-575 m

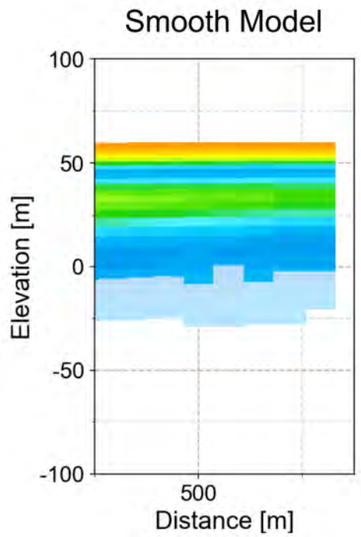
tTEM Model Section





Legend for Maps

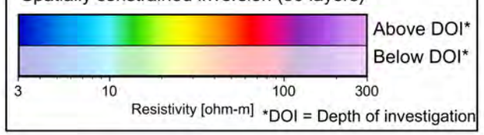
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- Quaternary fault (USGS, 2018)



Legend for Model Sections

Smooth model

Spatially constrained inversion (30 layers)



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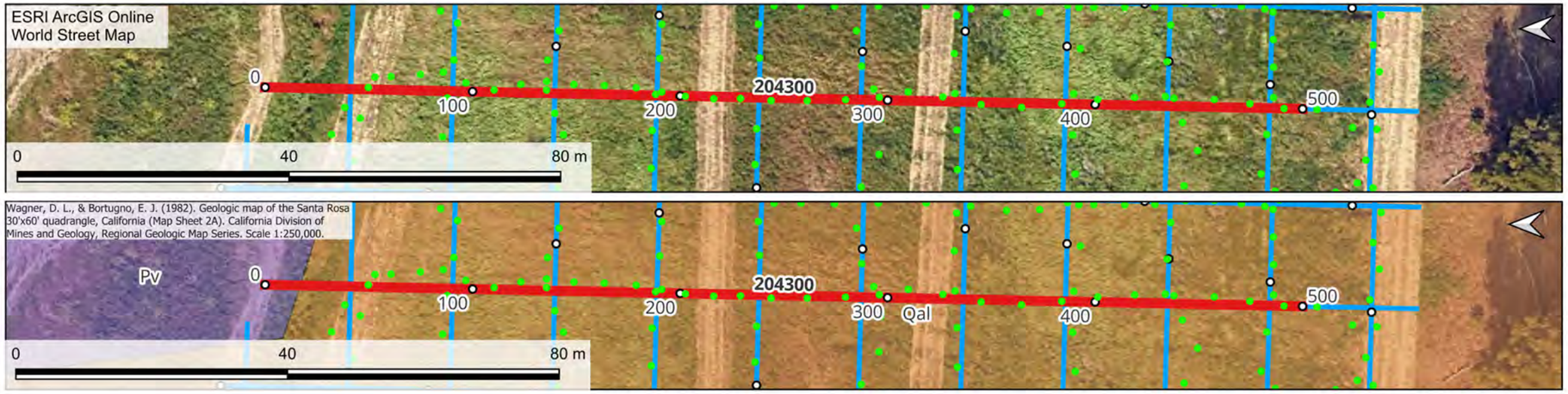
Sonoma County Water Agency
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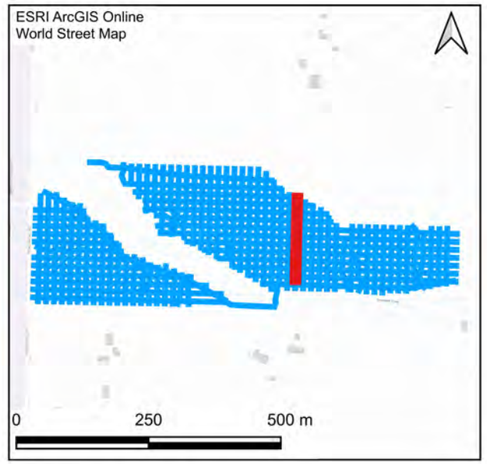
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Date: 2025-12-30, Created by: JP, Checked by: JC, Approved by: TPK

SCWA GSA tTEM Survey: Line 204300 0-500 m

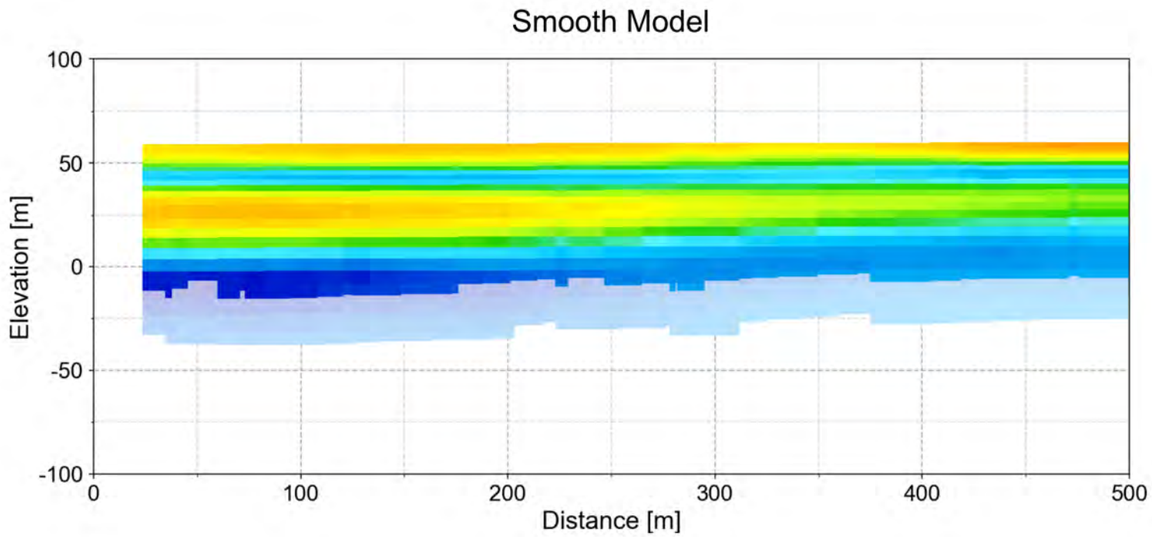
tTEM Model Section





Legend for Maps

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Legend for Model Sections

Smooth model

Spatially constrained inversion (30 layers)

Above DOI*

Below DOI*

3 10 100 300

Resistivity [ohm-m]

*DOI = Depth of investigation

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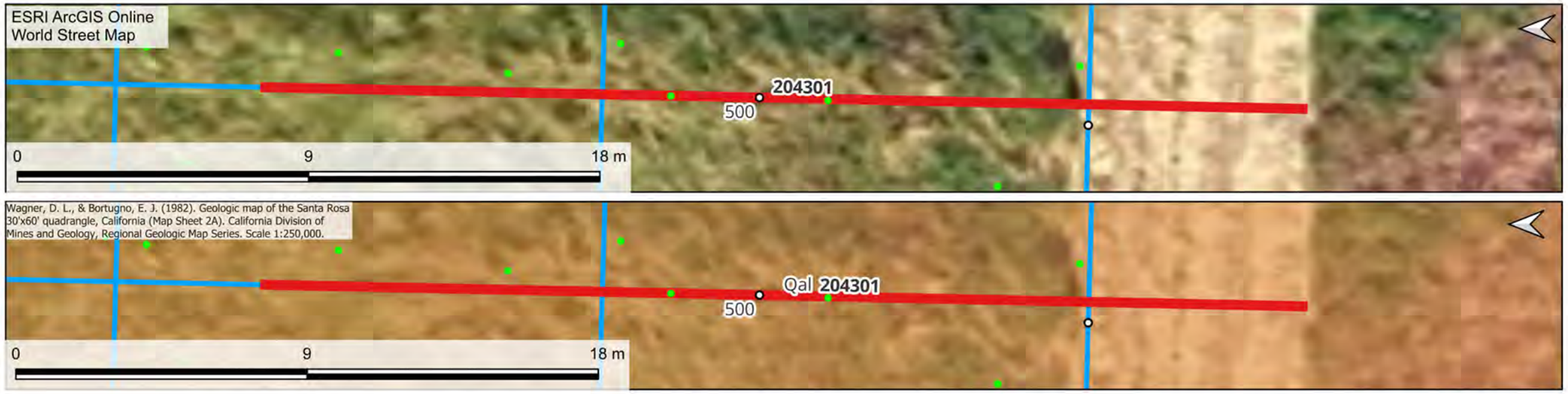
Sonoma County Water Agency
Project #: 1940113846

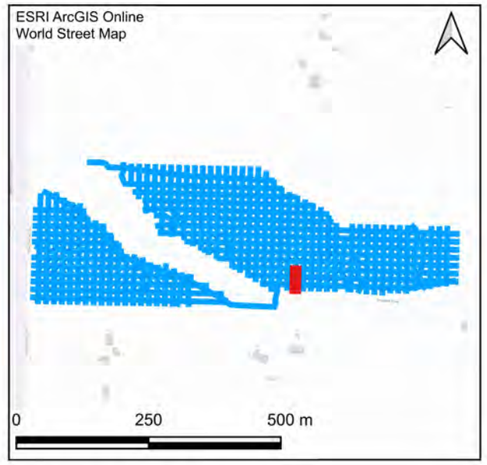
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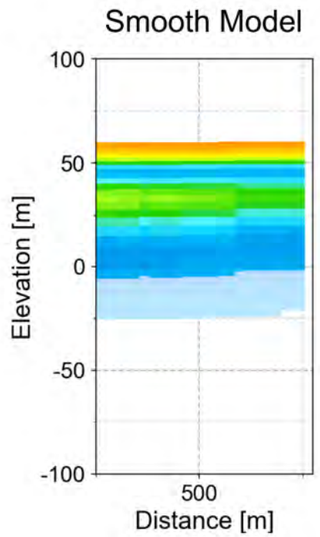
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SCWA GSA tTEM Survey: Line 204300 450-555 m

tTEM Model Section







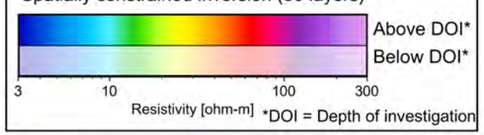
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Smooth model

Spatially constrained inversion (30 layers)



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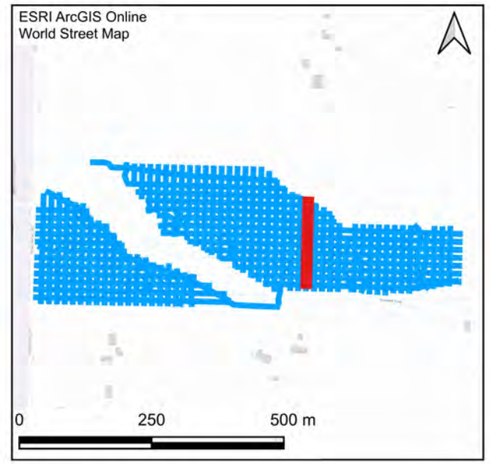
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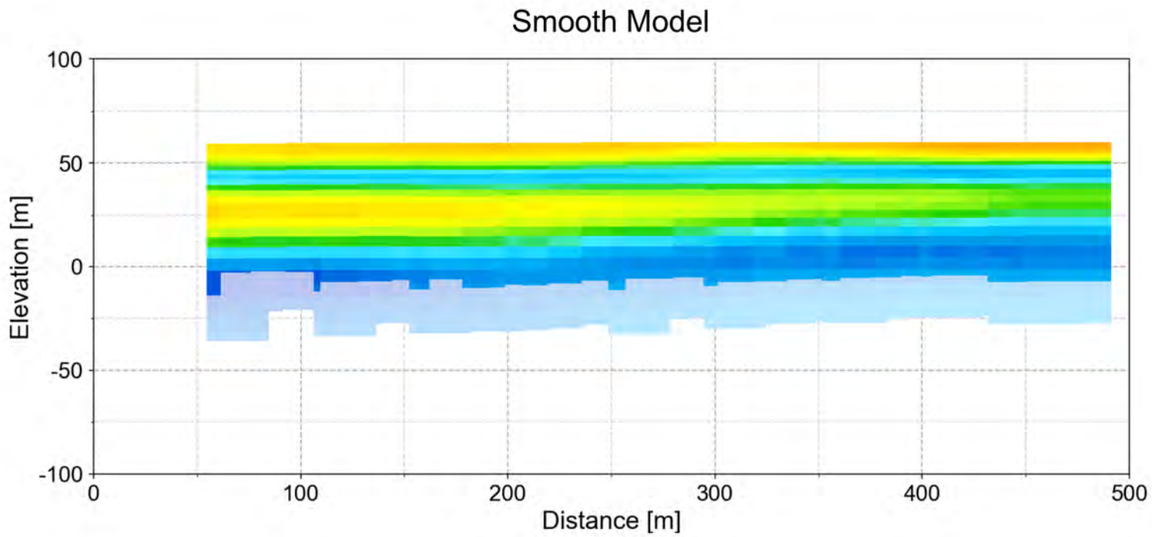
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SCWA GSA tTEM Survey: Line 204400 0-500 m

tTEM Model Section







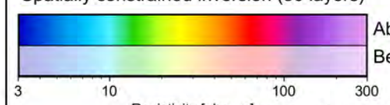
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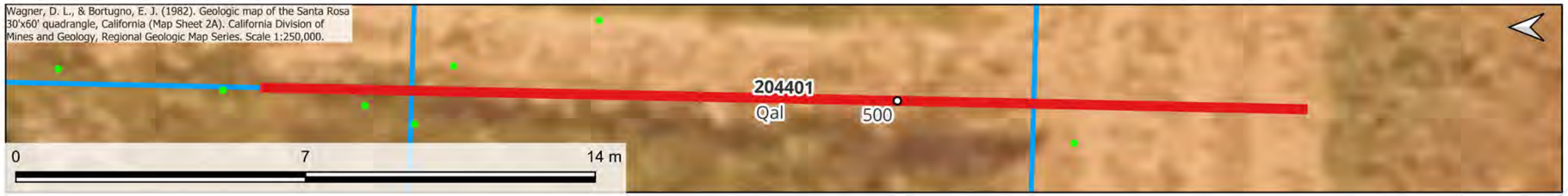
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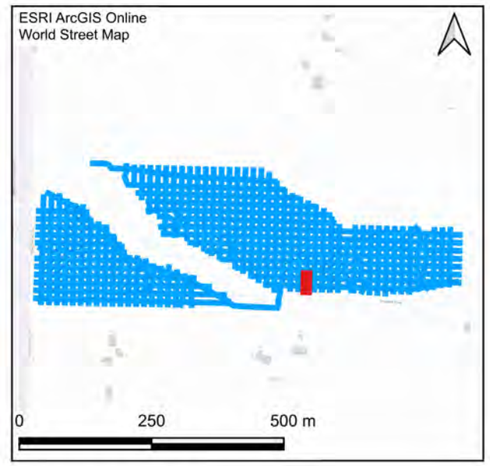
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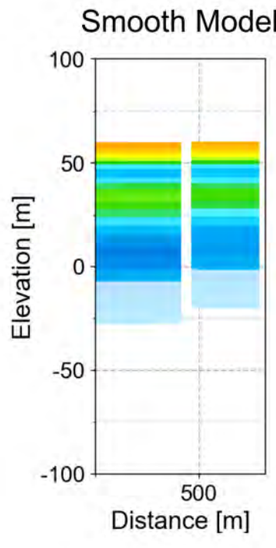
SCWA GSA tTEM Survey: Line 204400 450-532 m

tTEM Model Section









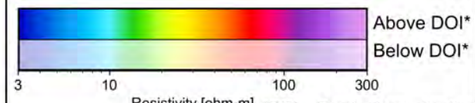
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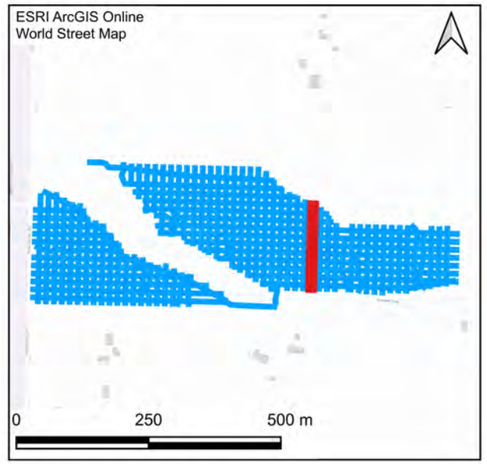
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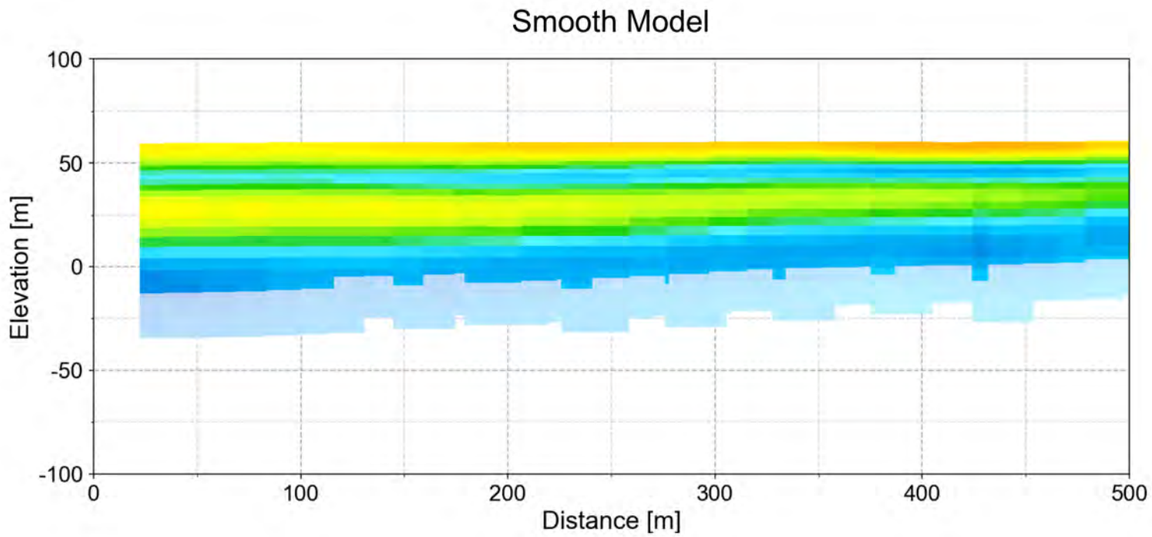
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SCWA GSA tTEM Survey: Line 204500 0-500 m

tTEM Model Section







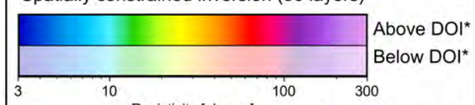
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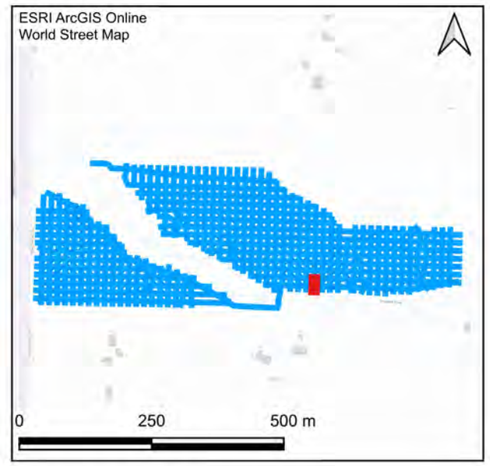
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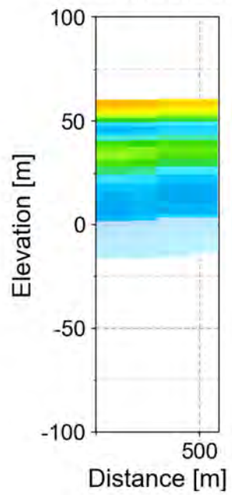
SCWA GSA tTEM Survey: Line 204500 450-509 m

tTEM Model Section





Smooth Model



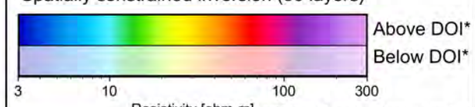
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Legend for Model Sections

Smooth model

Spatially constrained inversion (30 layers)



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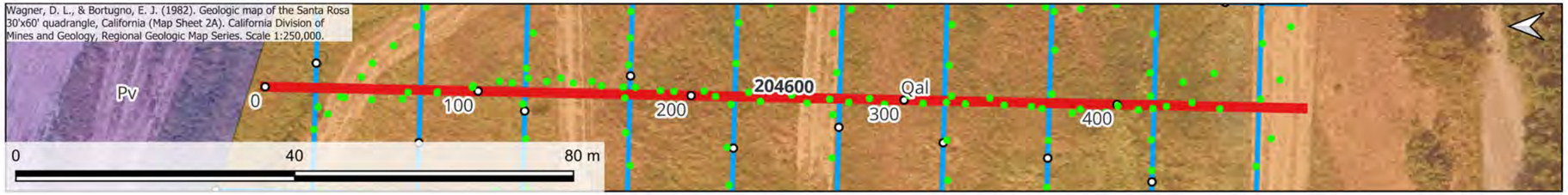
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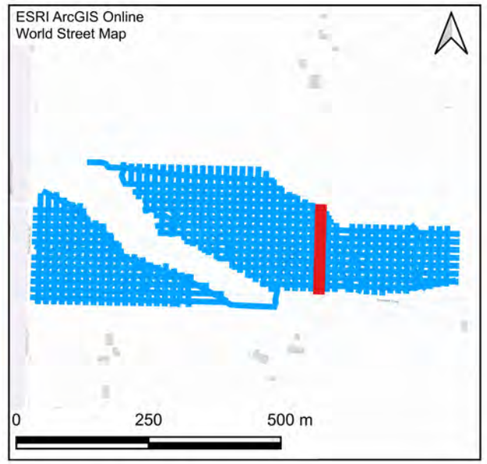
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SCWA GSA tTEM Survey: Line 204600 0-487 m

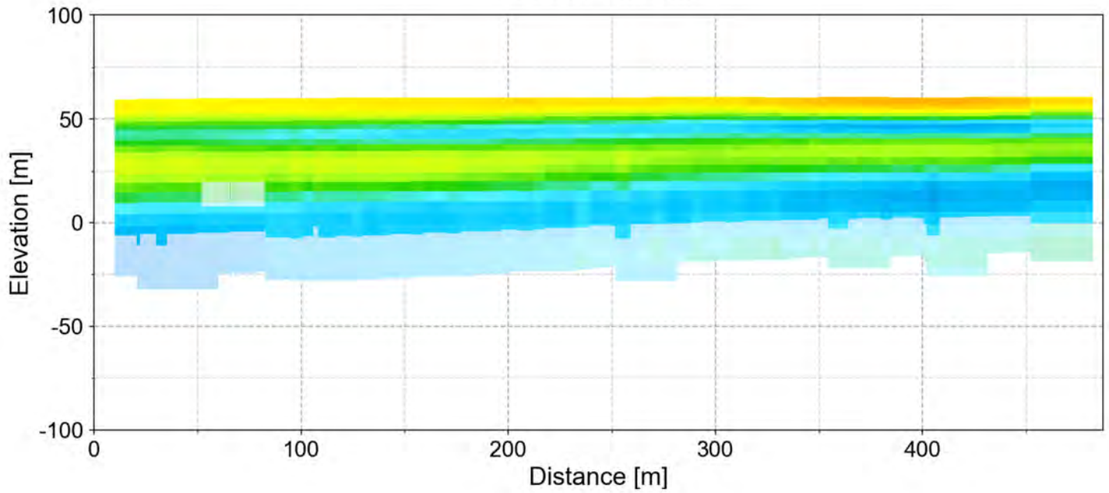
tTEM Model Section







Smooth Model



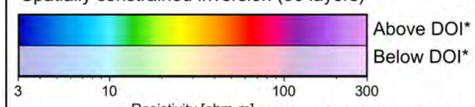
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Legend for Model Sections

Smooth model

Spatially constrained inversion (30 layers)



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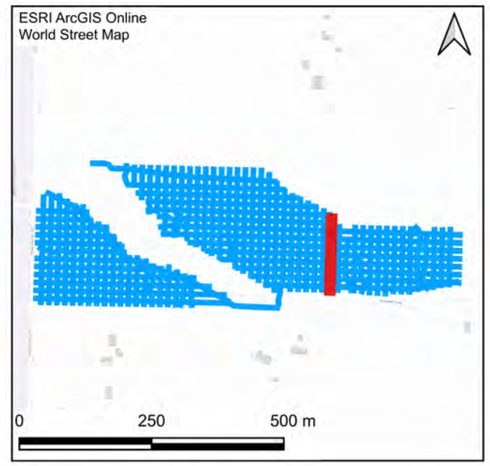
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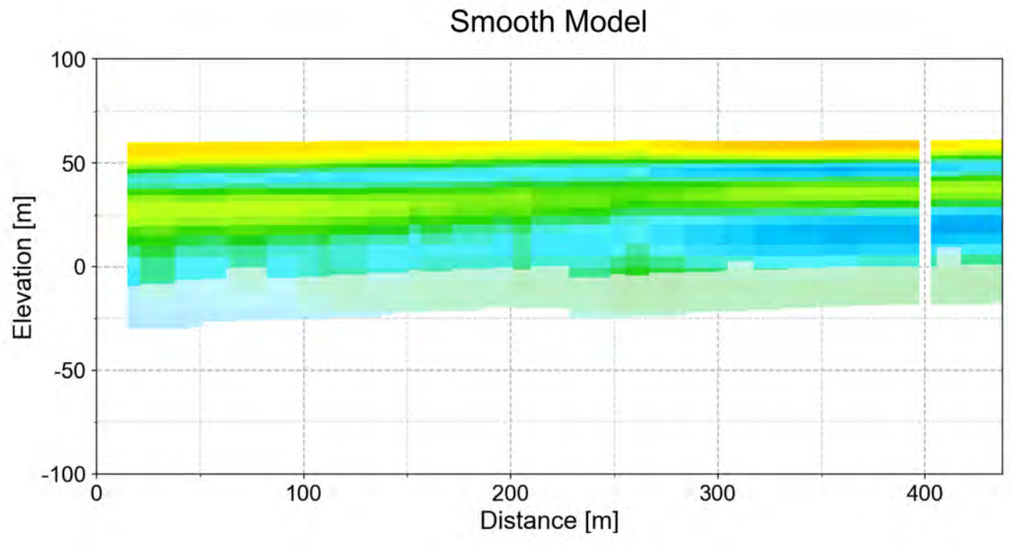
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SCWA GSA tTEM Survey: Line 204700 0-437 m

tTEM Model Section







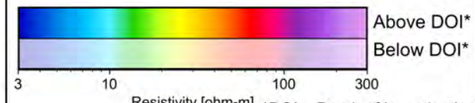
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Legend for Model Sections

Smooth model

Spatially constrained inversion (30 layers)



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Coordinate Reference System: EPSG 2226 - NAD83 / California zone 2 (ftUS)

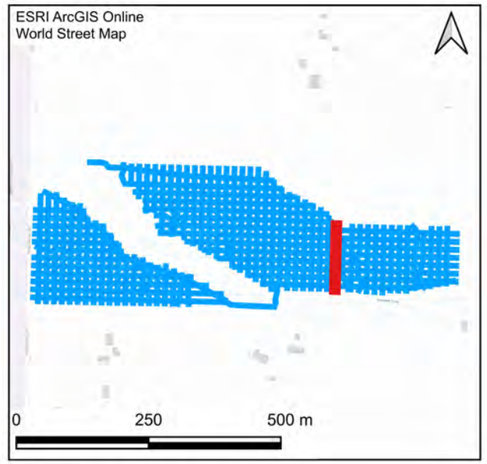
Date: 2025-12-30, Created by: JP, Checked by: JC, Approved by: TPK

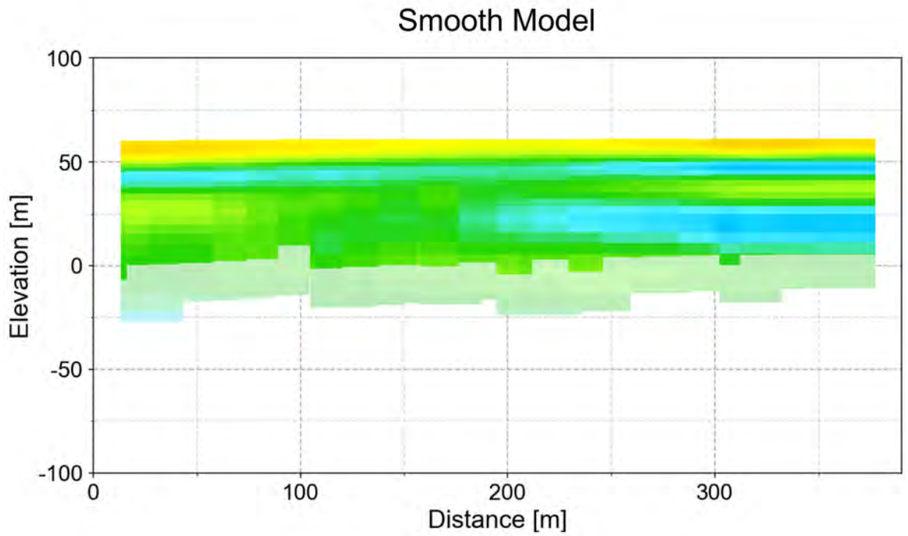
SCWA GSA tTEM Survey: Line 204800 0-390 m

tTEM Model Section









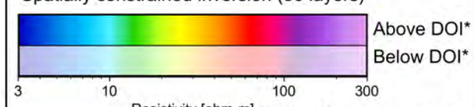
Legend for Maps

- tTEM data used for inversion
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- Pipelines (AmeriGEOSS, 2022)
- Quaternary fault (USGS, 2018)

Legend for Model Sections

Smooth model

Spatially constrained inversion (30 layers)



Copeland Creek tTEM Results
Santa Rosa Plain GSA
Sonoma County, CA

RAMBOLL

COLLIER GEOPHYSICS

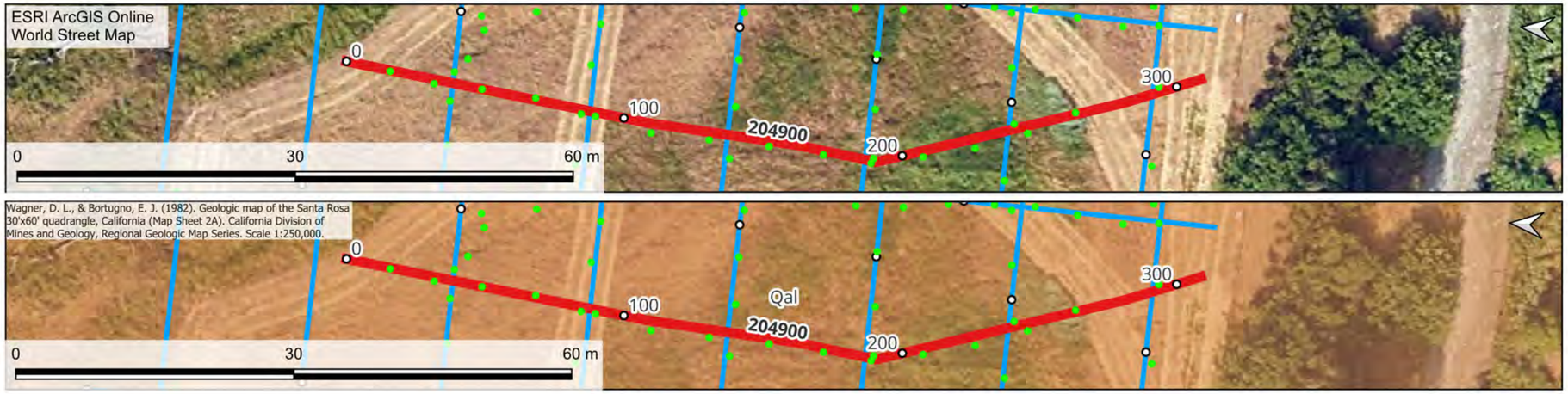
Sonoma County Water Agency
Project #: 1940113846

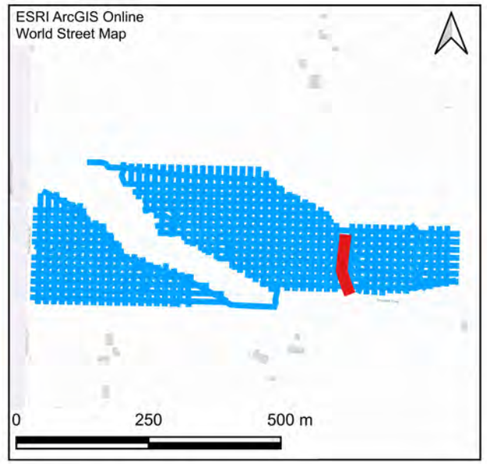
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Date: 2025-12-30, Created by: JP, Checked by: JC, Approved by: TPK

SCWA GSA tTEM Survey: Line 204900 0-309 m

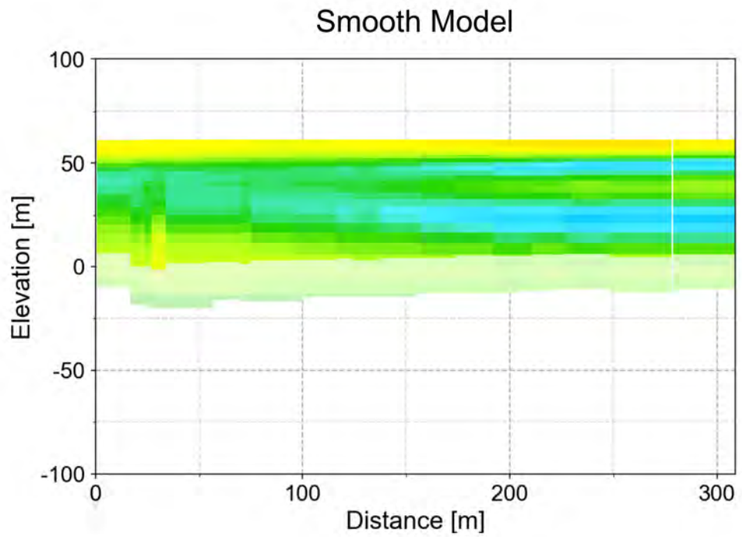
tTEM Model Section





Legend for Maps

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- Quaternary fault (USGS, 2018)



Legend for Model Sections

Smooth model

Spatially constrained inversion (30 layers)

Above DOI*

Below DOI*

3 10 100 300

Resistivity [ohm-m]

*DOI = Depth of investigation

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Santa Rosa Plain GSA
Sonoma County, CA

RAMBOLL

COLLIER GEOPHYSICS

Sonoma County Water Agency
Project #: 1940113846

Coordinate Reference System: EPSG 2226 - NAD83 / California zone 2 (ftUS)

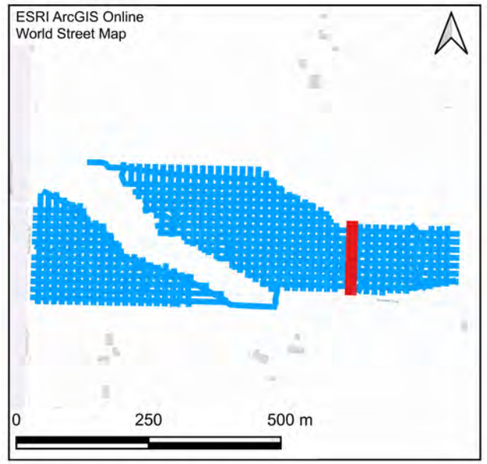
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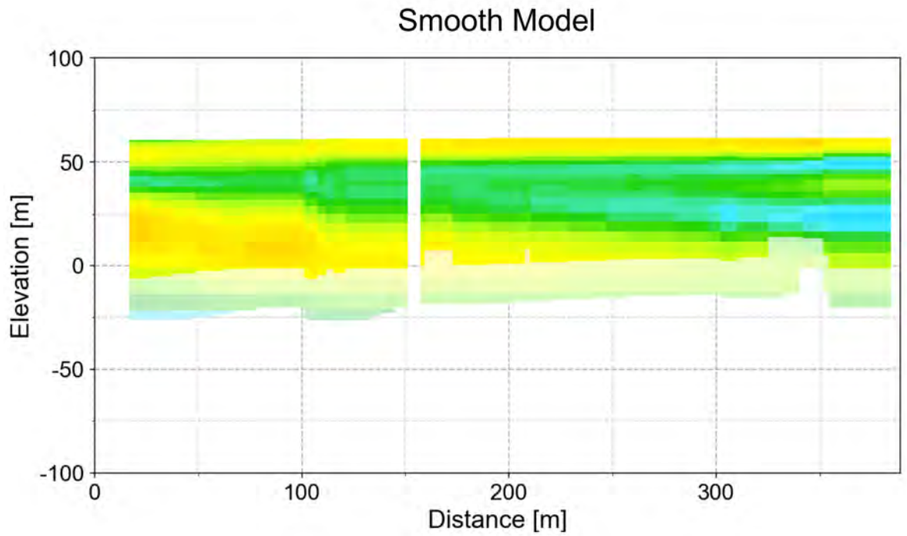
SCWA GSA tTEM Survey: Line 205000 0-389 m

tTEM Model Section









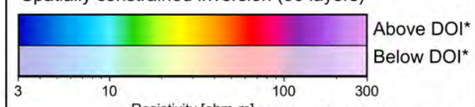
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Legend for Model Sections

Smooth model

Spatially constrained inversion (30 layers)



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COLLIER GEOPHYSICS

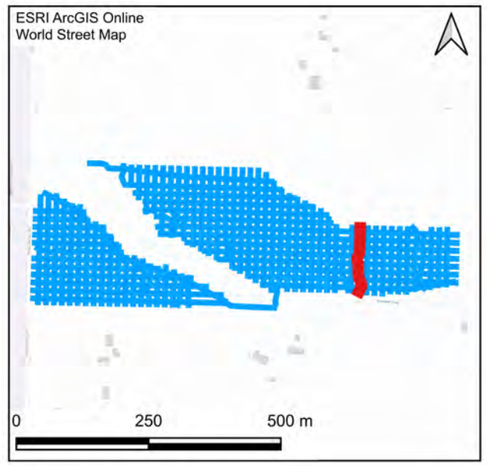
Sonoma County Water Agency
Project #: 1940113846

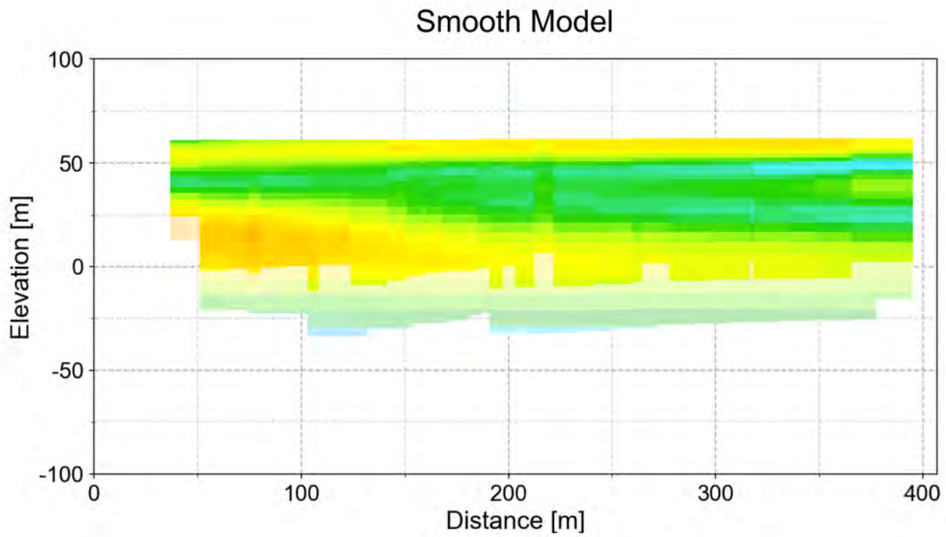
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Date: 2025-12-30, Created by: JP, Checked by: JC, Approved by: TPK

SCWA GSA tTEM Survey: Line 205100 0-407 m

tTEM Model Section







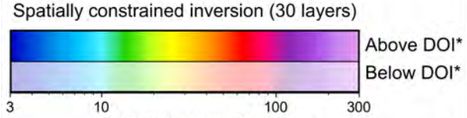
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Legend for Model Sections

Smooth model

Spatially constrained inversion (30 layers)



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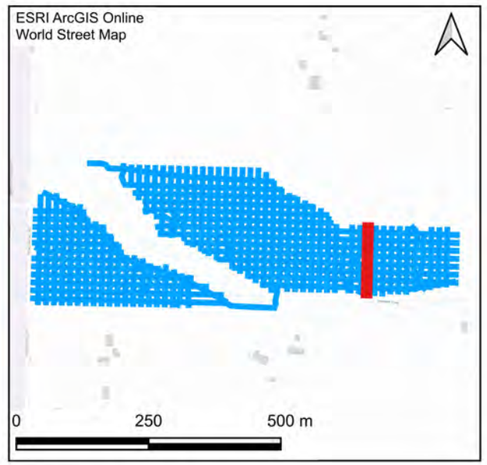
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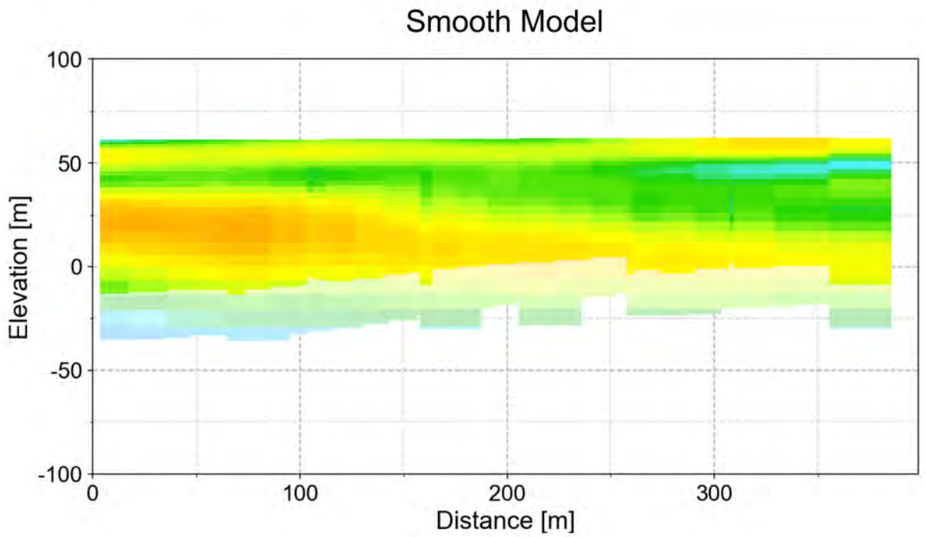
SCWA GSA tTEM Survey: Line 205200 0-398 m

tTEM Model Section









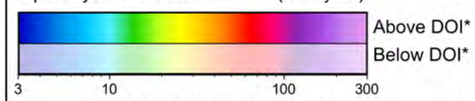
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Legend for Model Sections

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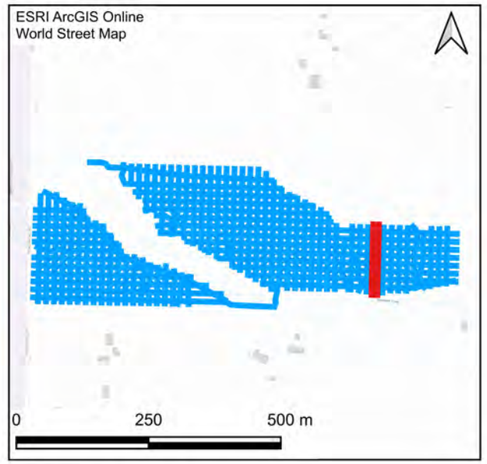
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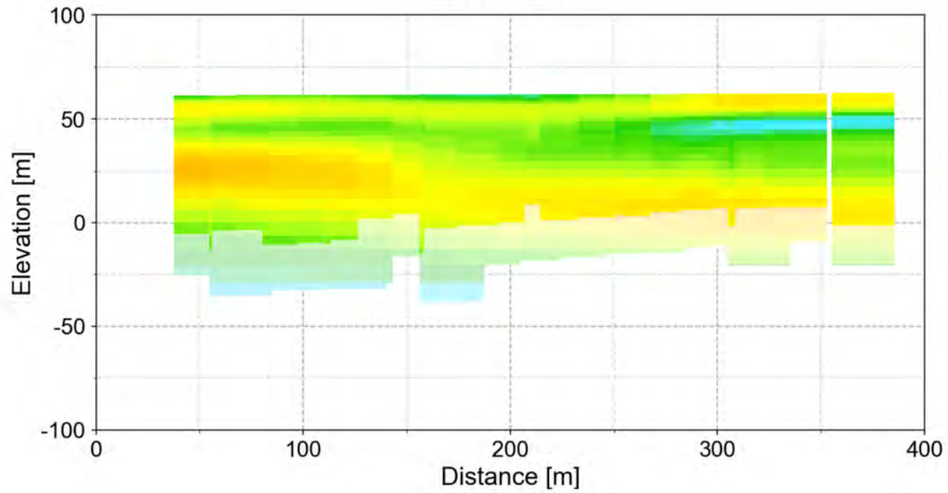
SCWA GSA tTEM Survey: Line 205300 0-400 m

tTEM Model Section





Smooth Model



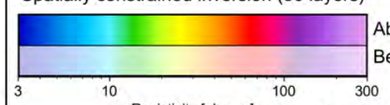
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Legend for Model Sections

Smooth model

Spatially constrained inversion (30 layers)



*DOI = Depth of investigation

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COLLIER GEOPHYSICS

Sonoma County Water Agency
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Coordinate Reference System: EPSG 2226 - NAD83 / California zone 2 (ftUS)

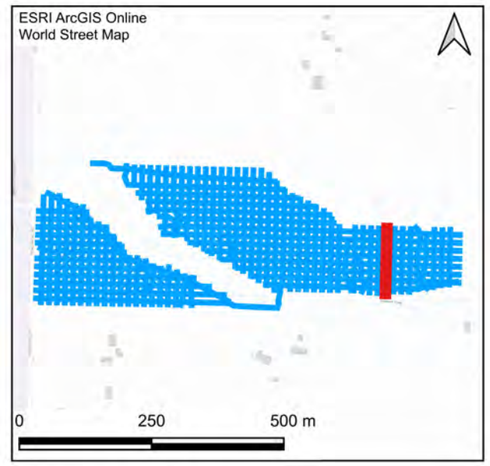
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SCWA GSA tTEM Survey: Line 205400 0-402 m

tTEM Model Section

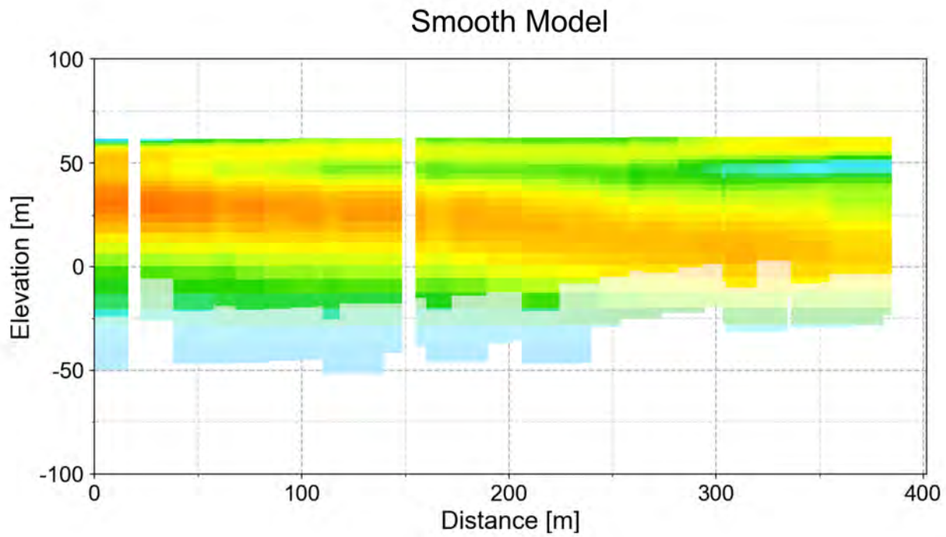






Legend for Maps

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Legend for Model Sections

Smooth model

Spatially constrained inversion (30 layers)

Above DOI*

Below DOI*

3 10 100 300

Resistivity [ohm-m]

*DOI = Depth of investigation

Copeland Creek tTEM Results
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Sonoma County, CA

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COLLIER GEOPHYSICS

Sonoma County Water Agency
Project #: 1940113846

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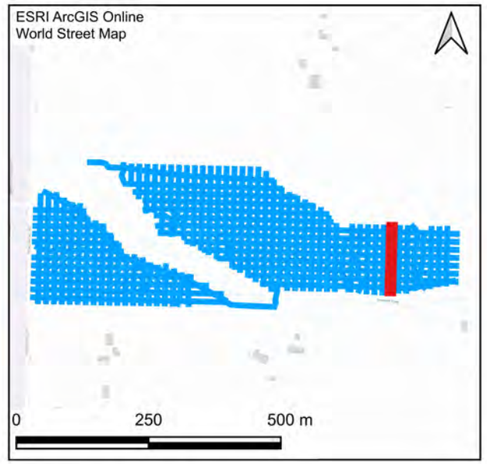
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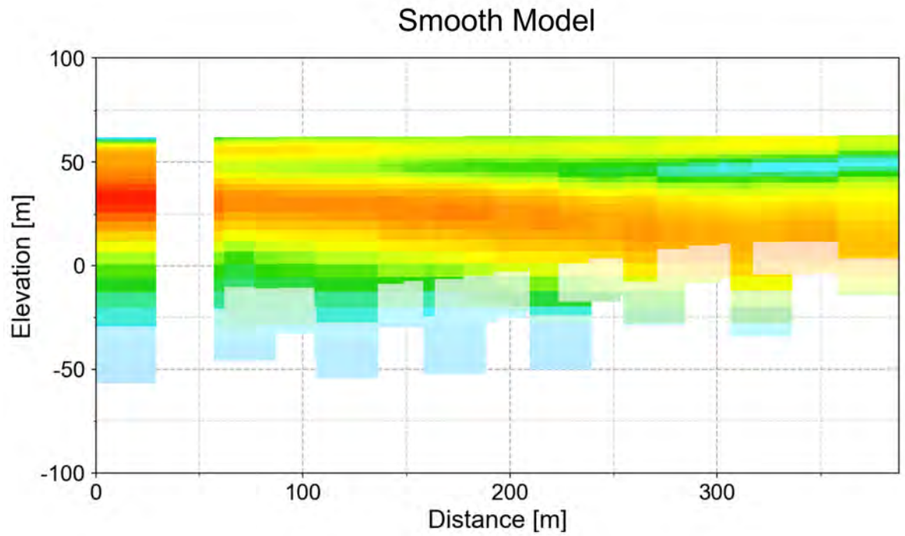
SCWA GSA tTEM Survey: Line 205500 0-388 m

tTEM Model Section









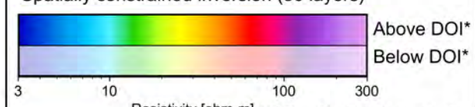
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Legend for Model Sections

Smooth model

Spatially constrained inversion (30 layers)



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COLLIER GEOPHYSICS

Sonoma County Water Agency
Project #: 1940113846

Coordinate Reference System: EPSG 2226 - NAD83 / California zone 2 (ftUS)

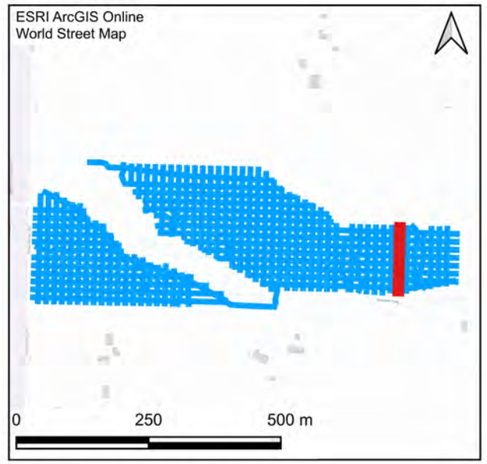
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SCWA GSA tTEM Survey: Line 205600 0-388 m

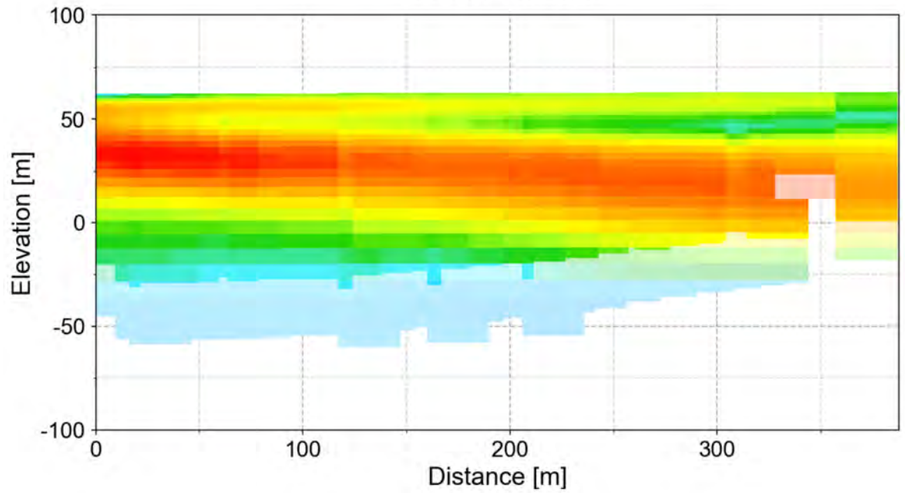
tTEM Model Section







Smooth Model



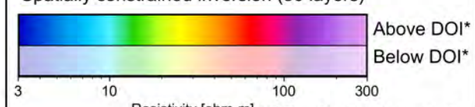
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Legend for Model Sections

Smooth model

Spatially constrained inversion (30 layers)



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COLLIER GEOPHYSICS

Sonoma County Water Agency
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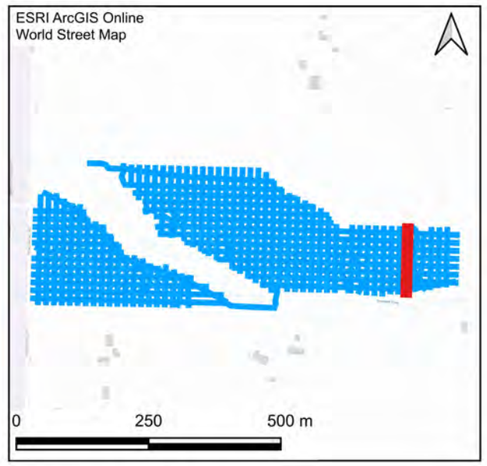
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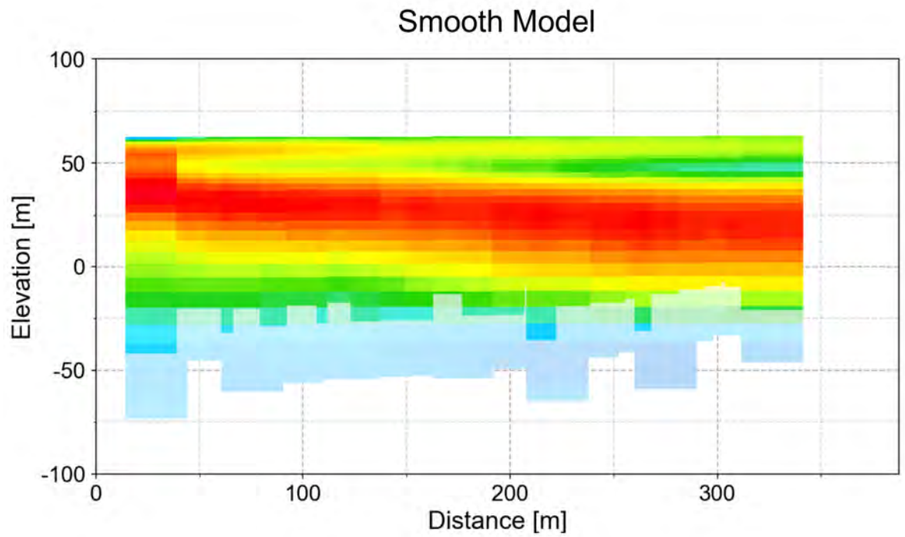
SCWA GSA tTEM Survey: Line 205700 0-388 m

tTEM Model Section









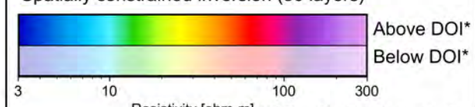
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Legend for Model Sections

Smooth model

Spatially constrained inversion (30 layers)



Copeland Creek tTEM Results
Santa Rosa Plain GSA
Sonoma County, CA

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Sonoma County Water Agency
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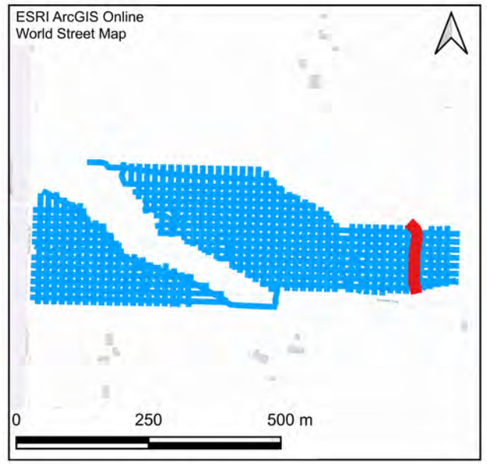
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Date: 2025-12-30, Created by: JP, Checked by: JC, Approved by: TPK

SCWA GSA tTEM Survey: Line 205800 0-390 m

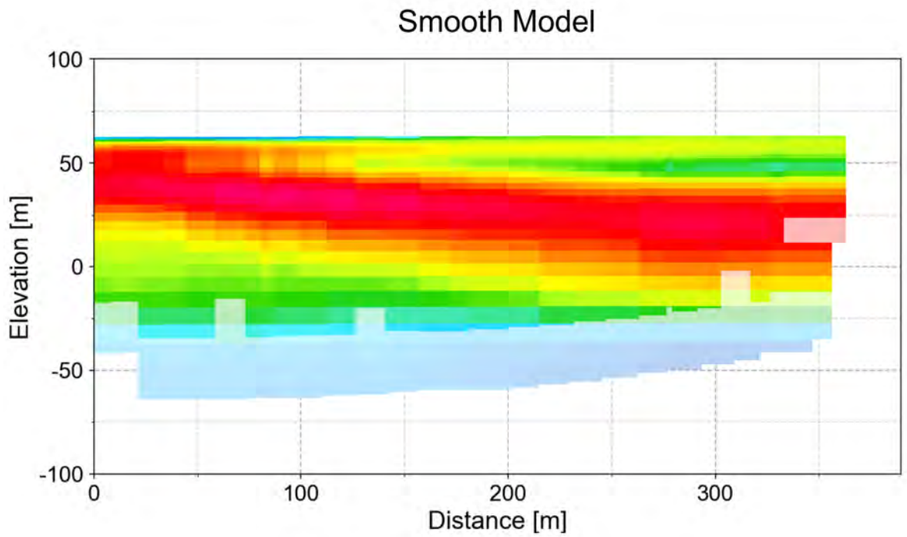
tTEM Model Section





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Legend for Model Sections

Smooth model

Spatially constrained inversion (30 layers)

Above DOI*

Below DOI*

3 10 100 300

Resistivity [ohm-m] *DOI = Depth of investigation

Copeland Creek tTEM Results
Santa Rosa Plain GSA
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RAMBOLL

COLLIER GEOPHYSICS

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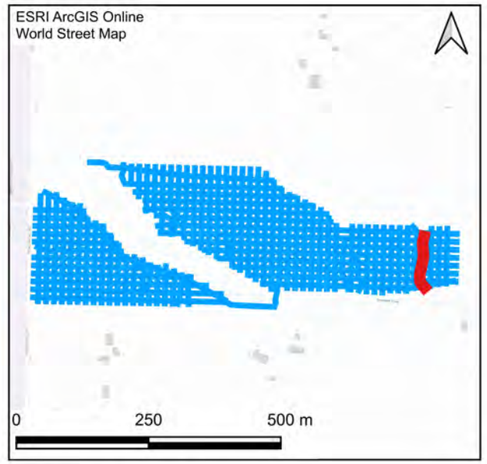
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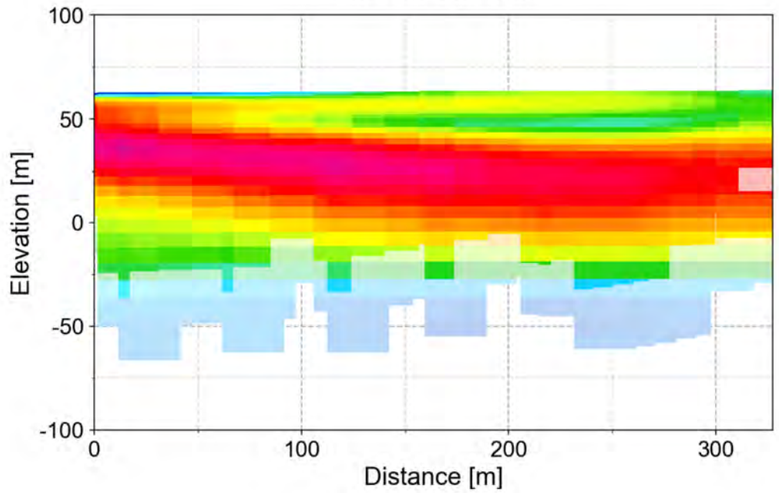
SCWA GSA tTEM Survey: Line 205900 0-327 m

tTEM Model Section





Smooth Model



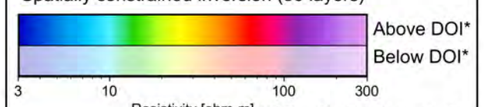
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Legend for Model Sections

Smooth model

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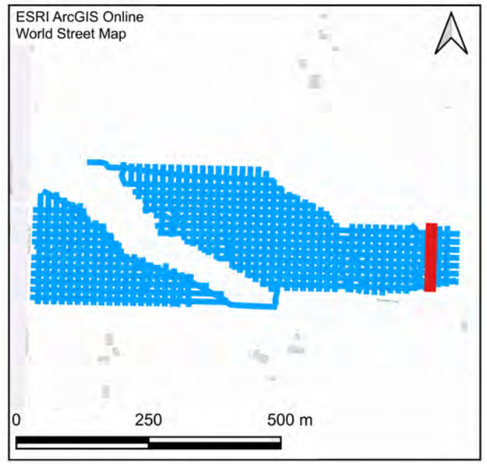
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SCWA GSA tTEM Survey: Line 206000 0-354 m

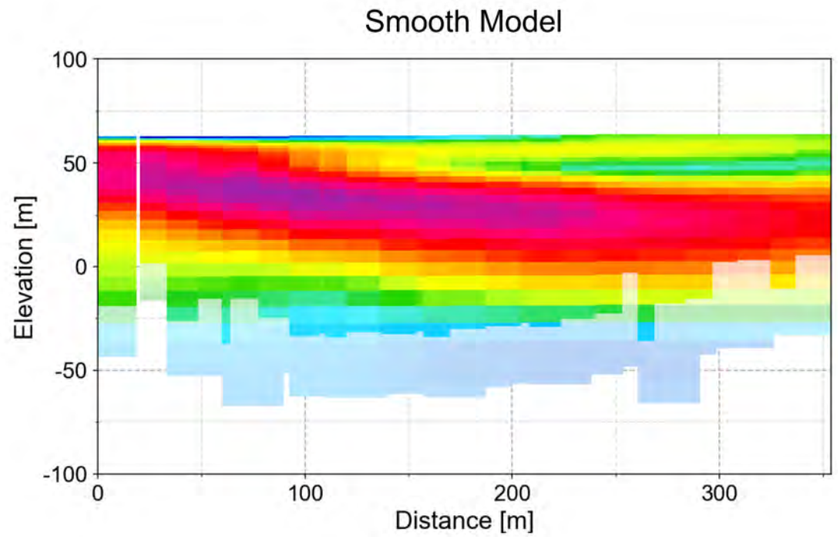
tTEM Model Section





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Legend for Model Sections

Smooth model

Spatially constrained inversion (30 layers)

Above DOI*

Below DOI*

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Resistivity [ohm-m] *DOI = Depth of investigation

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Sonoma County, CA

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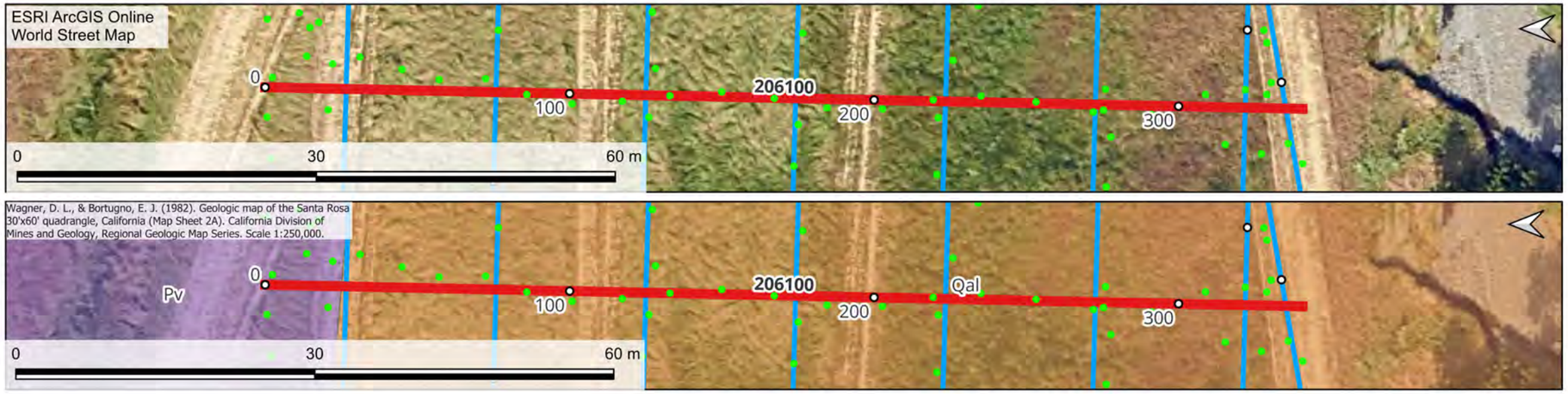
Sonoma County Water Agency
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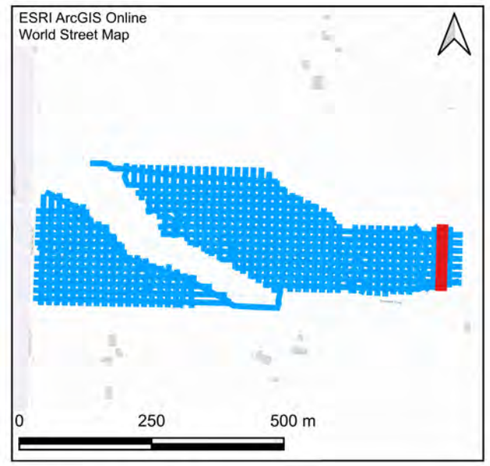
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Date: 2025-12-30, Created by: JP, Checked by: JC, Approved by: TPK

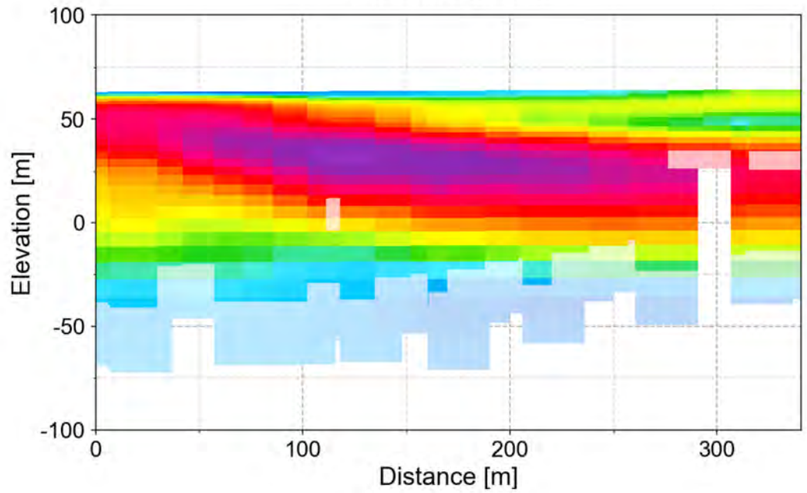
SCWA GSA tTEM Survey: Line 206100 0-341 m

tTEM Model Section





Smooth Model



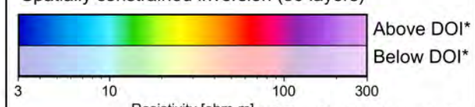
Legend for Maps

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- Pipelines (AmeriGEOSS, 2022)
- Quaternary fault (USGS, 2018)

Legend for Model Sections

Smooth model

Spatially constrained inversion (30 layers)



*DOI = Depth of investigation

Copeland Creek tTEM Results
Santa Rosa Plain GSA
Sonoma County, CA

RAMBOLL

COLLIER GEOPHYSICS

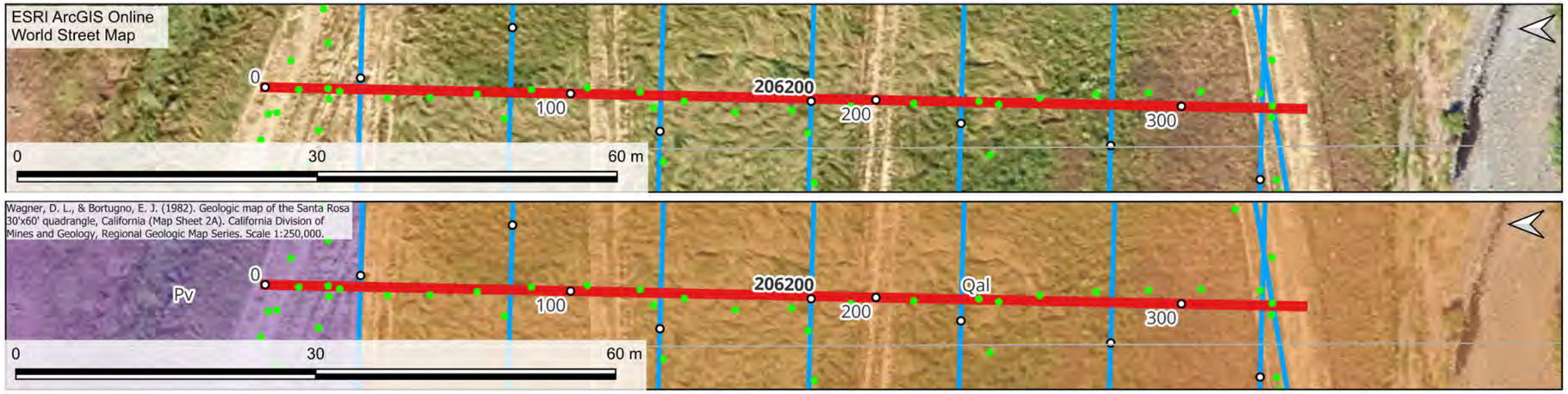
Sonoma County Water Agency
Project #: 1940113846

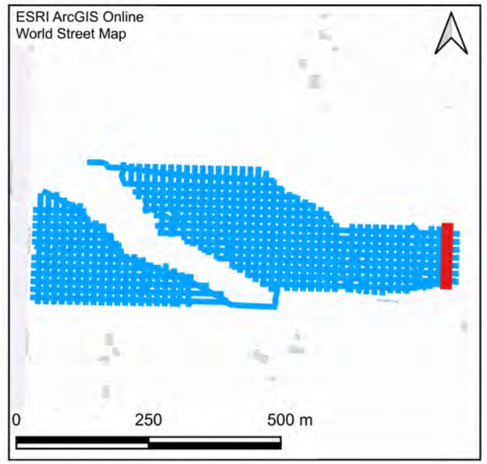
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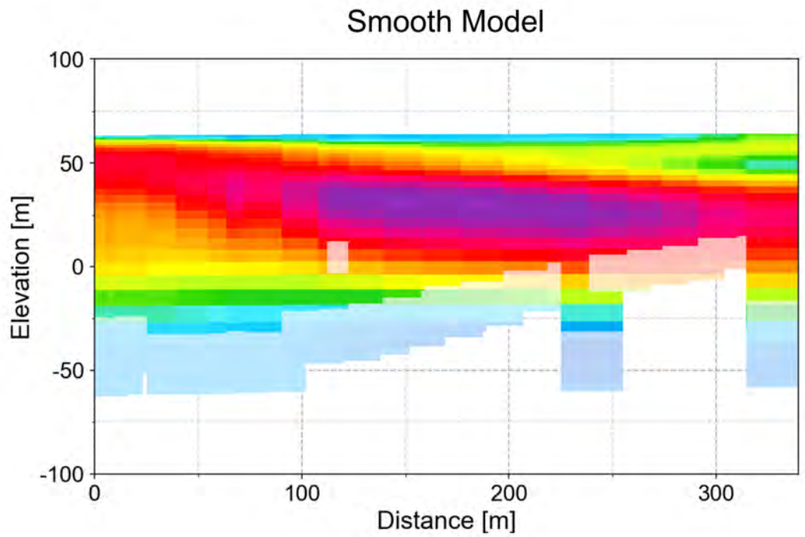
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SCWA GSA tTEM Survey: Line 206200 0-340 m

tTEM Model Section







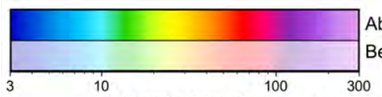
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Legend for Model Sections

Smooth model

Spatially constrained inversion (30 layers)



Copeland Creek tTEM Results
Santa Rosa Plain GSA
Sonoma County, CA

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COLLIER GEOPHYSICS

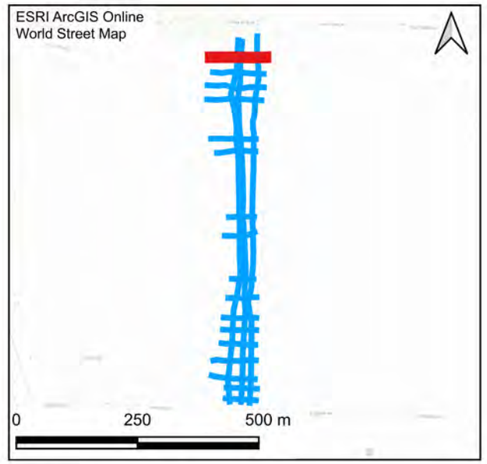
Sonoma County Water Agency
Project #: 1940113846

Coordinate Reference System: EPSG 2226 - NAD83 / California zone 2 (ftUS)
Date: 2025-12-30, Created by: JP, Checked by: JC, Approved by: TPK

SCWA GSA tTEM Survey: Line 500100 0-371 m

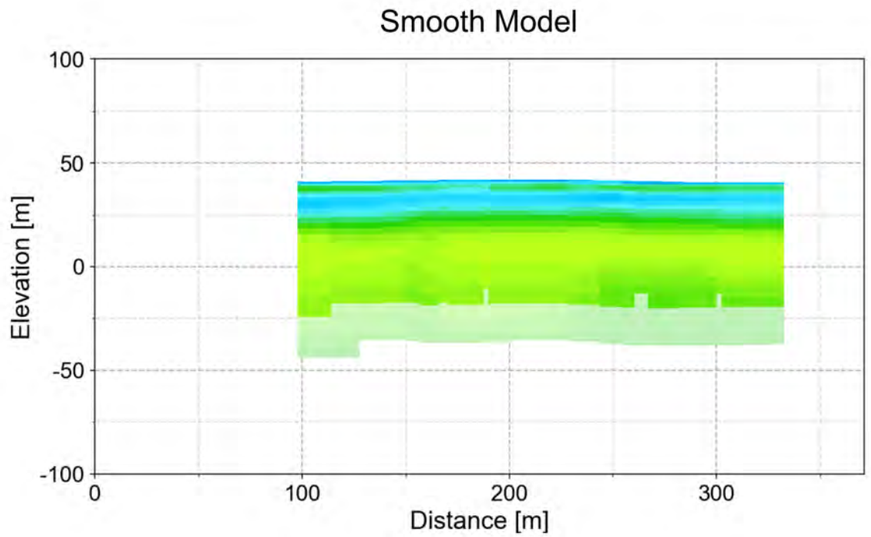
tTEM Model Section





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- Basin Boundary



Legend for Model Sections

Smooth model

Spatially constrained inversion (30 layers)

Above DOI*

Below DOI*

3 10 100 300

Resistivity [ohm-m] *DOI = Depth of investigation

Valley House Drive tTEM Results
Santa Rosa Plain and Petaluma Valley GSA
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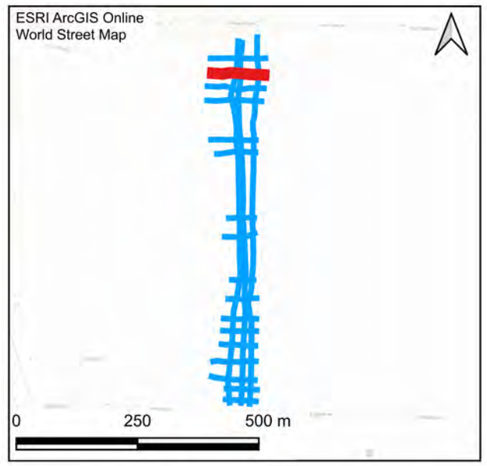
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Date: 2025-12-30, Created by: JP, Checked by: JC, Approved by: TPK

SCWA GSA tTEM Survey: Line 500200 0-345 m

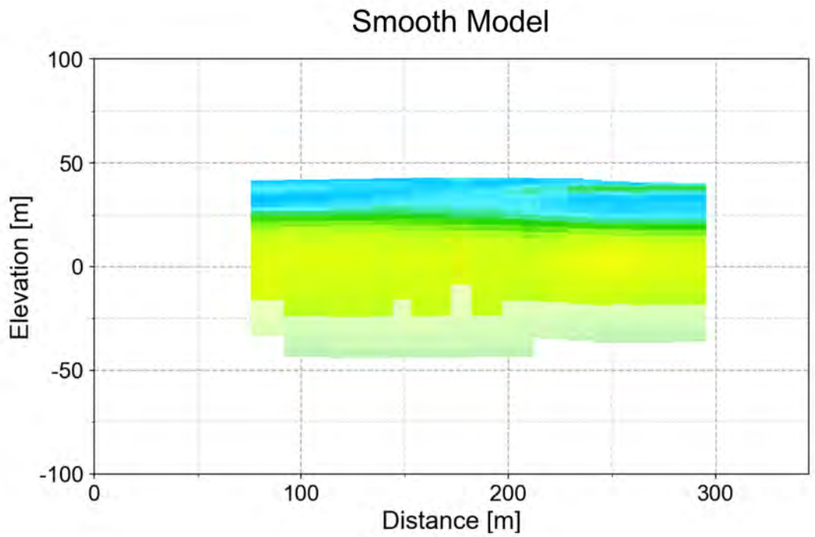
tTEM Model Section





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- Basin Boundary



Legend for Model Sections

Smooth model

Spatially constrained inversion (30 layers)

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Resistivity [ohm-m]

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Santa Rosa Plain and Petaluma Valley GSA
Sonoma County, CA

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Sonoma County Water Agency
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1940113846

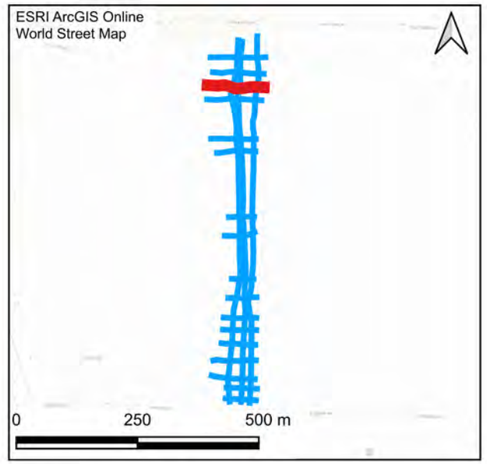
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Date: 2025-12-30, Created by: JP, Checked by: JC, Approved by: TPK

SCWA GSA tTEM Survey: Line 500300 0-386 m

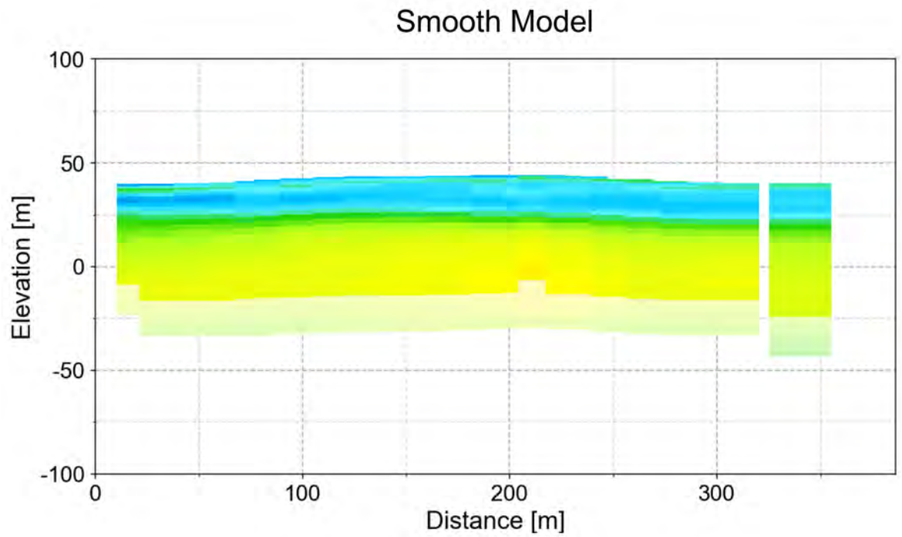
tTEM Model Section





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Legend for Model Sections

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Resistivity [ohm-m] *DOI = Depth of investigation

Valley House Drive tTEM Results
Santa Rosa Plain and Petaluma Valley GSA
Sonoma County, CA

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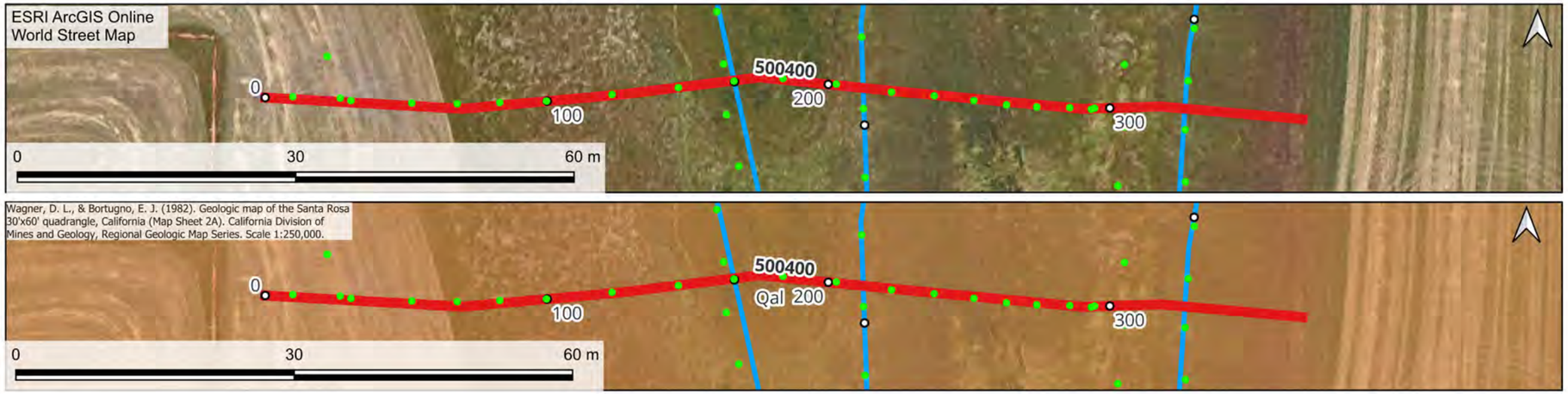
Sonoma County Water Agency
Project #: 1940113846

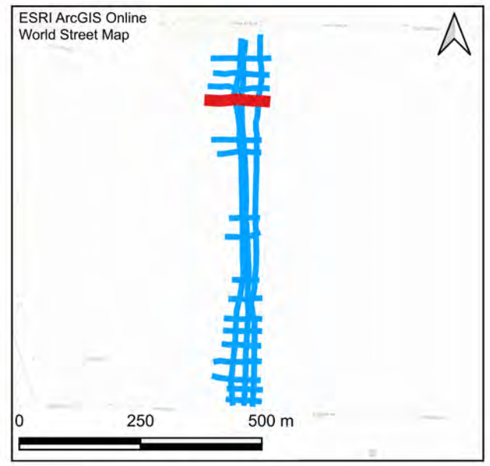
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SCWA GSA tTEM Survey: Line 500400 0-368 m

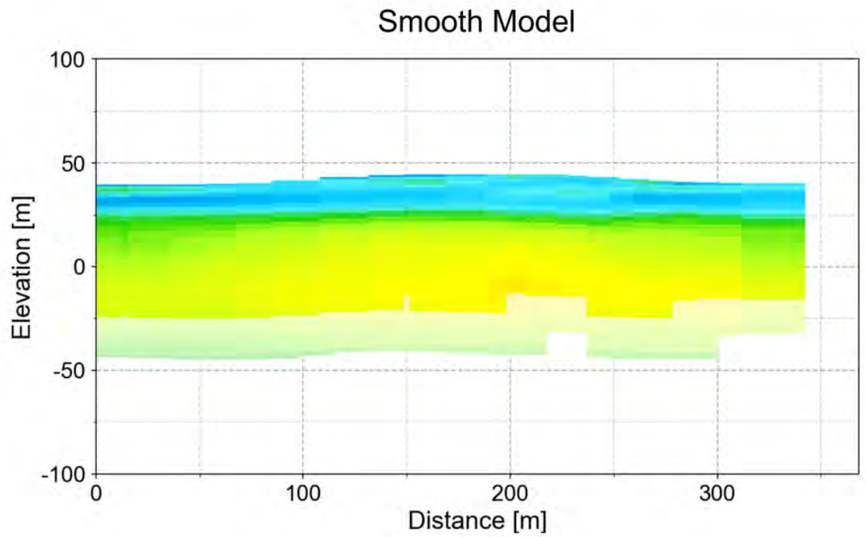
tTEM Model Section





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Legend for Model Sections

Smooth model

Spatially constrained inversion (30 layers)

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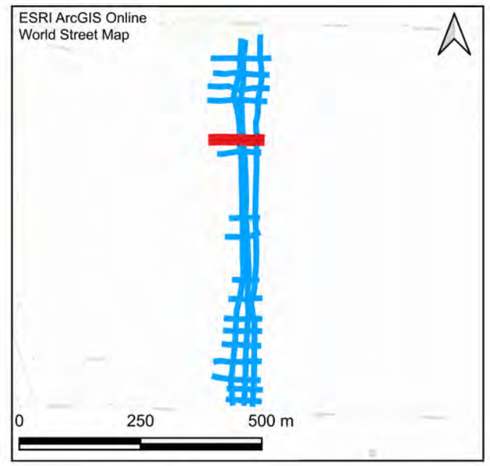
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SCWA GSA tTEM Survey: Line 500500 0-302 m

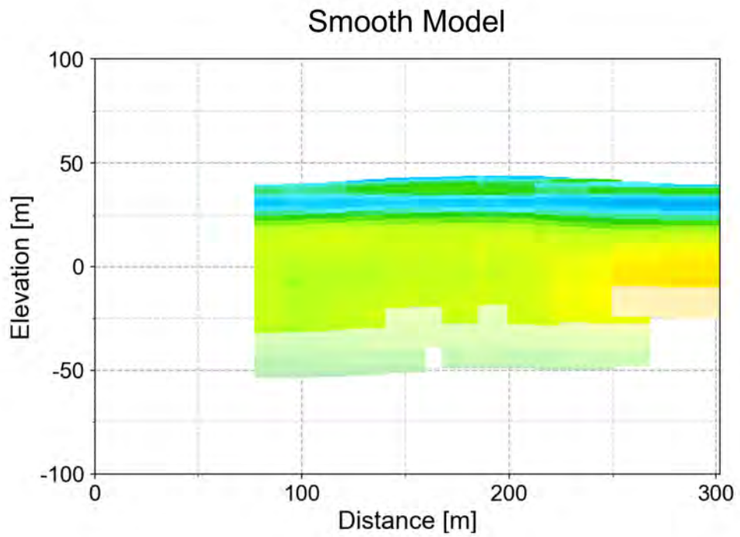
tTEM Model Section





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Legend for Model Sections

Smooth model

Spatially constrained inversion (30 layers)

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Resistivity [ohm-m]

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Valley House Drive tTEM Results
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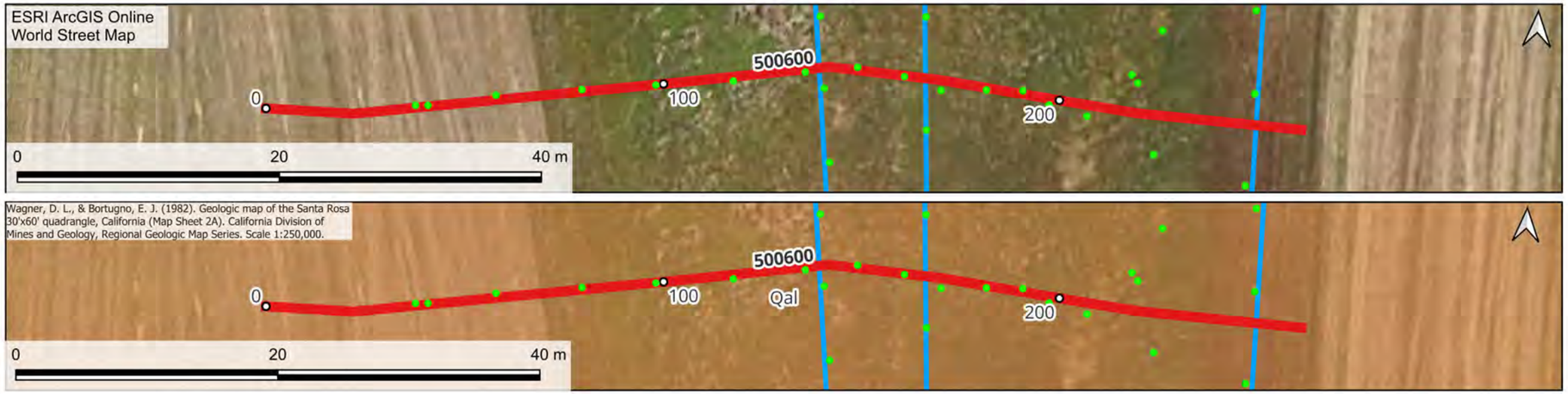
Sonoma County Water Agency
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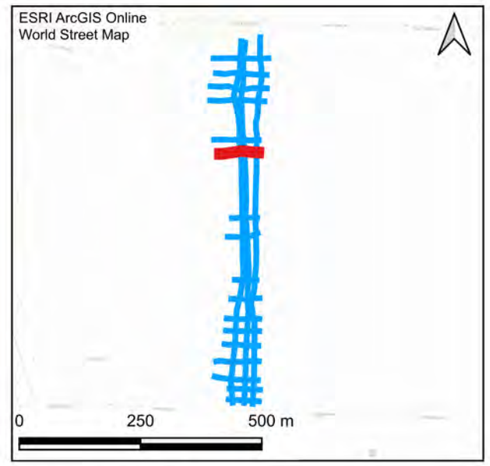
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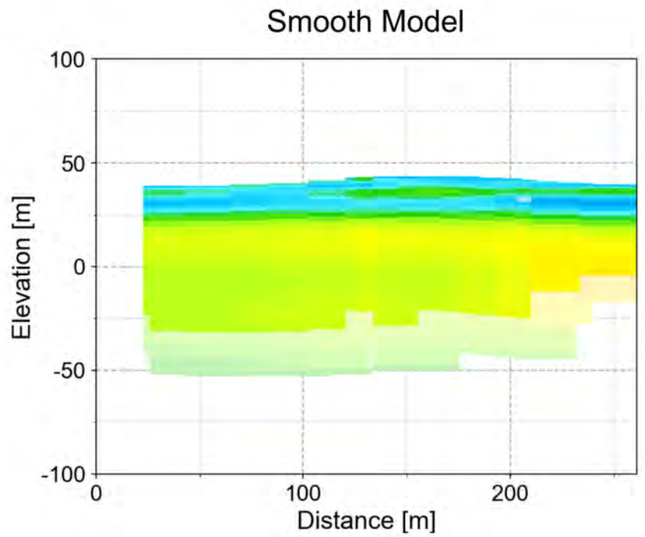
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SCWA GSA tTEM Survey: Line 500600 0-261 m

tTEM Model Section







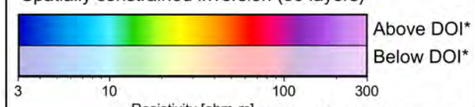
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Smooth model

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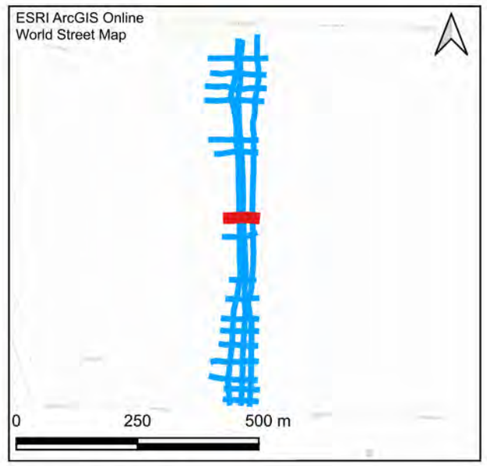
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SCWA GSA tTEM Survey: Line 500700 0-171 m

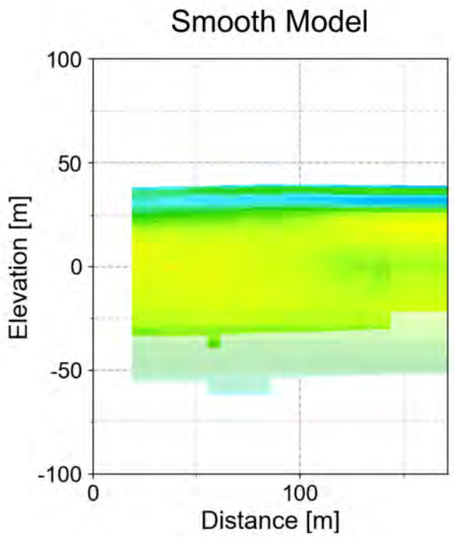
tTEM Model Section





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Legend for Model Sections

Smooth model

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Resistivity [ohm-m]

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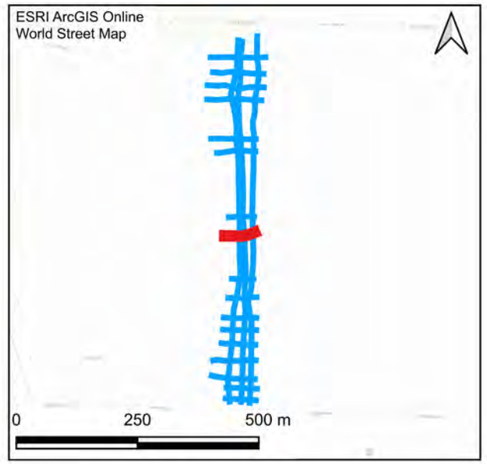
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SCWA GSA tTEM Survey: Line 500800 0-205 m

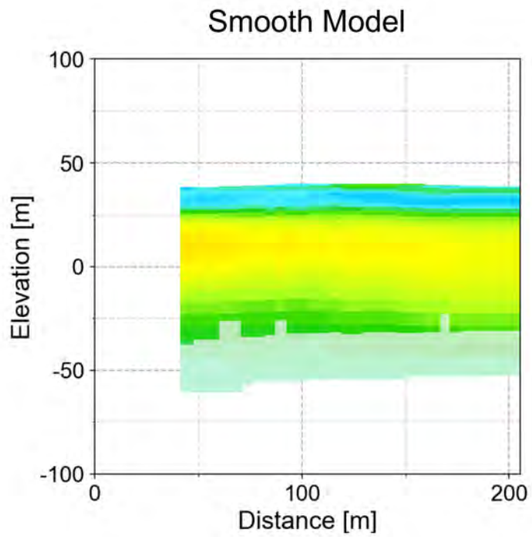
tTEM Model Section





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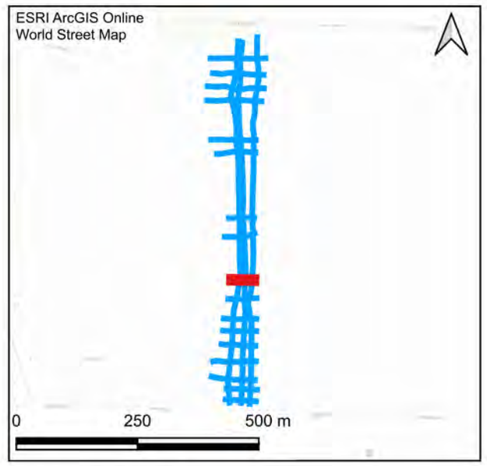
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SCWA GSA tTEM Survey: Line 500900 0-145 m

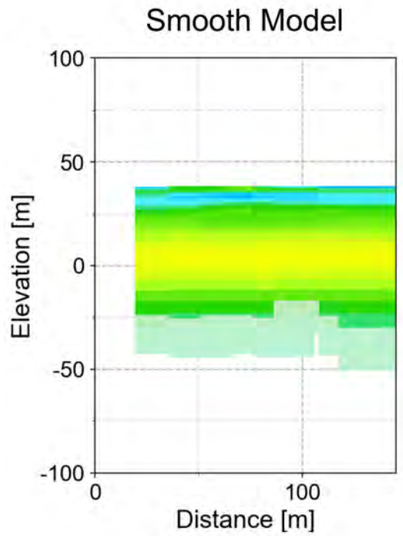
tTEM Model Section





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Legend for Model Sections

Smooth model

Spatially constrained inversion (30 layers)

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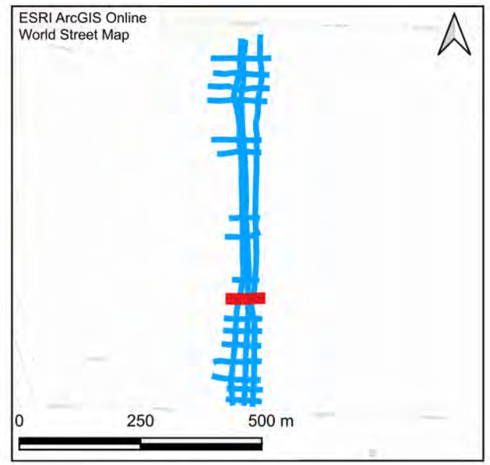
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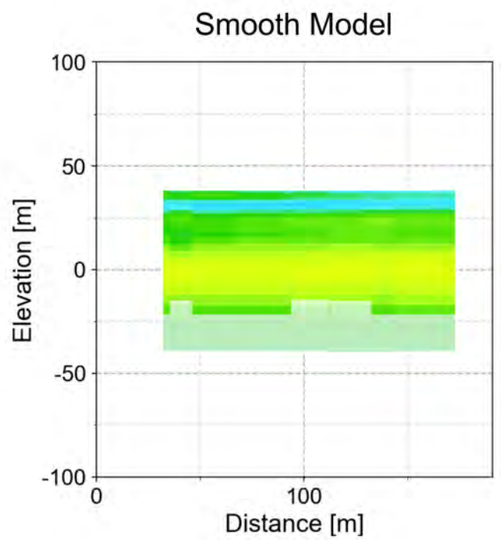
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SCWA GSA tTEM Survey: Line 501000 0-191 m

tTEM Model Section







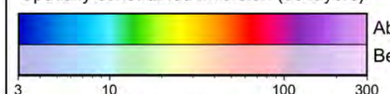
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Legend for Model Sections

Smooth model

Spatially constrained inversion (30 layers)



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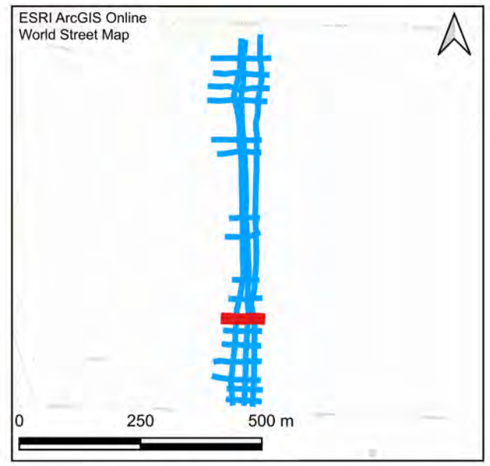
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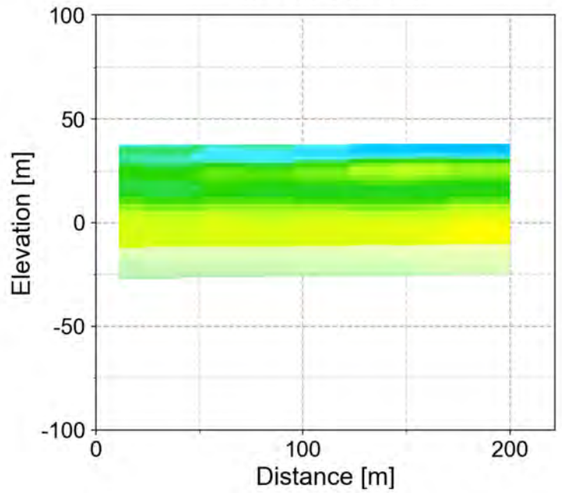
SCWA GSA tTEM Survey: Line 501100 0-222 m

tTEM Model Section





Smooth Model



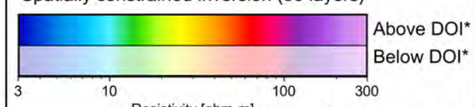
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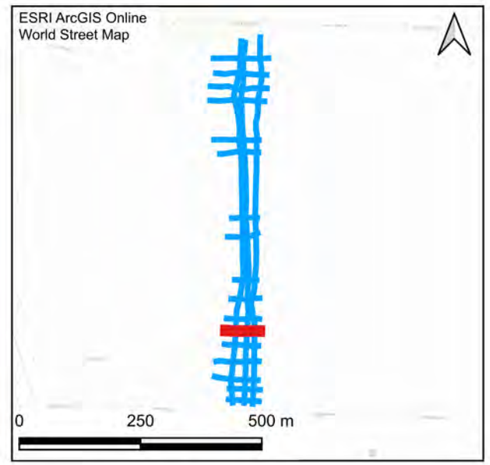
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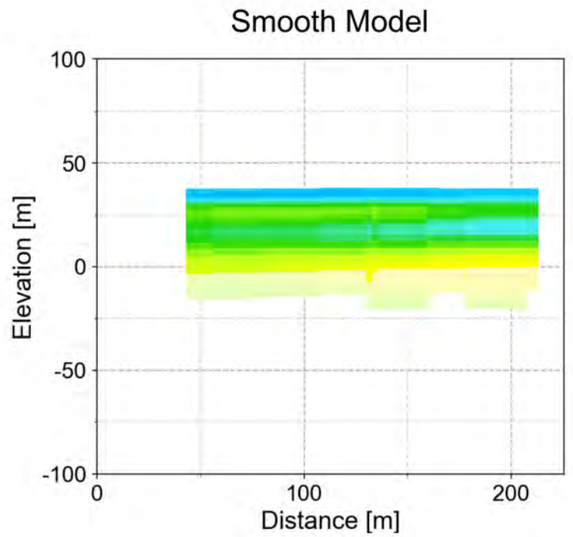
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SCWA GSA tTEM Survey: Line 501200 0-225 m

tTEM Model Section







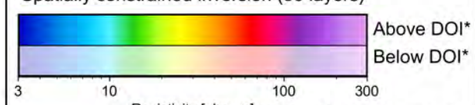
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- Pipelines (AmeriGEOSS, 2022)
- Quaternary fault (USGS, 2018)
- Basin Boundary

Legend for Model Sections

Smooth model

Spatially constrained inversion (30 layers)



Valley House Drive tTEM Results
Santa Rosa Plain and Petaluma Valley GSA
Sonoma County, CA

RAMBOLL

COLLIER GEOPHYSICS

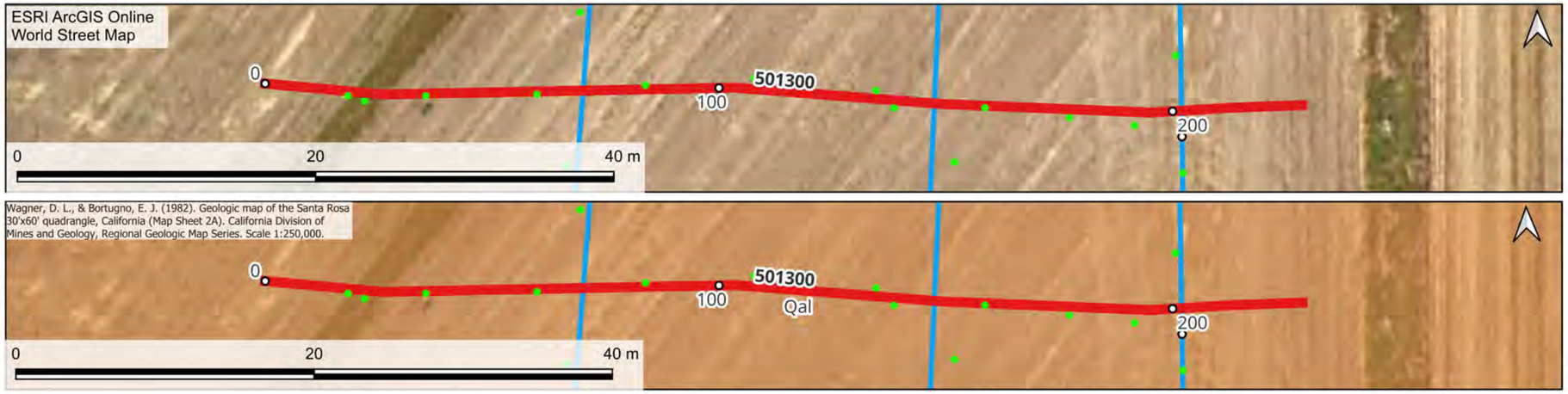
Sonoma County Water Agency
Project #:
1940113846

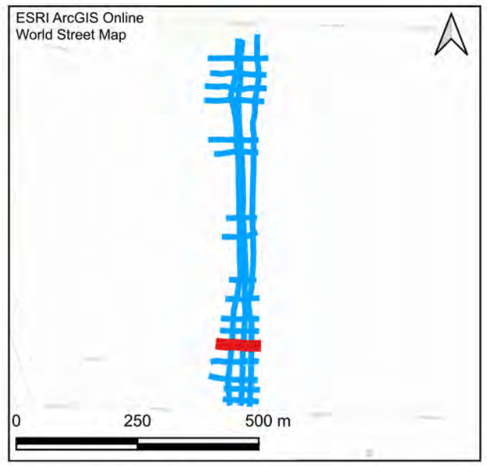
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Date: 2025-12-30, Created by: JP, Checked by: JC, Approved by: TPK

SCWA GSA tTEM Survey: Line 501300 0-229 m

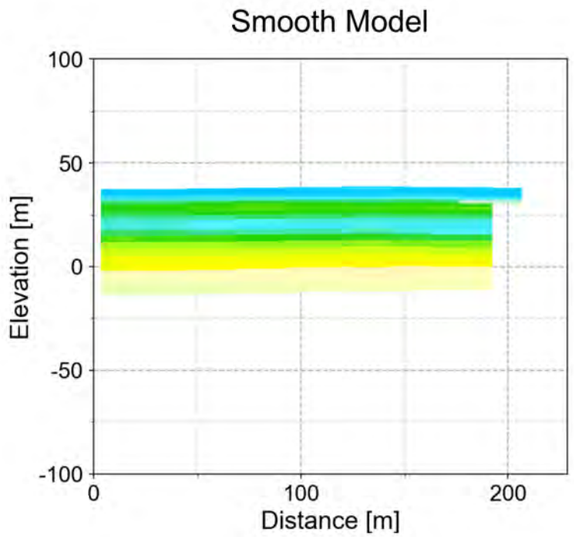
tTEM Model Section





Legend for Maps

- tTEM data used for inversion
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- Pipelines (AmeriGEOSS, 2022)
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Legend for Model Sections

Smooth model

Spatially constrained inversion (30 layers)

Above DOI*

Below DOI*

3 10 100 300

Resistivity [ohm-m] *DOI = Depth of investigation

Valley House Drive tTEM Results
Santa Rosa Plain and Petaluma Valley GSA
Sonoma County, CA

RAMBOLL

COLLIER GEOPHYSICS

Sonoma County Water Agency
Project #:
1940113846

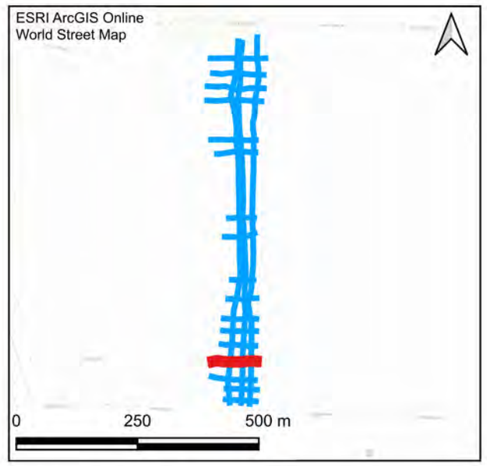
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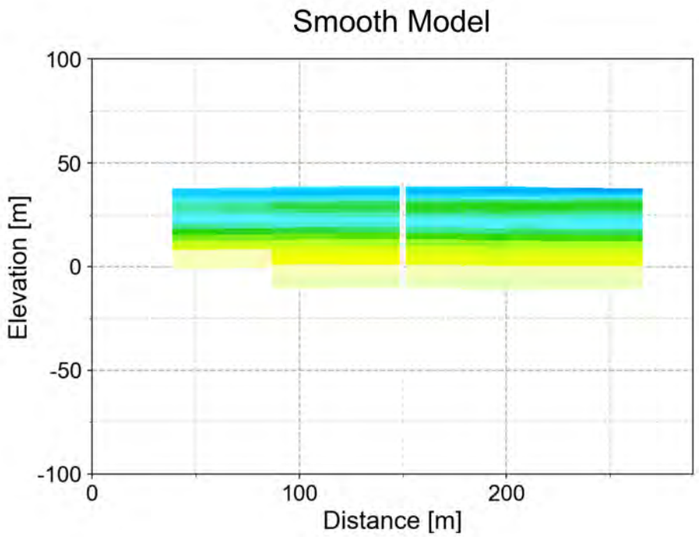
tTEM Model Section





Legend for Maps

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Legend for Model Sections

Smooth model

Spatially constrained inversion (30 layers)

Above DOI*

Below DOI*

3 10 100 300

Resistivity [ohm-m] *DOI = Depth of investigation

Valley House Drive tTEM Results
Santa Rosa Plain and Petaluma Valley GSA
Sonoma County, CA

RAMBOLL

COLLIER GEOPHYSICS

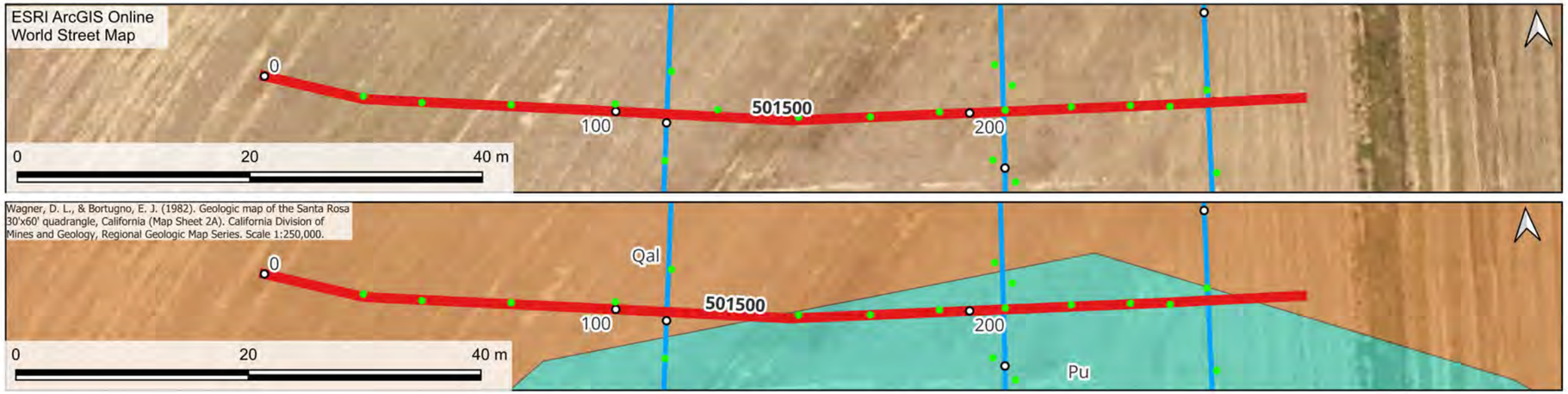
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Project #: 1940113846

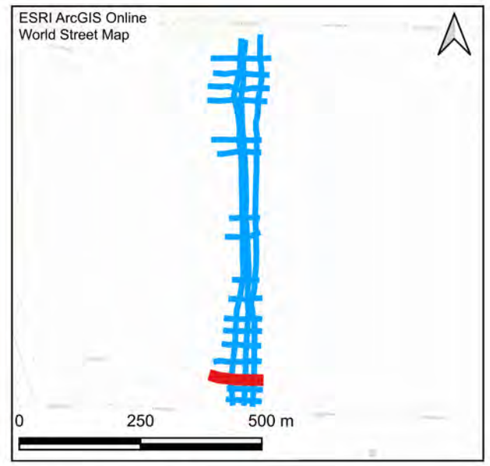
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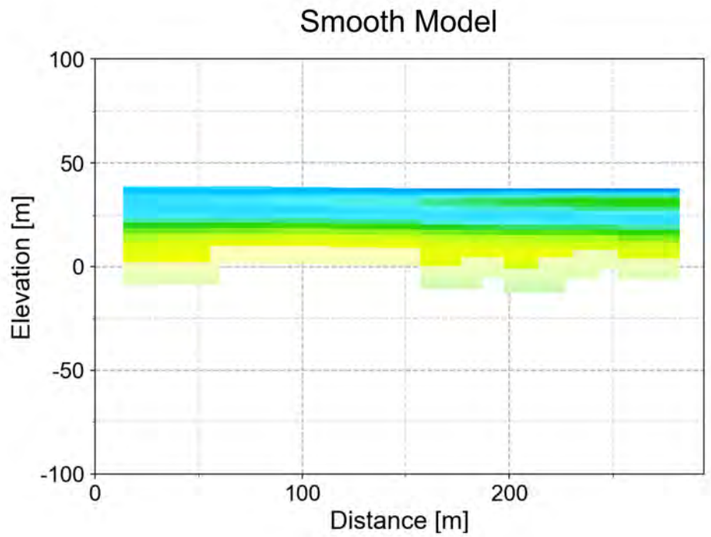
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SCWA GSA tTEM Survey: Line 501500 0-294 m

tTEM Model Section







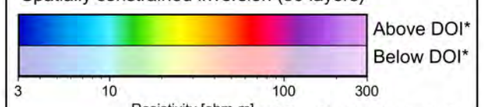
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Sonoma County, CA

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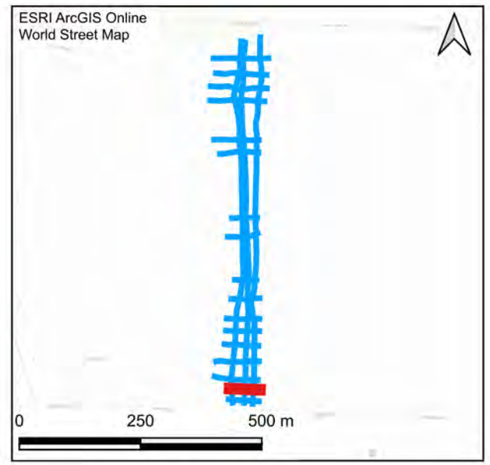
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Project #: 1940113846

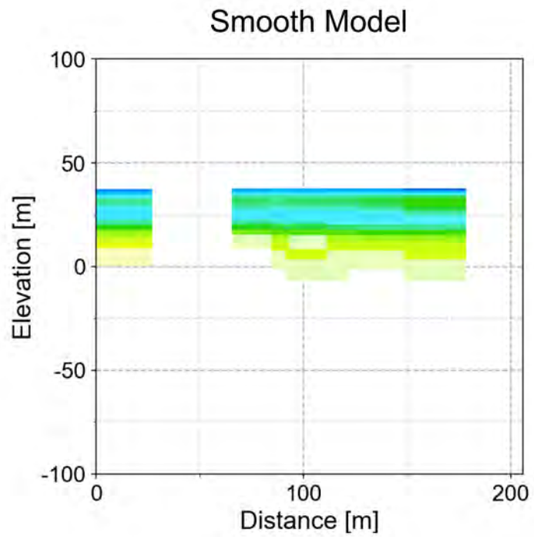
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SCWA GSA tTEM Survey: Line 501600 0-206 m

tTEM Model Section







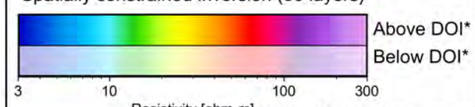
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Legend for Model Sections

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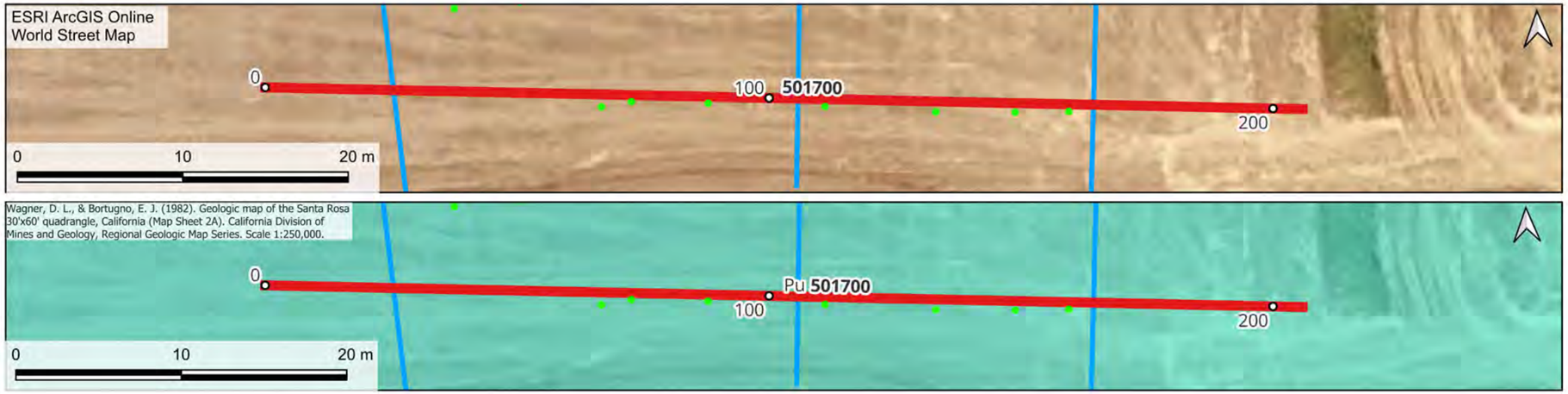
Sonoma County Water Agency
Project #: 1940113846

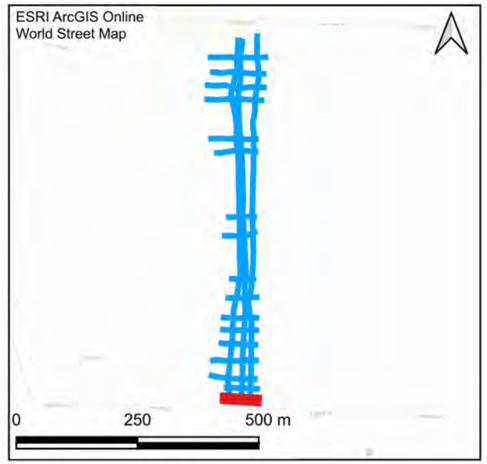
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SCWA GSA tTEM Survey: Line 501700 0-206 m

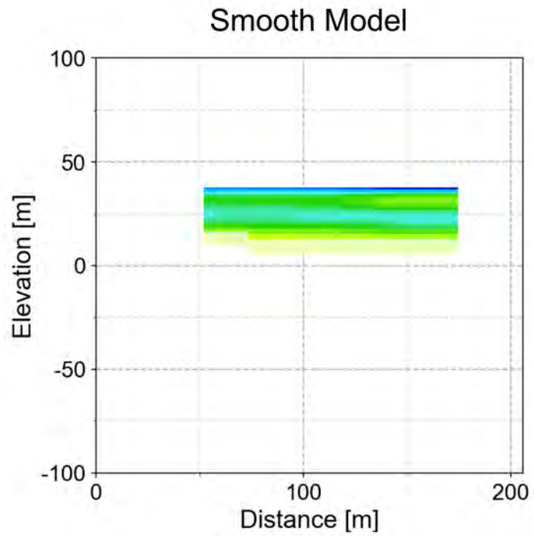
tTEM Model Section





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Legend for Model Sections

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Above DOI*

Below DOI*

3 10 100 300

Resistivity [ohm-m] *DOI = Depth of investigation

Valley House Drive tTEM Results
Santa Rosa Plain and Petaluma Valley GSA
Sonoma County, CA

RAMBOLL

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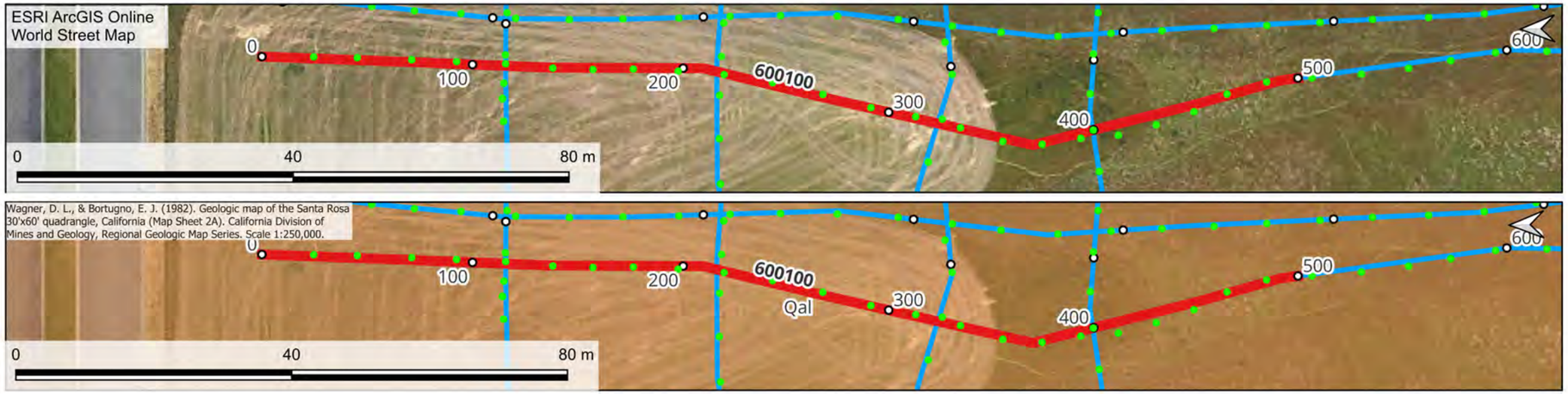
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Project #: 1940113846

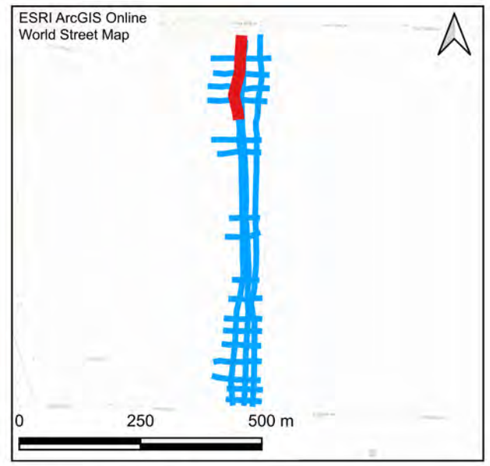
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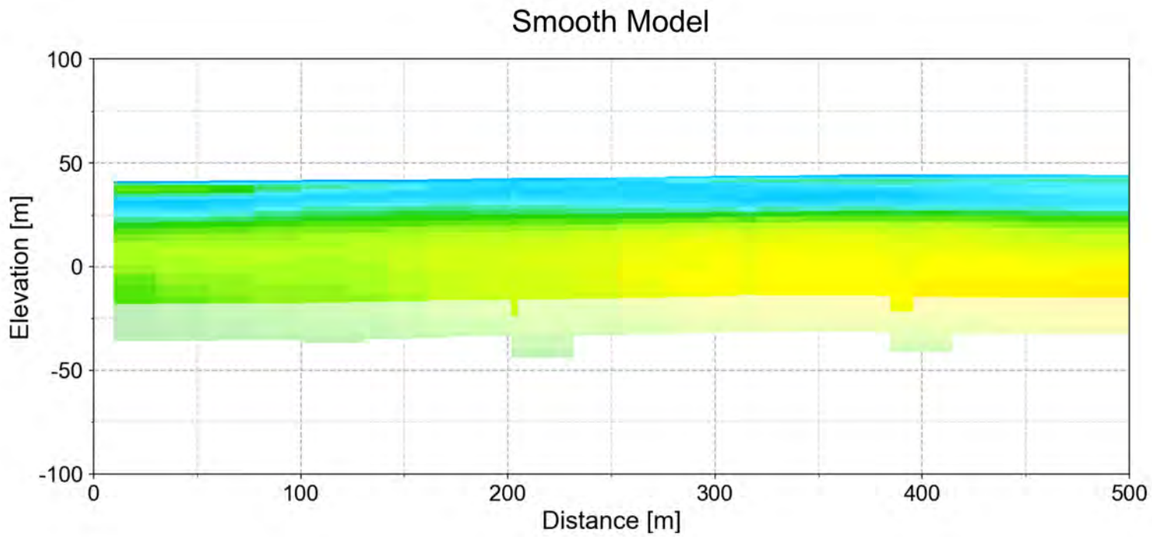
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SCWA GSA tTEM Survey: Line 600100 0-500 m

tTEM Model Section







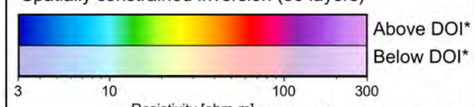
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RAMBOLL

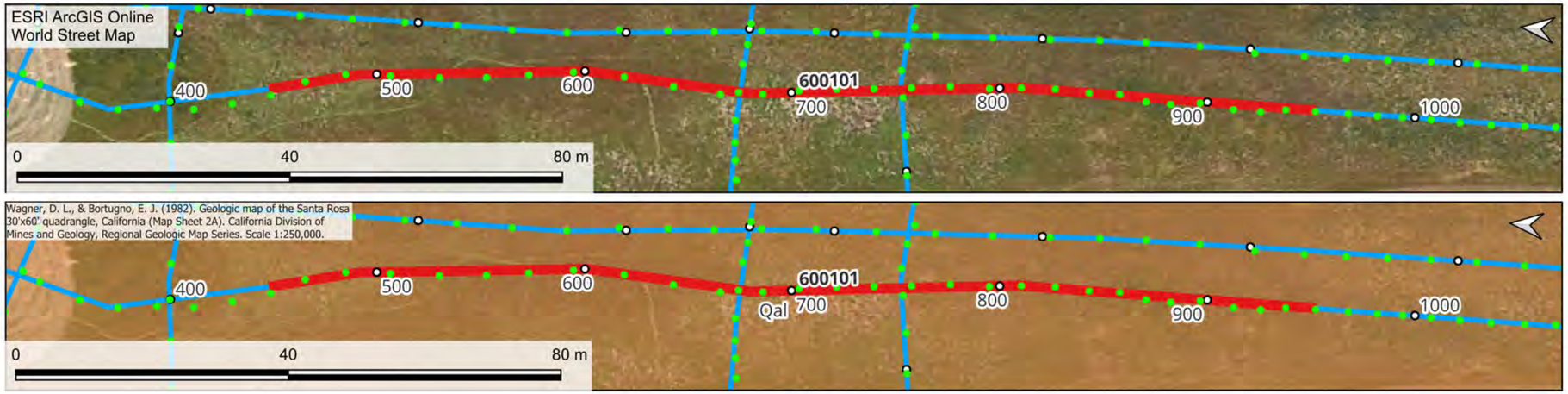
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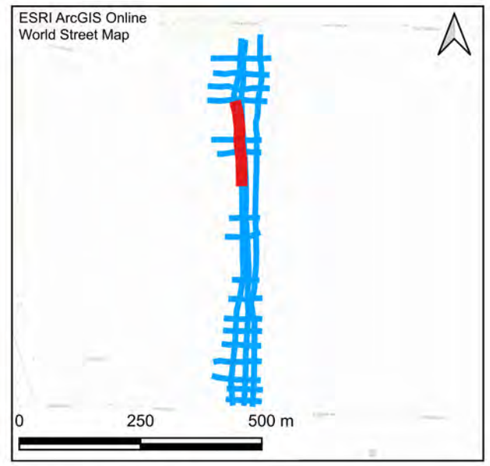
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Project #: 1940113846

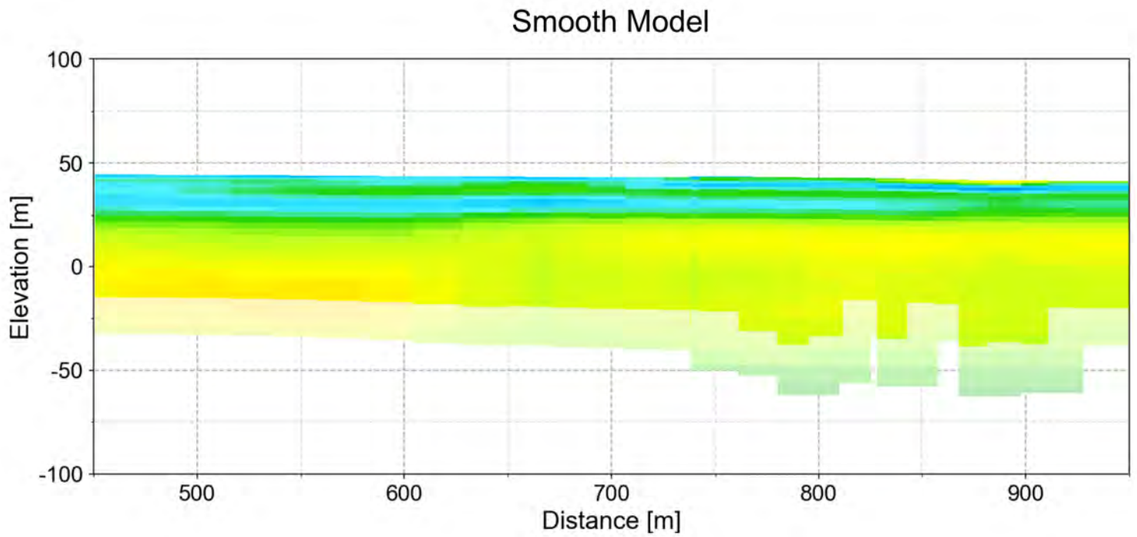
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Date: 2025-12-30, Created by: JP, Checked by: JC, Approved by: TPK

SCWA GSA tTEM Survey: Line 600100 450-950 m

tTEM Model Section







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Spatially constrained inversion (30 layers)

Above DOI*
Below DOI*

3 10 100 300

Resistivity [ohm-m] *DOI = Depth of investigation

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Santa Rosa Plain and Petaluma Valley GSA
Sonoma County, CA

RAMBOLL
COLLIER GEOPHYSICS

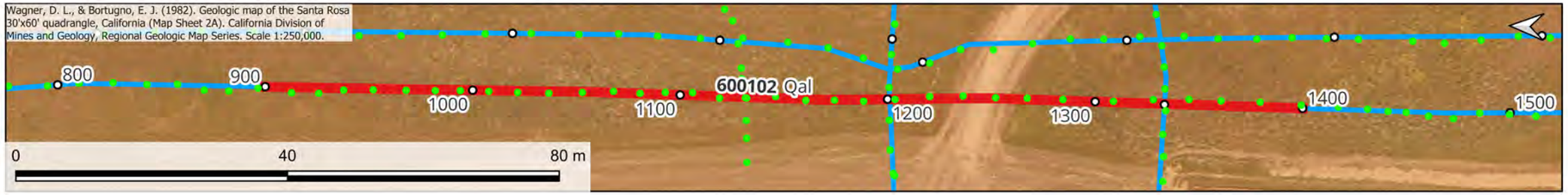
Sonoma County Water Agency
Project #: 1940113846

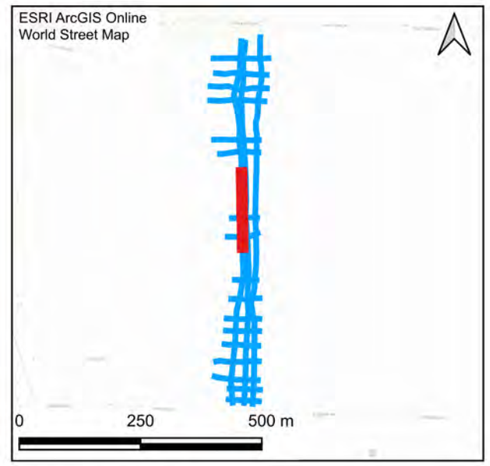
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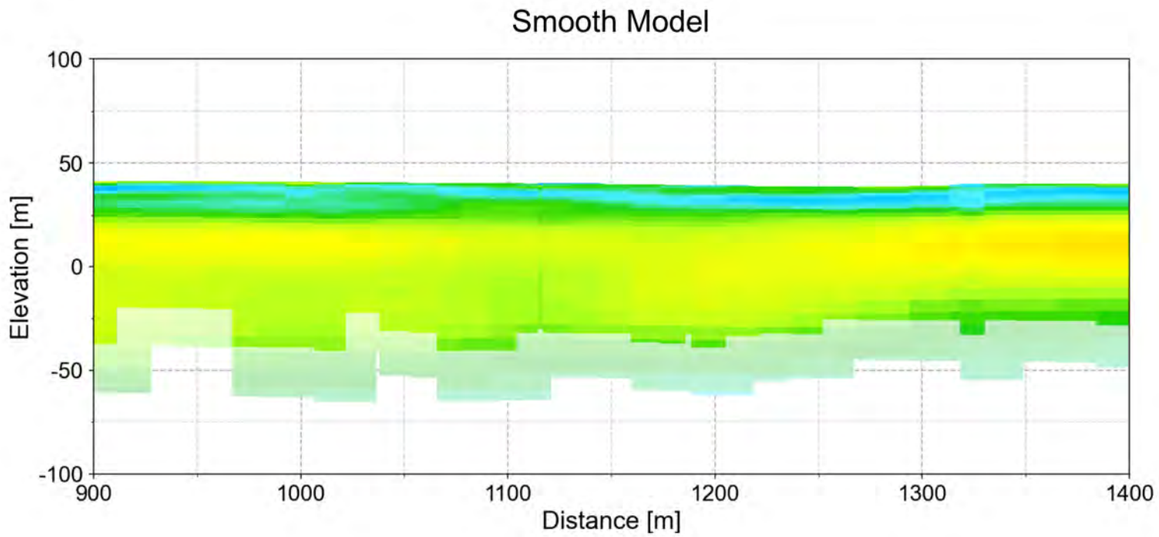
SCWA GSA tTEM Survey: Line 600100 900-1400 m

tTEM Model Section









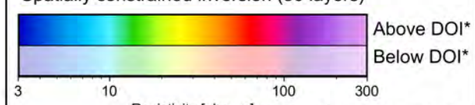
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Santa Rosa Plain and Petaluma Valley GSA
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RAMBOLL

COLLIER GEOPHYSICS

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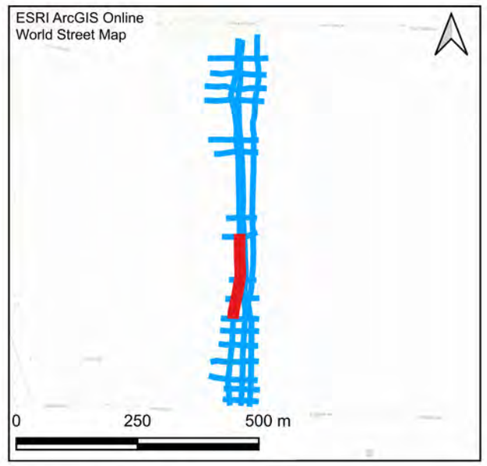
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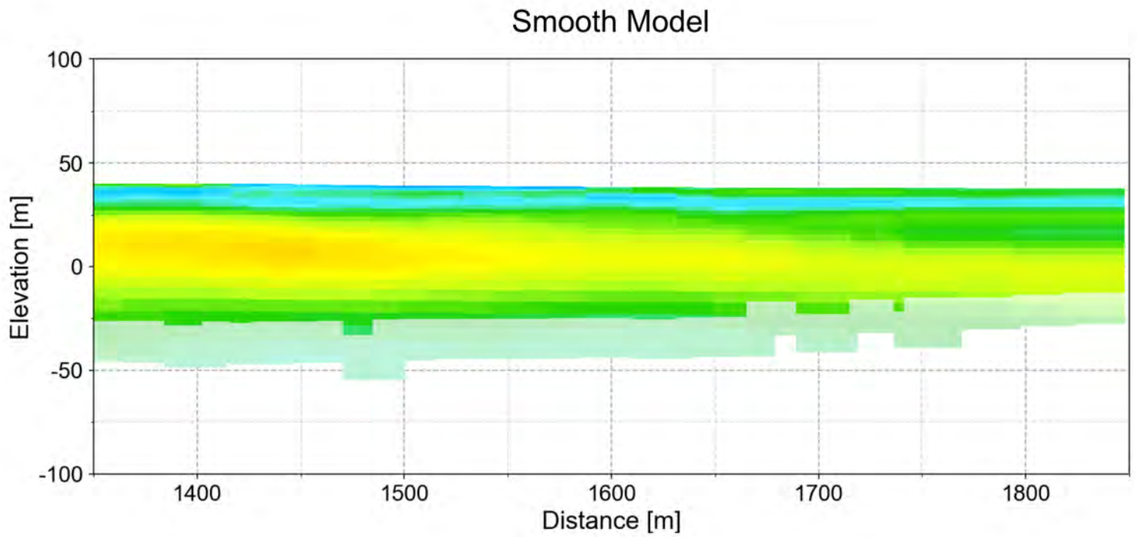
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SCWA GSA tTEM Survey: Line 600100 1350-1850 m

tTEM Model Section







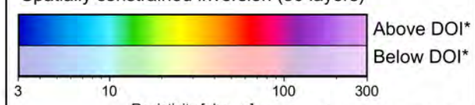
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Coordinate Reference System: EPSG 2226 - NAD83 / California zone 2 (ftUS)

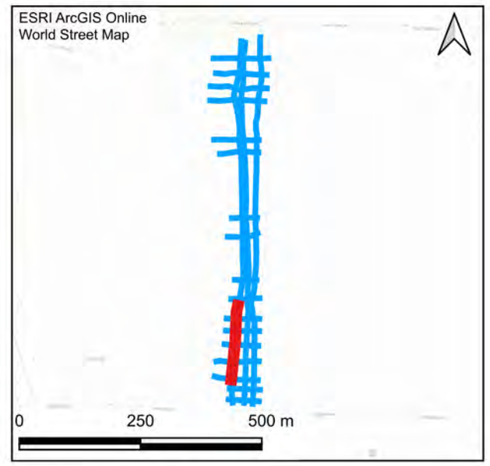
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SCWA GSA tTEM Survey: Line 600100 1800-2300 m

tTEM Model Section

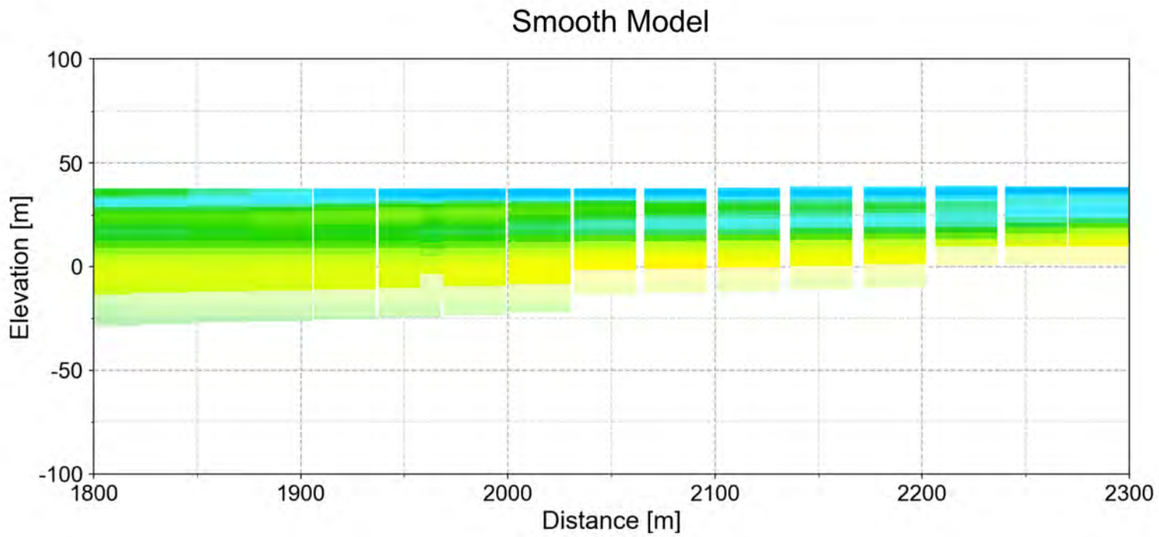






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Legend for Model Sections

Smooth model

Spatially constrained inversion (30 layers)

Above DOI*

Below DOI*

3 10 100 300

Resistivity [ohm-m] *DOI = Depth of investigation

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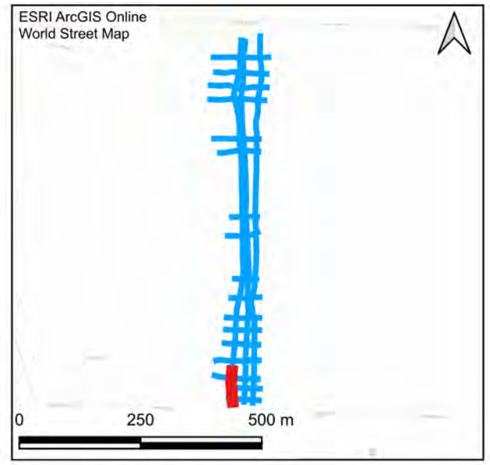
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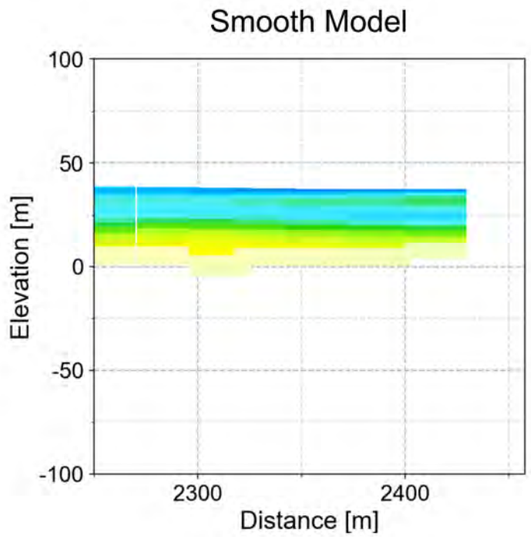
SCWA GSA tTEM Survey: Line 600100 2250-2458 m

tTEM Model Section









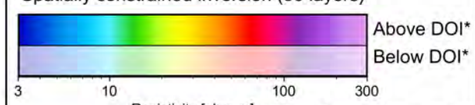
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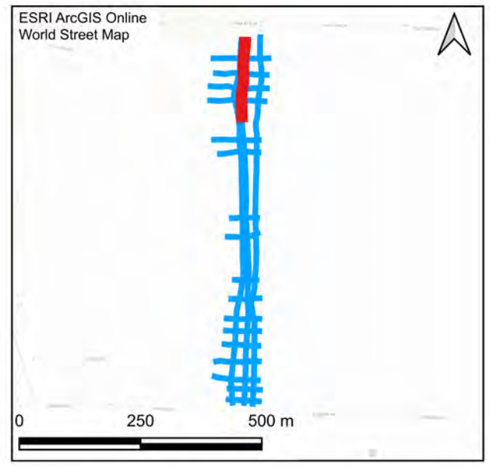
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SCWA GSA tTEM Survey: Line 600200 0-500 m

tTEM Model Section

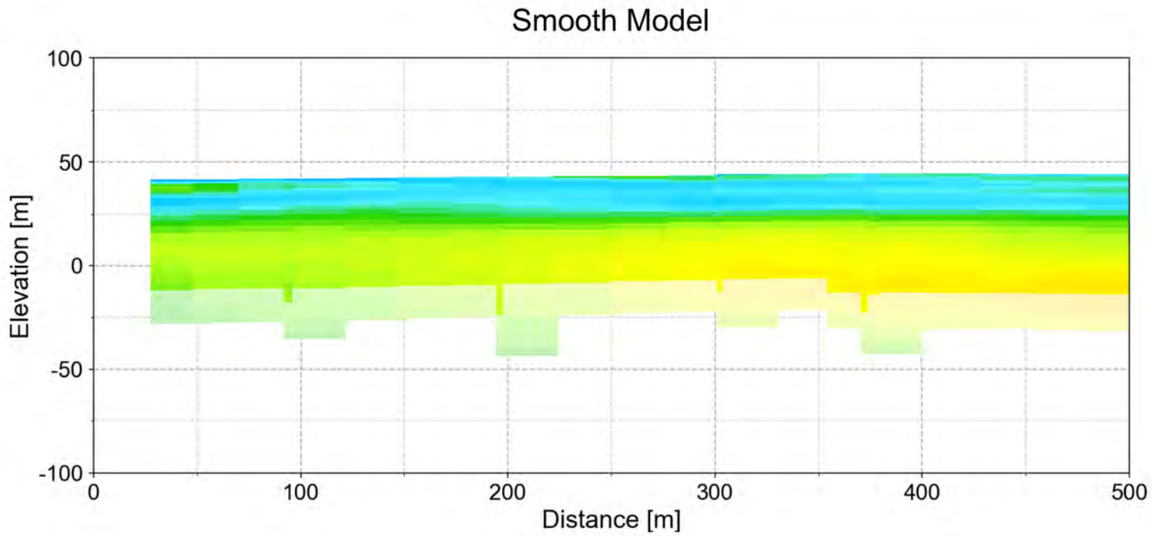






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Resistivity [ohm-m]

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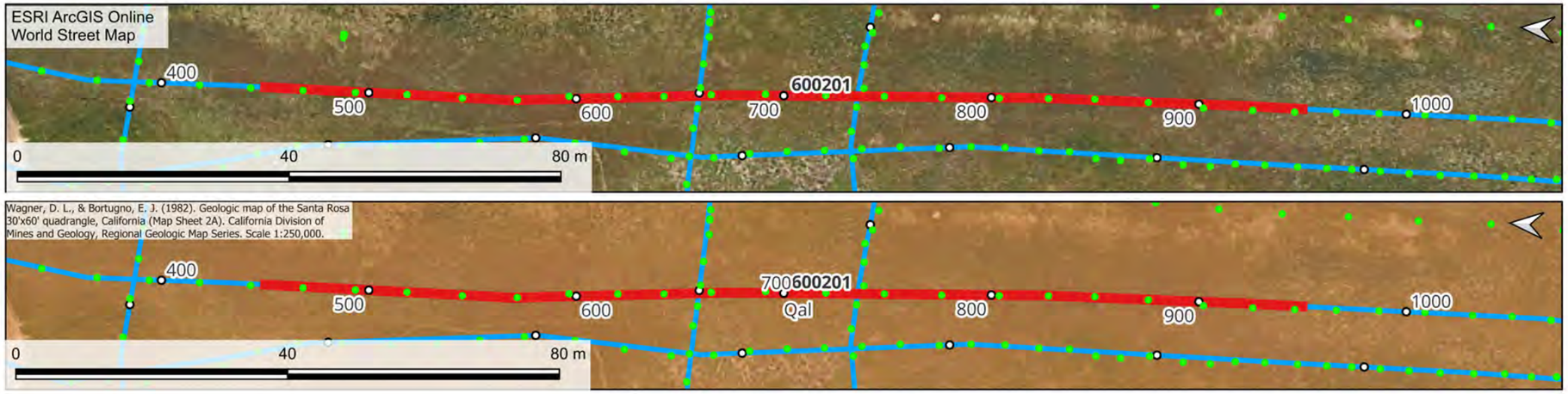
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Project #: 1940113846

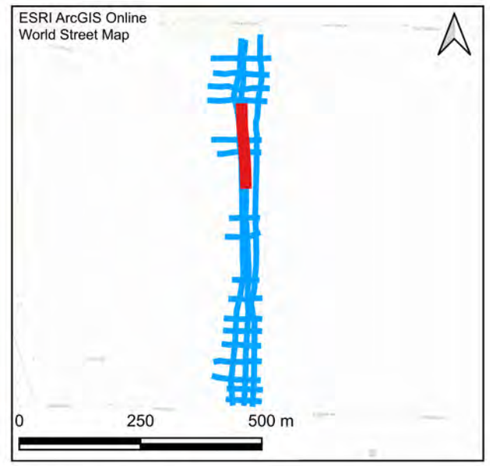
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Date: 2025-12-30, Created by: JP, Checked by: JC, Approved by: TPK

SCWA GSA tTEM Survey: Line 600200 450-950 m

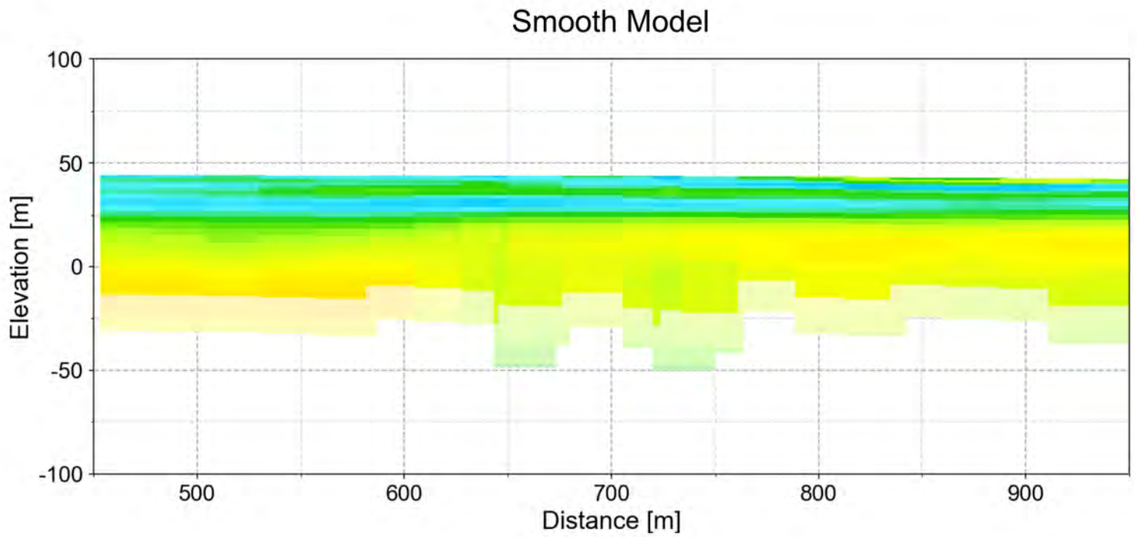
tTEM Model Section





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- Basin Boundary



Legend for Model Sections

Smooth model

Spatially constrained inversion (30 layers)

Above DOI*

Below DOI*

3 10 100 300

Resistivity [ohm-m] *DOI = Depth of investigation

Valley House Drive tTEM Results
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Sonoma County Water Agency
Project #: 1940113846

Coordinate Reference System: EPSG 2226 - NAD83 / California zone 2 (ftUS)

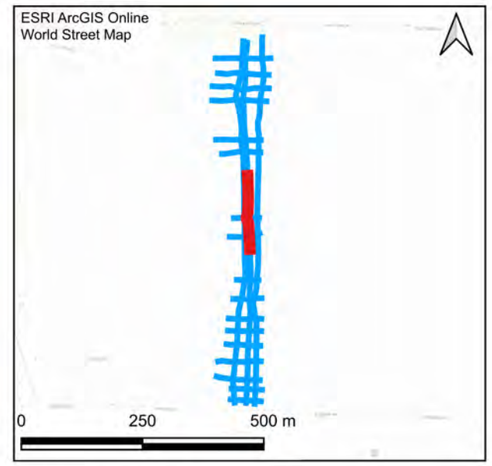
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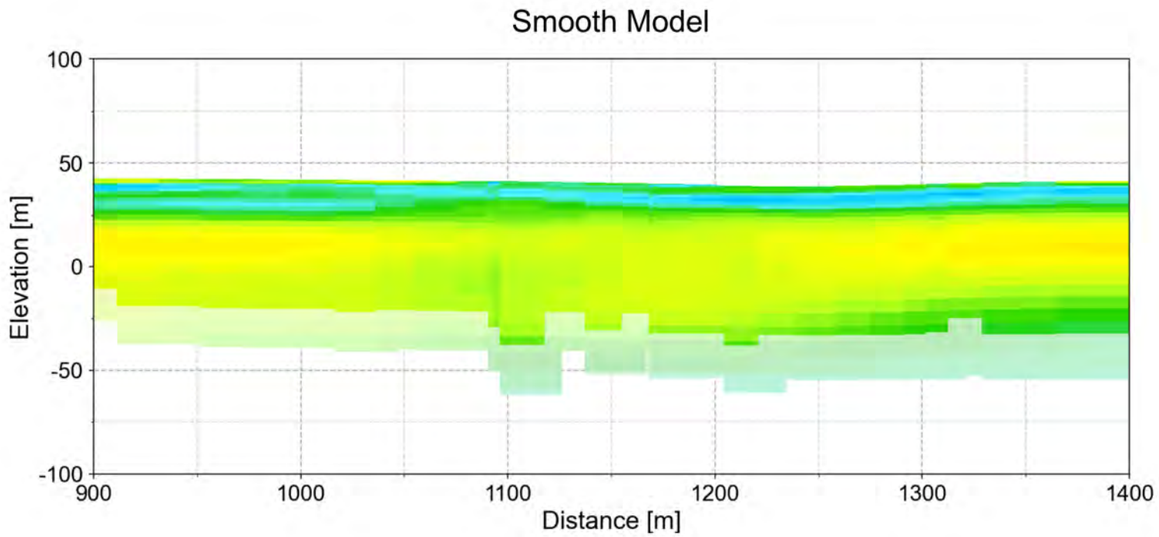
SCWA GSA tTEM Survey: Line 600200 900-1400 m

tTEM Model Section









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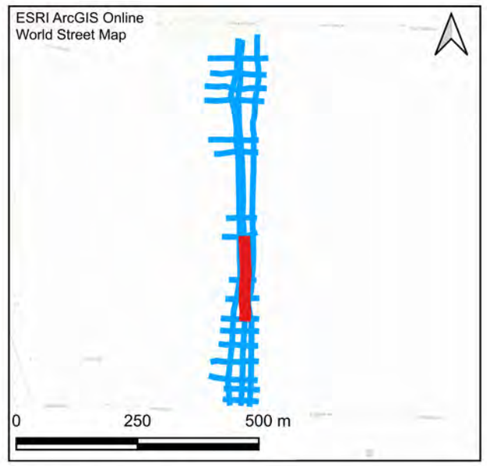
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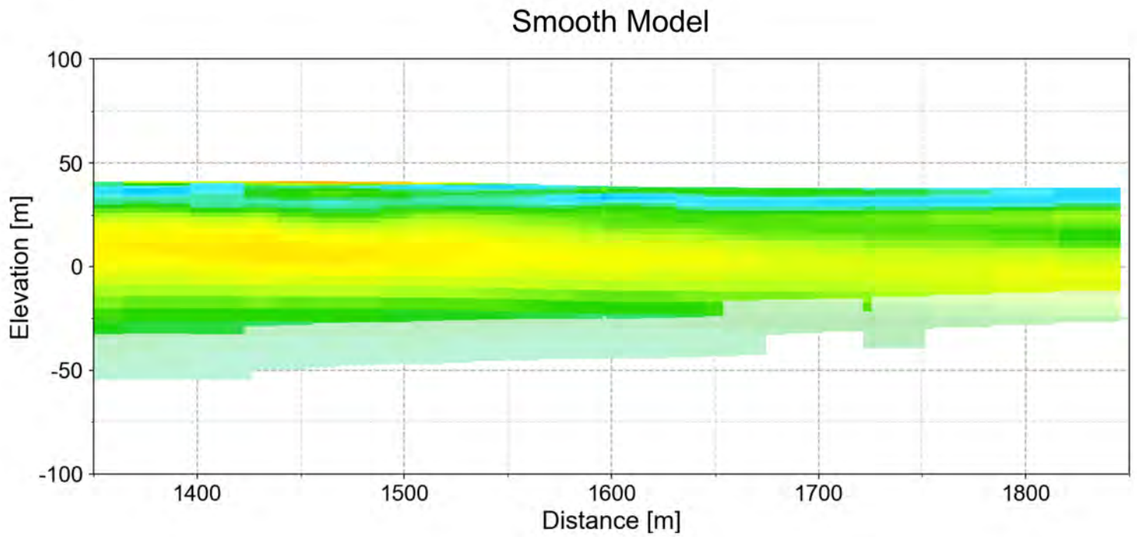
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SCWA GSA tTEM Survey: Line 600200 1350-1850 m

tTEM Model Section







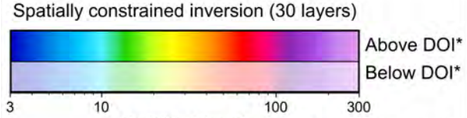
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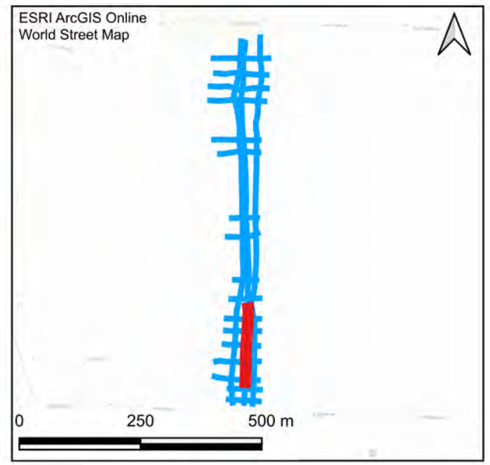
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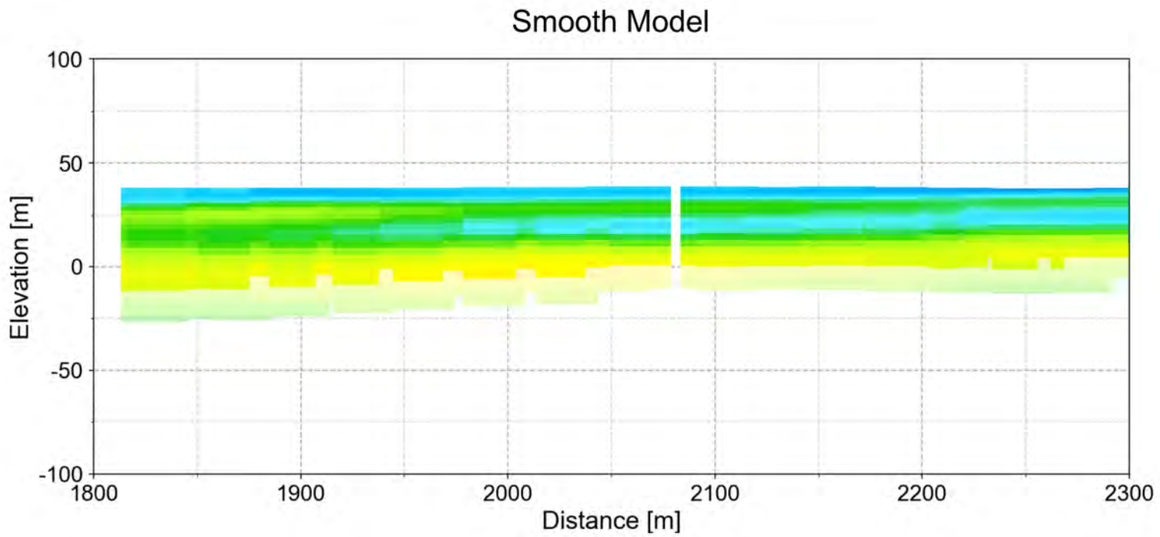
Date: 2025-12-30, Created by: JP, Checked by: JC, Approved by: TPK

SCWA GSA tTEM Survey: Line 600200 1800-2300 m

tTEM Model Section







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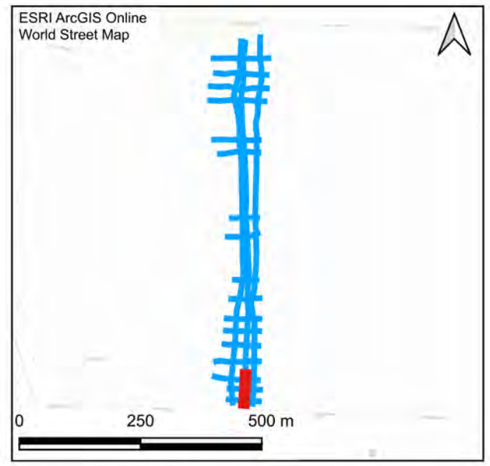
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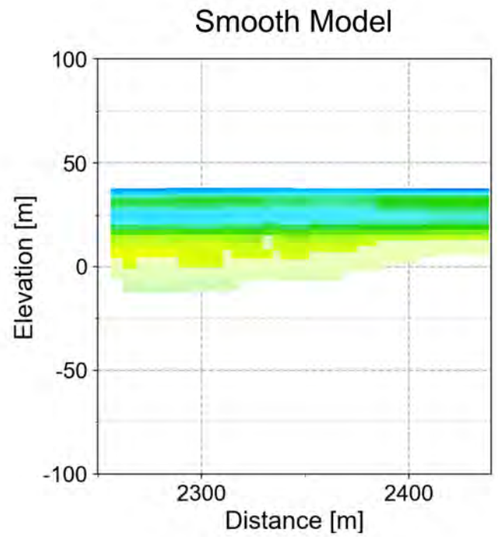
SCWA GSA tTEM Survey: Line 600200 2250-2440 m

tTEM Model Section









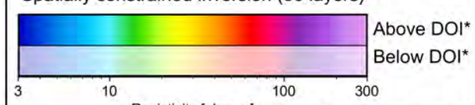
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Legend for Model Sections

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Spatially constrained inversion (30 layers)



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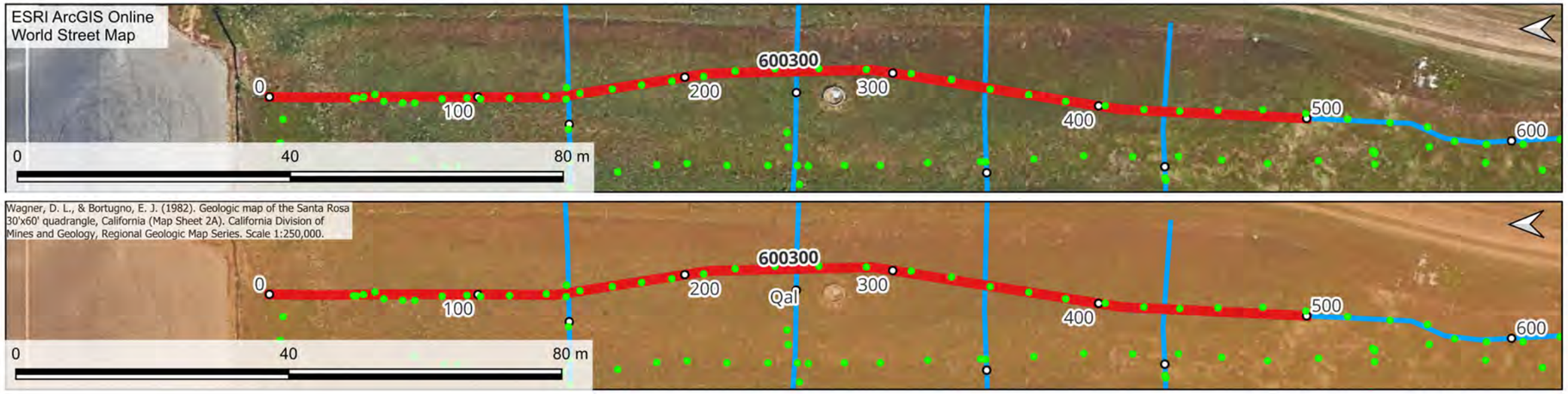
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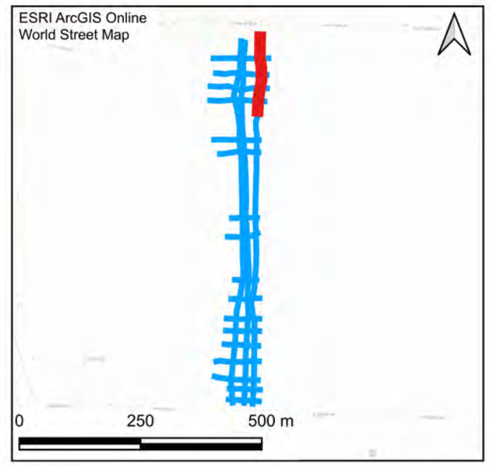
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Date: 2025-12-30, Created by: JP, Checked by: JC, Approved by: TPK

SCWA GSA tTEM Survey: Line 600300 0-500 m

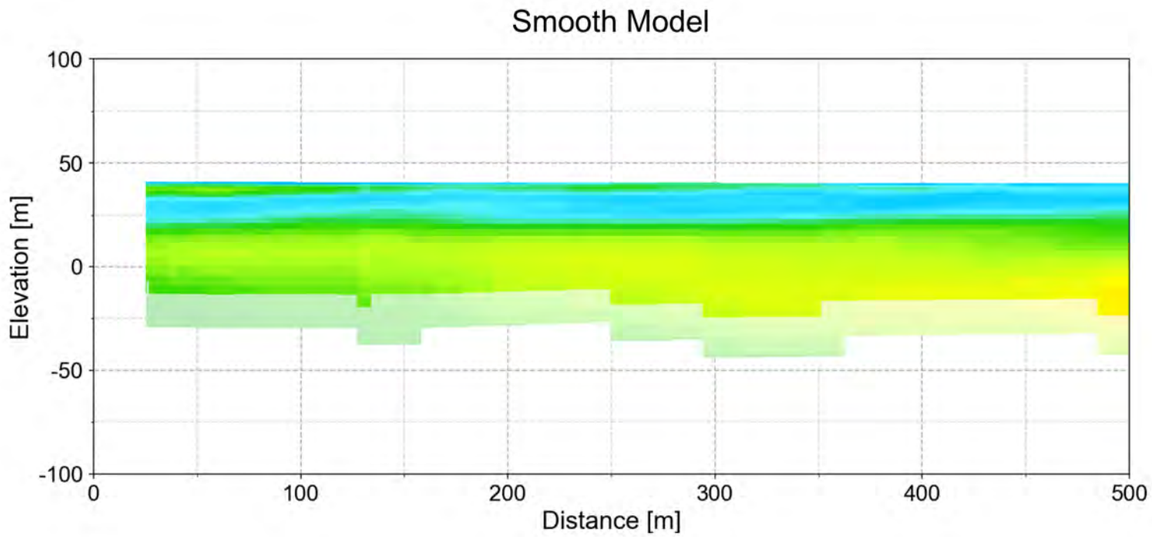
tTEM Model Section





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Legend for Model Sections

Smooth model

Spatially constrained inversion (30 layers)

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3 10 100 300

Resistivity [ohm-m]

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Valley House Drive tTEM Results
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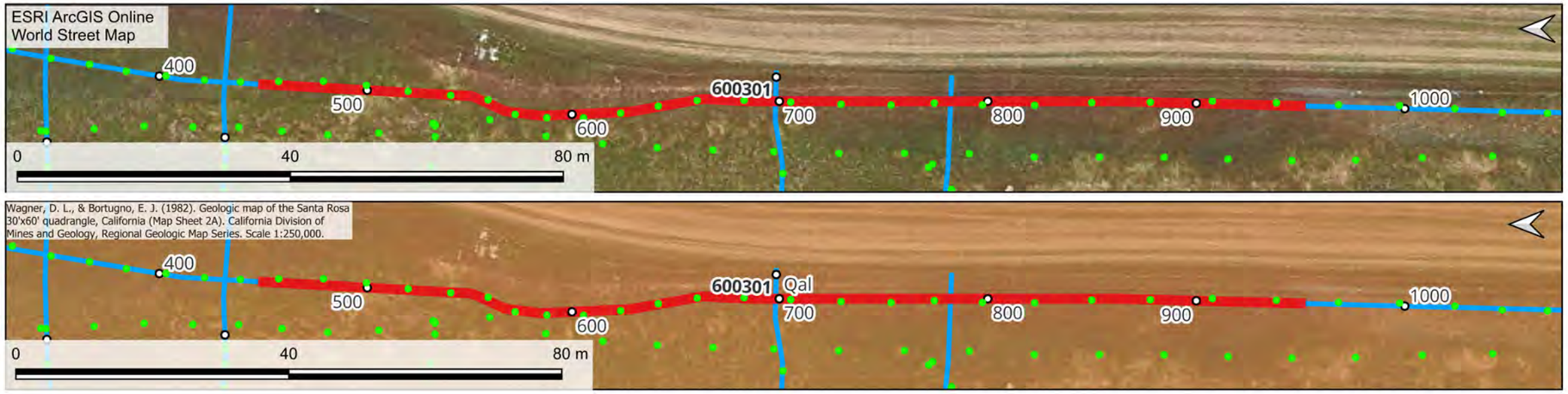
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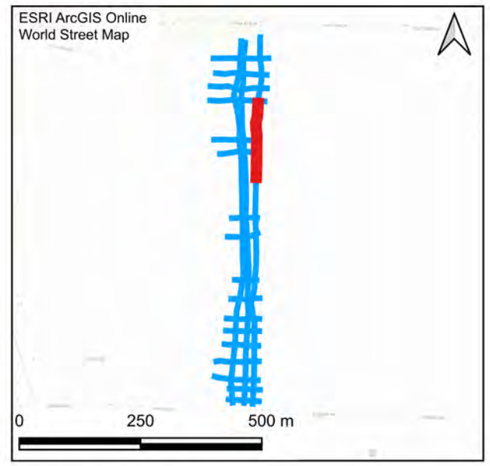
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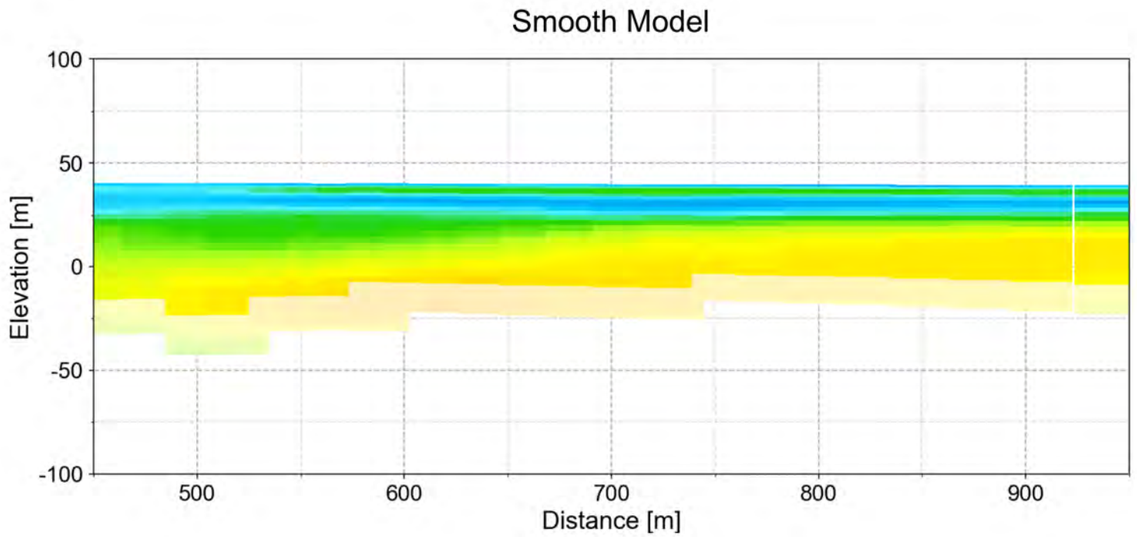
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SCWA GSA tTEM Survey: Line 600300 450-950 m

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Valley House Drive tTEM Results
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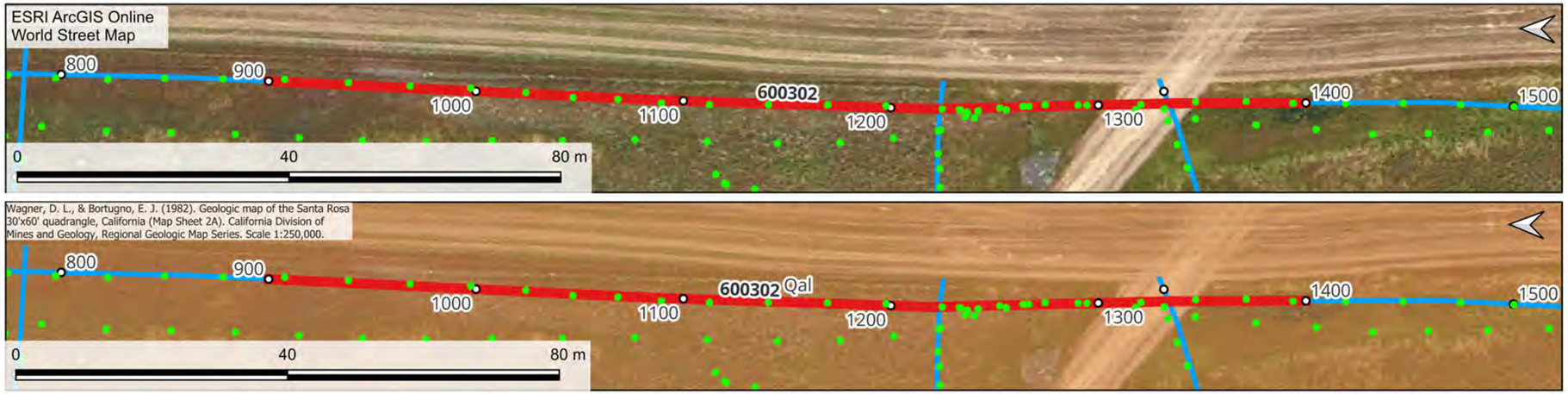
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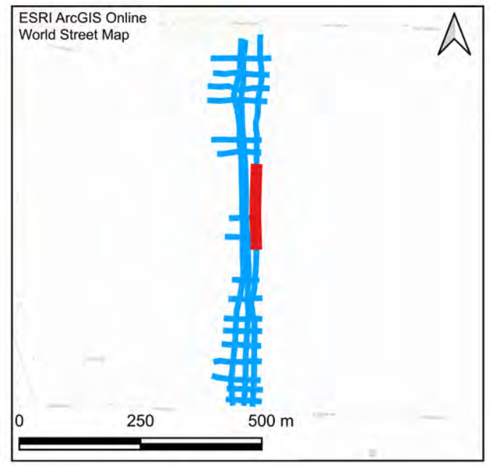
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SCWA GSA tTEM Survey: Line 600300 900-1400 m

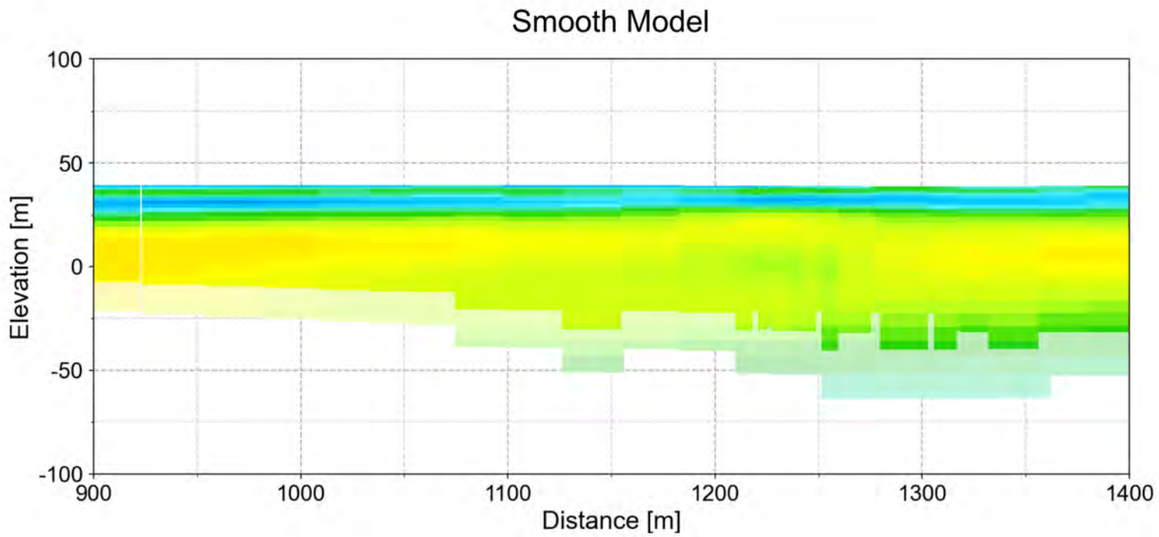
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Resistivity [ohm-m] *DOI = Depth of investigation

Valley House Drive tTEM Results
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COLLIER GEOPHYSICS

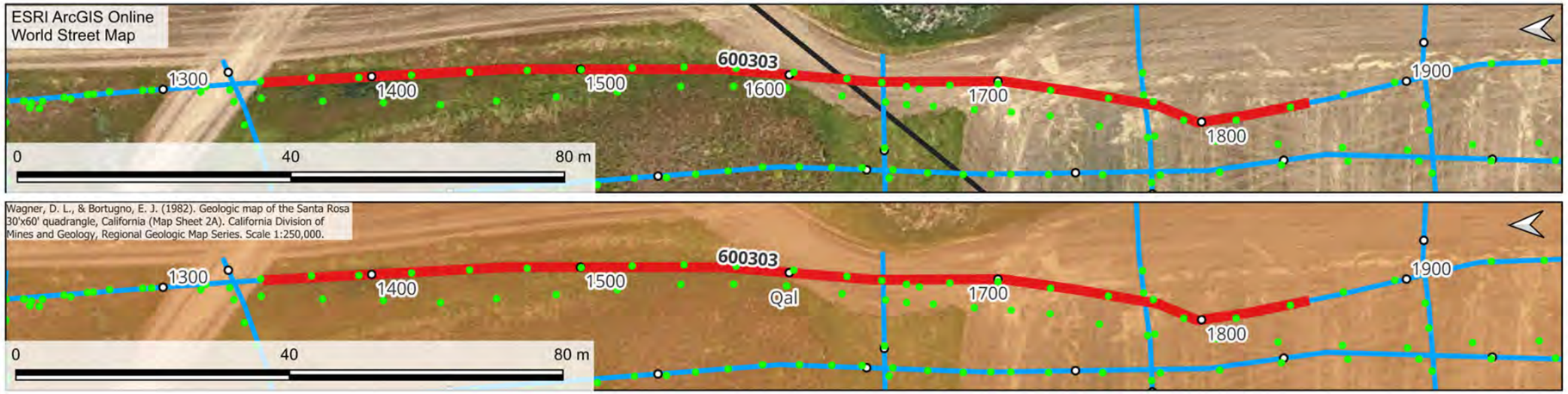
Sonoma County Water Agency
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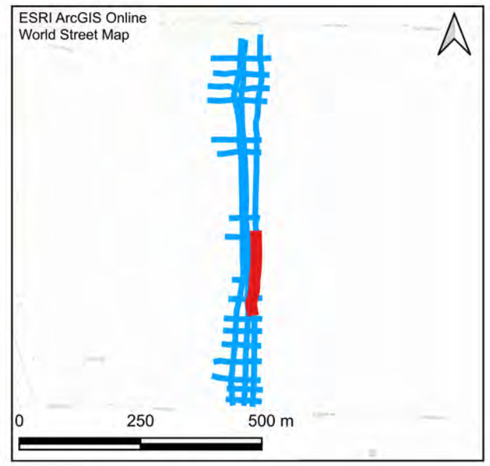
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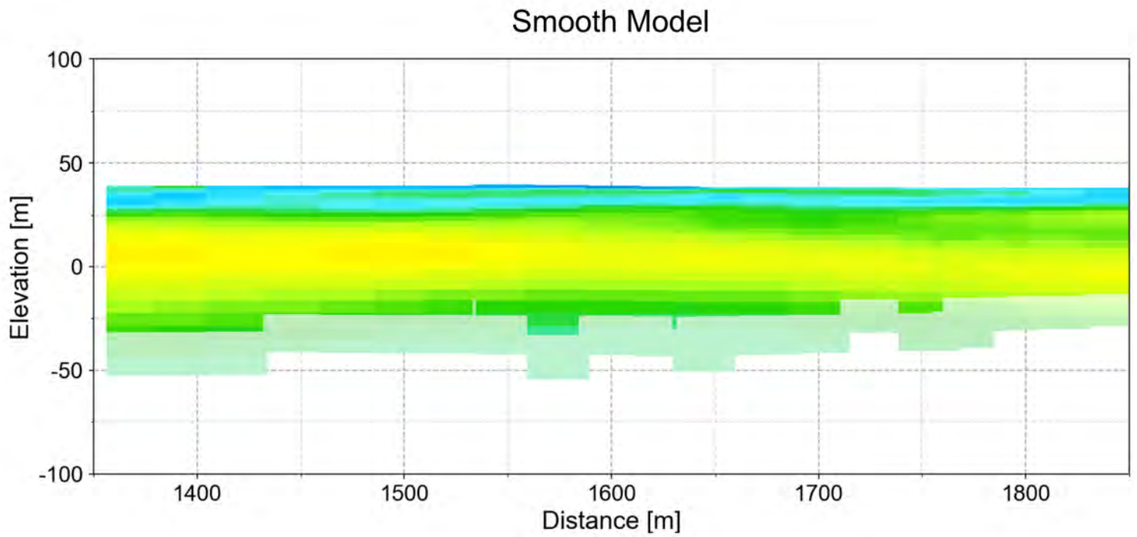
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SCWA GSA tTEM Survey: Line 600300 1350-1850 m

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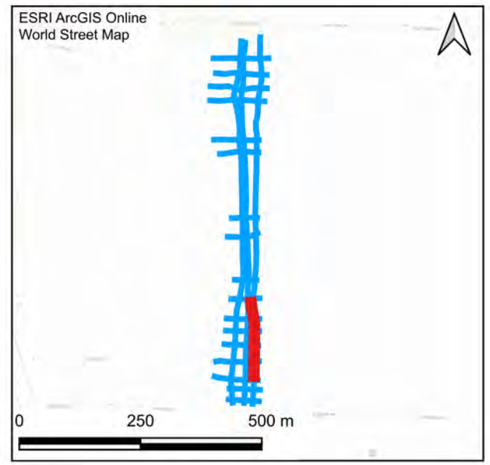
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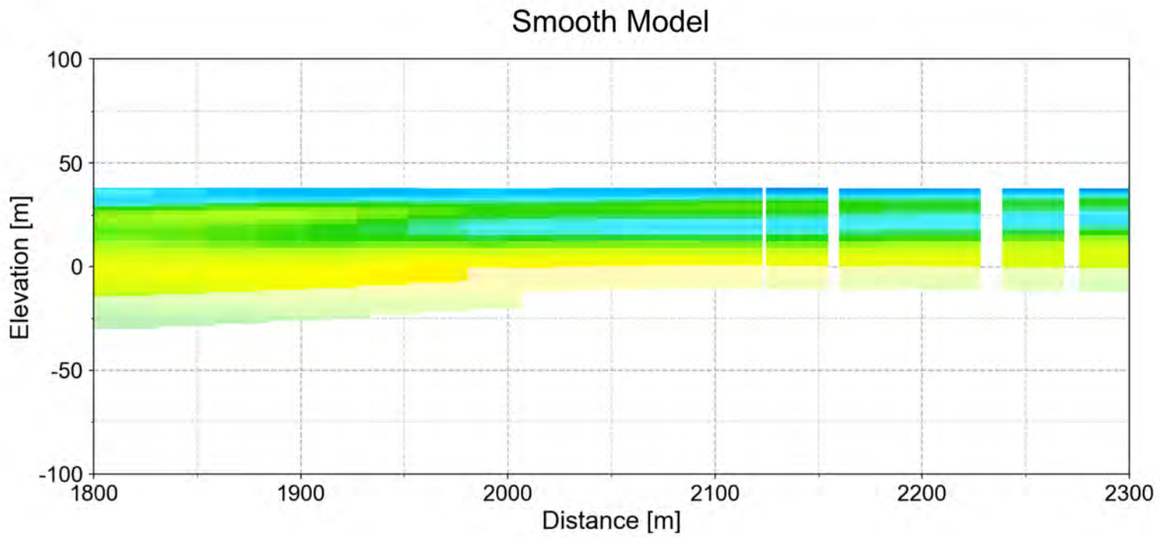
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SCWA GSA tTEM Survey: Line 600300 1800-2300 m

tTEM Model Section







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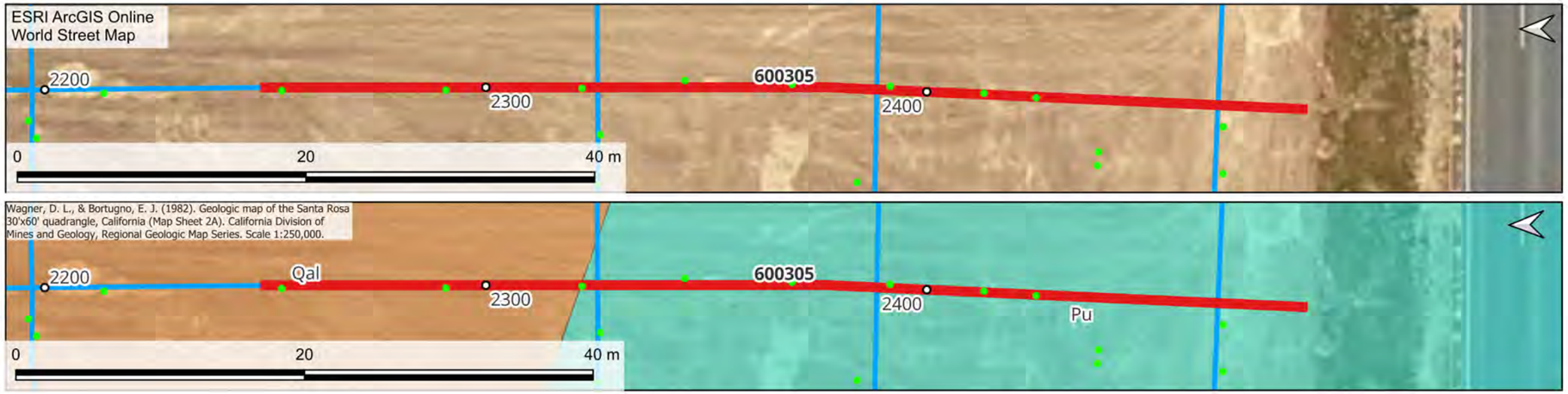
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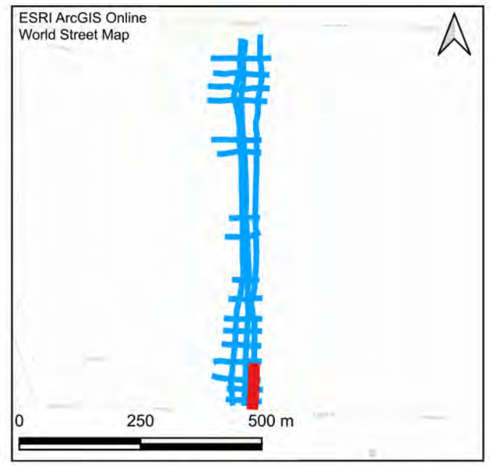
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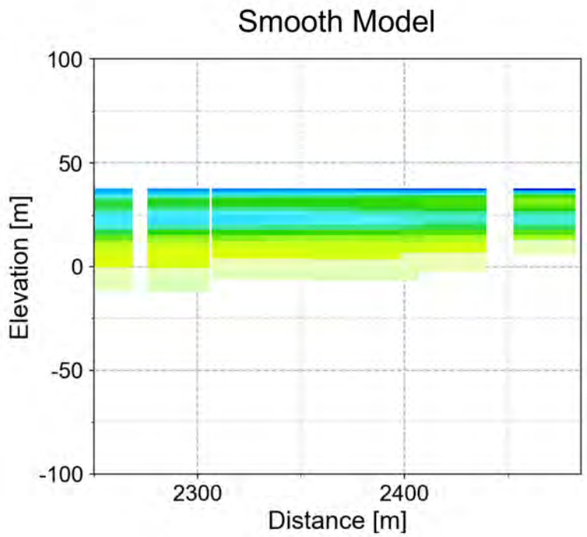
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SCWA GSA tTEM Survey: Line 600300 2250-2485 m

tTEM Model Section







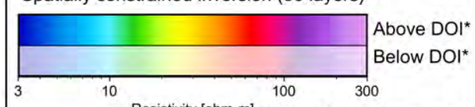
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