2022

Kaleya Smallholders Company Ltd

Groundwater Assessment and Geophysical Survey

Project №. AQ22-003

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1. INTRODUCTION AND BACKGROUND

Following Aquaquest's proposal (ref. PAQ22-001), Kaleya Smallholders Company (KASCOL) engaged the services of the Consultant to undertake a geophysical survey and investigate the potential for groundwater development at their Estate in Mazabuka district. Kaleya Estate is located in Southern Province, about 6 km south-west of Mazabuka town, off Livingstone Road and south of the Nakambala sugar plantation (Figure 1).

The groundwater investigation is part of a broader Feasibility Study for Irrigation System Development, which is being carried out simultaneously by Aquaquest. The results of the hydrogeological investigations and the subsequent exploratory drilling work, will further guide the water supply options that are available for the planned expansion of the Estate, which envisages and enhanced area of sugarcane plantation under drip-irrigation.

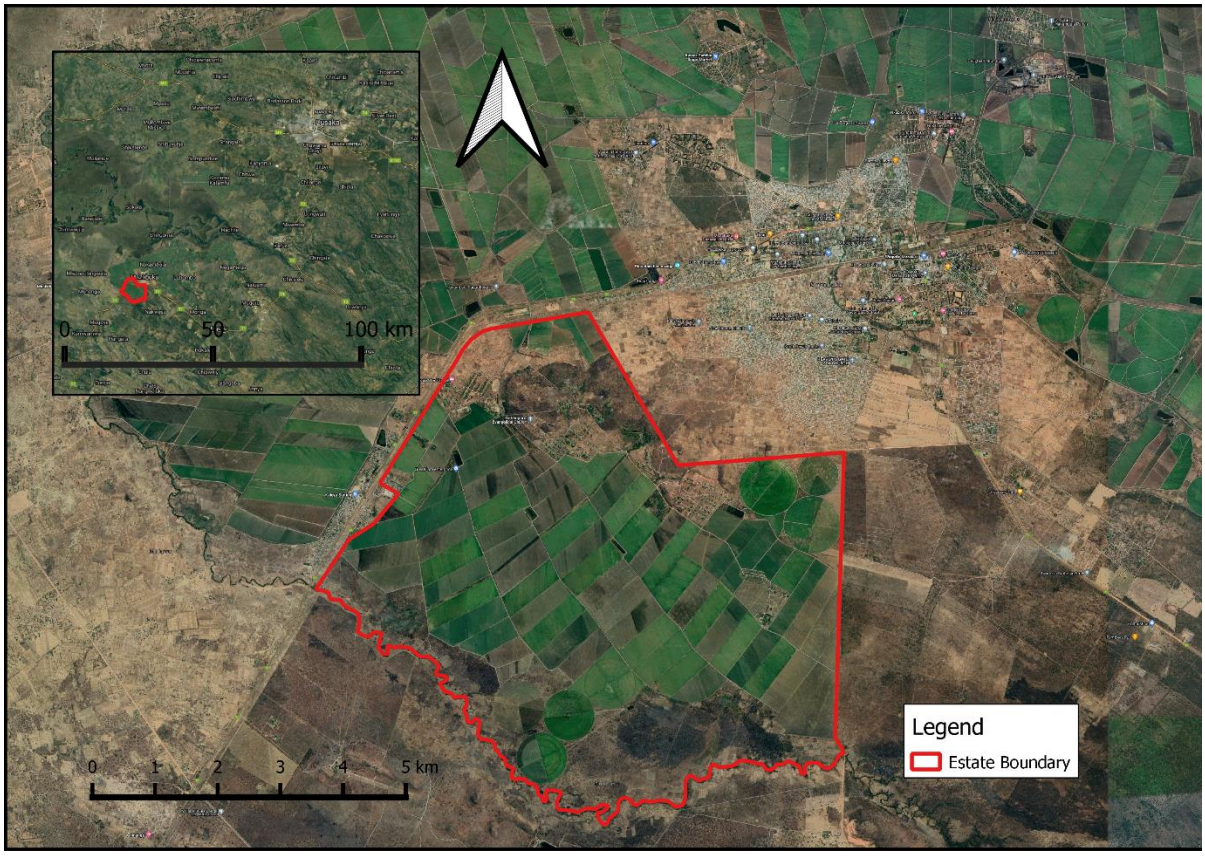

Figure 1: Location of Kaleya Estate (Google Earth satellite image)

The Estate is currently supplied with surface water from the Kafue River by Zambia Sugar, the principal off-taker of the sugarcane produce and main partner in the farming activities. In view of the growing irrigation requirements, the farm already experiences a deficit of water. In this light, a project grant has been provided by the Dutch Fund for Climate Development (DFCD). The purpose of the grant is to support a technical assessment for the planned conversion from the current furrow irrigation systems to much more water-

efficient drip irrigation systems, as well as a social & environmental study to assess the impacts of this development.

Aquaquest first conducted a review of the existing data (Chapter 2) and subsequently carried out a geophysical field survey (Chapter 3) to identify the locations with the highest potential for groundwater development.

2. DATA REVIEW

A data review was conducted with the aim of developing a general understanding of the local hydrogeology and for gaining insight in the local groundwater regime.

2.1 CLIMATE

In Mazabuka, the climate is warm and temperate. When compared with winter, the summers have much more rainfall. According to Köppen and Geiger, this climate is classified as **monsoon-influenced humid subtropical climate** (Cwa). The average annual temperature is 21.5 °C in Mazabuka. About 751 mm of precipitation falls annually.

In the area of KASCOL Estate and its surroundings, three seasons are clearly distinguishable:

1. Mid-April to mid-August, which is cool and dry. Mean day temperatures vary between 14°C and 18°C, with minimum temperatures often falling below 4°C in June and July.
2. The period from Mid-August to mid-November represents the hot and dry season. Mean daily temperatures vary between 20°C and 23°C, with highs up to 32°C in October and November.
3. Mid-November to Mid-April is warm and wet. Typically, the vast majority of the annual rainfall falls during this period.

Data from the three nearest weather stations (at Mazabuka Town, Kafue Polder and Magoye) was collected. Table 1 shows the monthly rainfall around Mazabuka, based on the rainfall measured at these three weather stations, expressed in the categories of low, high and best-estimated rainfall.

Table 1: Monthly rainfall data for Mazabuka (FAO, LocClim)

	Best Estimate	Low Estimate	High Estimate
Precipitation	**[mm]**	**[mm]**	**[mm]**
January	184	176	191.9
February	176	155	197
March	68	61	75.1
April	11	0	25.6
May	0	0	2.5
June	0	0	0
July	0	0	0
August	0	0	0
September	1	0.5	1.5
October	16	12.9	19.1
November	101	82.6	119.4
December	211	210.1	211.9
Total	**768**	**698.1**	**844**

KASCOL also recorded their own rainfall data from 2017 onwards (Table 2).

Table 2: Rainfall data recorded by KASCOL, for the years 2017-2020

Month	Mean precipitation [mm]
January	123.2
February	211.8
March	67.0
April	17.2
May	0.0
June	0.0
July	0.0
August	0.0
September	0.0
October	13.4
November	81.8
December	158.3
Total	**672.5**

The recorded data by KASCOL suggests lower mean annual rainfall, when compared with the data from the three Mazabuka weather stations. This difference should mainly be attributed to the fact that the weather stations and FAO data cover a much longer period, while the fact that the recent year 2019 was exceptionally dry weighs heavily on the short-term record for KASCOL, thus significantly lowering the mean precipitation.

Table 3: Monthly weather average data for Mazabuka (climate-data.org)

	January	February	March	April	May	June	July	August	September	October	November	December
Avg. Temperature °C	22.3 °C	22.1 °C	21.9 °C	20.8 °C	19.3 °C	17.3 °C	16.9 °C	19.8 °C	23.6 °C	26 °C	25.1 °C	23.1 °C
Min. Temperature °C	18.8 °C	18.6 °C	18.3 °C	16.3 °C	14.1 °C	12.1 °C	11.5 °C	14 °C	17.6 °C	20.3 °C	20.3 °C	19.3 °C
Max. Temperature °C	26.4 °C	26.3 °C	26.4 °C	25.8 °C	25 °C	23.1 °C	22.9 °C	26.3 °C	30.3 °C	32.1 °C	30.5 °C	27.6 °C
Precipitation / Rainfall mm	211	151	100	24	2	0	0	0	1	13	78	171
Humidity (%)	80%	81%	77%	66%	56%	55%	50%	41%	33%	35%	50%	73%
Rainy days (d)	17	15	12	3	0	0	0	0	0	2	9	16
avg. Sun hours (hours)	8.4	8.2	7.9	8.3	9.4	9.2	9.3	10.2	10.6	10.8	10.4	9

Monthly average climate parameters for Mazabuka are further shown in Table 3. Additional conclusions from the review of regional and local climate data are as follows:

- The driest month is June. There is 0 mm of precipitation in June. In January, the precipitation reaches its peak, with an average of 211 mm.
- With an average of 26.0 °C, October is the warmest month. At 16.9 °C on average, July is the coldest month of the year.
- The month with the highest relative humidity is February (80.72 %). The month with the lowest relative humidity is September (33.08 %).
- The month with the highest number of rainy days is January (23.23 days). The month with the lowest number of rainy days is August (0.03 days).

2.2 TOPOGRAPHY

The project area is located approximately 135 km south of Lusaka, off Livingstone Road, and about 6 km south of Mazabuka CBD.

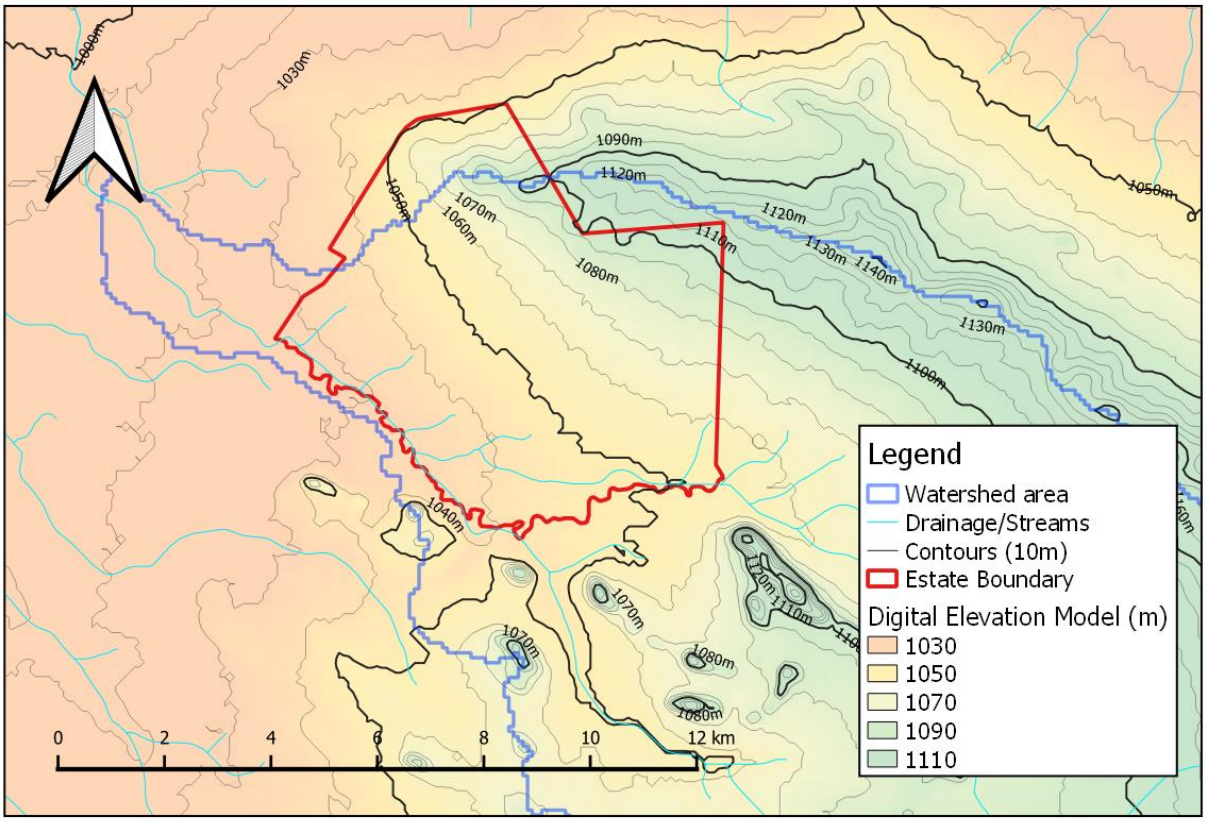

Figure 2: Elevation map of the area with elevation ranging between 1030 m amsl (green = low) and 1110 m amsl (orange = high).

Most of the Estate is relatively flat and defined by a gentle, relatively steady, and constant slope towards the southwest. The relatively flat part of the estate covers over 80percent and is mostly the arable portion where sugar cane fields are located.

The area along the northeastern border forms a topographic high of approximately 1,120 m amsl. The area with the lowest elevation (1,030 m amsl) is along the southwestern boundary, which is formed by the Kaleya River (Figure 3). The Kaleya stream flows from East to the north west and is a tributary of the Kafue River.

Catchment delineation shows that the estate is situated in the downstream part of the watershed of the Kaleya River, a tributary of the Kafue River (see Figure 3). Total catchment area amounts to 570km^2 and upstream catchment area amounts to 556.8km^2.

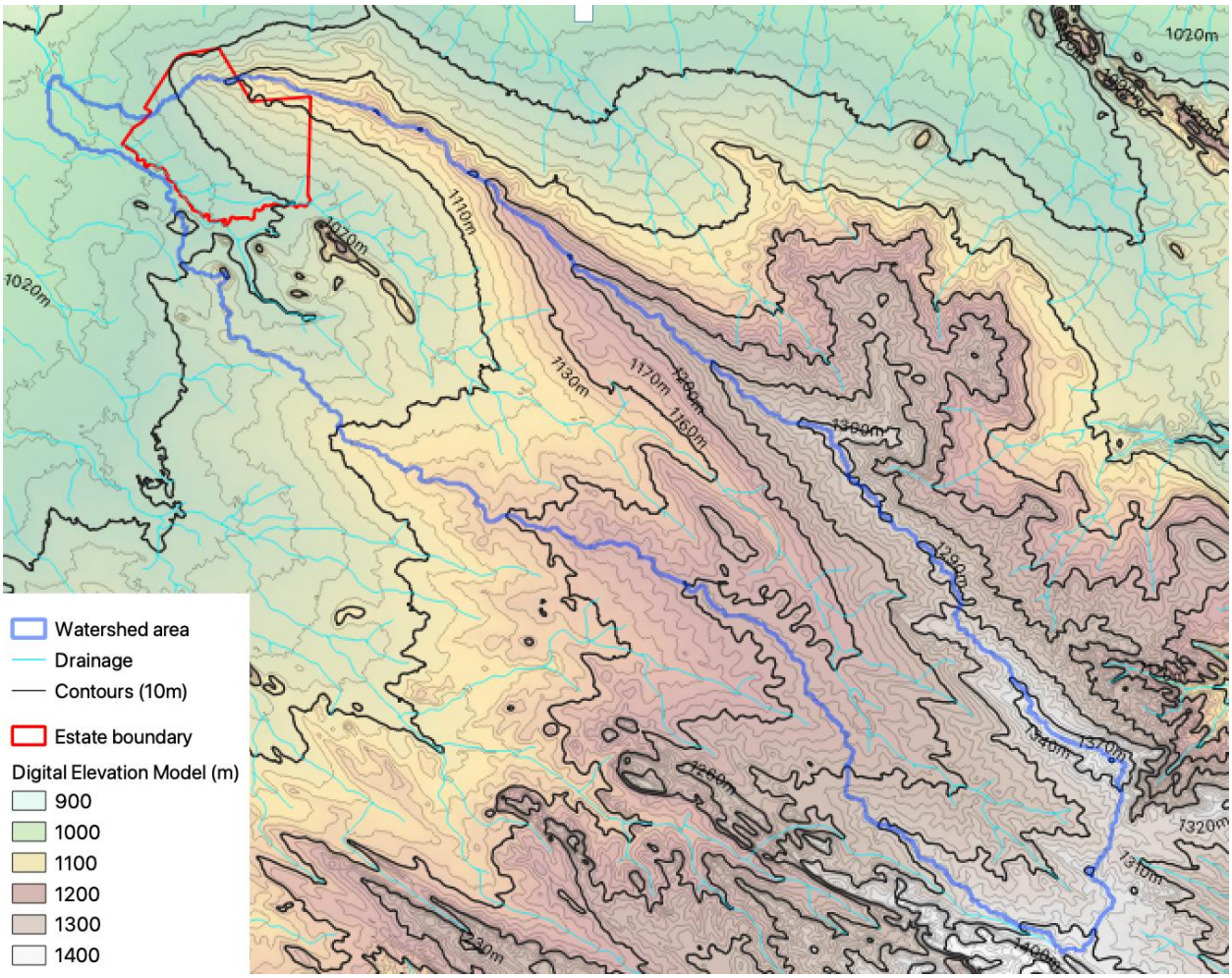

Figure 3: Catchment area surrounding the KASCOL estate

2.3 GEOLOGY

Kaleya Estate lies within the 1527 SE Quarter geological map of the Mazabuka Area, 1963, produced by the Geological Survey Department of the Republic of Zambia (Figure 4).

According to the geological map, limestone/dolomite formations are found in the more elevated northern parts of the farm. Dolomite outcrops are visible in the northeastern part of the estate.

The central and southern parts of the Estate are covered by a relatively thin layer of alluvium and residual deposits (i.e. hillslope deposits, colluvium). This is where the farming activities and plantations are situated.

Along the southern perimeter of the estate, quartz-muscovite rocks are exposed in the bottom of the Kaleya River valley, due to erosion and incision. Further east and west, the valley bottom changes to limestone/dolomite formations.

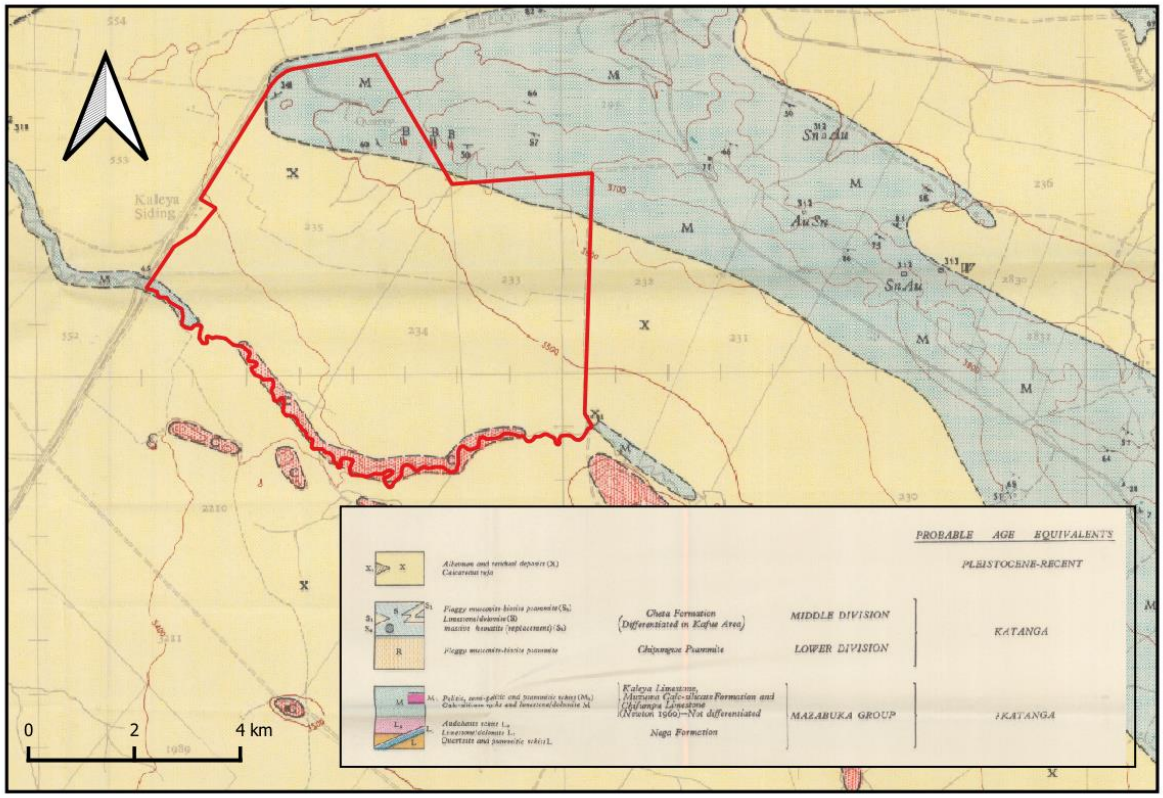

Figure 4: General geology; the dotted black line indicates a geological boundary. The estate area is within the red boundary (GSD Zambia).

The geological stratigraphy starts with alluvial sediments at the top, followed by dolomites and the quartzite metasediments at the bottom. Quartzite metasediments outcrops where not observed during fieldwork and have been inferred from the regional geological map.

2.4 GENERAL HYDROGEOLOGY

Available data was collected and analyzed to gain insight into the general hydrogeology and to develop a conceptual model of groundwater occurrence and movement within the study area. The occurrence and distribution of different geological units, soils, structural features, topography, rainfall, vegetation, and evapotranspiration all influence the local groundwater potential.

Typical conditions that may allow for the development of a viable aquifer are:

- Chemical weathering ('karstification') of carbonate rocks, such as the Lusaka Dolomite or banded limestones of the Cheta Formation, which are indicated to occur along the north eastern boundary of the estate.
- Highly fractured zones in the quartzite metasediments (Fractures are formed due to structural processes, resulting in deformation and cracking of the rock; where present and well-developed, fractures are an efficient means for transmission and abstraction of water in otherwise impermeable rocks), and;
- Thick weathered overburden with suitable coarse-grained aquifer material that provides both a conduit and adequate open pore-space for storage of water).

The project area is underlain by carbonate rocks (dolomites), which typically provide moderate to high yields, due to the possibile formation of karst systems within the rock. Karst features are caused by gradual dissolution of calcium carbonate minerals by the infiltration, percolation, and transmission of acidic water within weak zones (including fractures) in the carbonate rock. The dissolution will occur until the weak acids are neutralized, but will resume when new chemically aggressive (rain -or surface) water infiltrates downwards into the soil, rendering karstification a self-propelling process that may create large underground crevices and cavities.

A groundwater map of the area was developed by BGR (Baümle et al., 2007). According to the map (Figure 5), which indicates the aquifer potential around the estate, the general direction of groundwater flow is towards the north-west. The map is based on the geological map, in combination with borehole observations.

The geohydrological map shows potential for a ***local discontinuous productive aquifer or an extensive but only moderately productive aquifer*** in the northern part of the estate, which is underlain by limestone/dolomite. Primary porosity in these formations is generally low, limiting the amount of water that can be stored inter-granularly. Secondary porosity however can be high: dissolved cavities and fractures within the limestone/dolomite can function as great water storage reservoirs. Therefore, the volume of water that exists in the ground is likely hosted mainly within solution cavities and fractures, of which some may extend several kilometers in length. The solution cavities are known to host significant amounts of groundwater. Fractures of 1.0 mm in width already have the capability to transmit high volumes of water. A zone consisting of fractures several cm or greater in width has the potential to support submersible pumping. The challenge is to identify these zones, which are generally not easily recognizable.

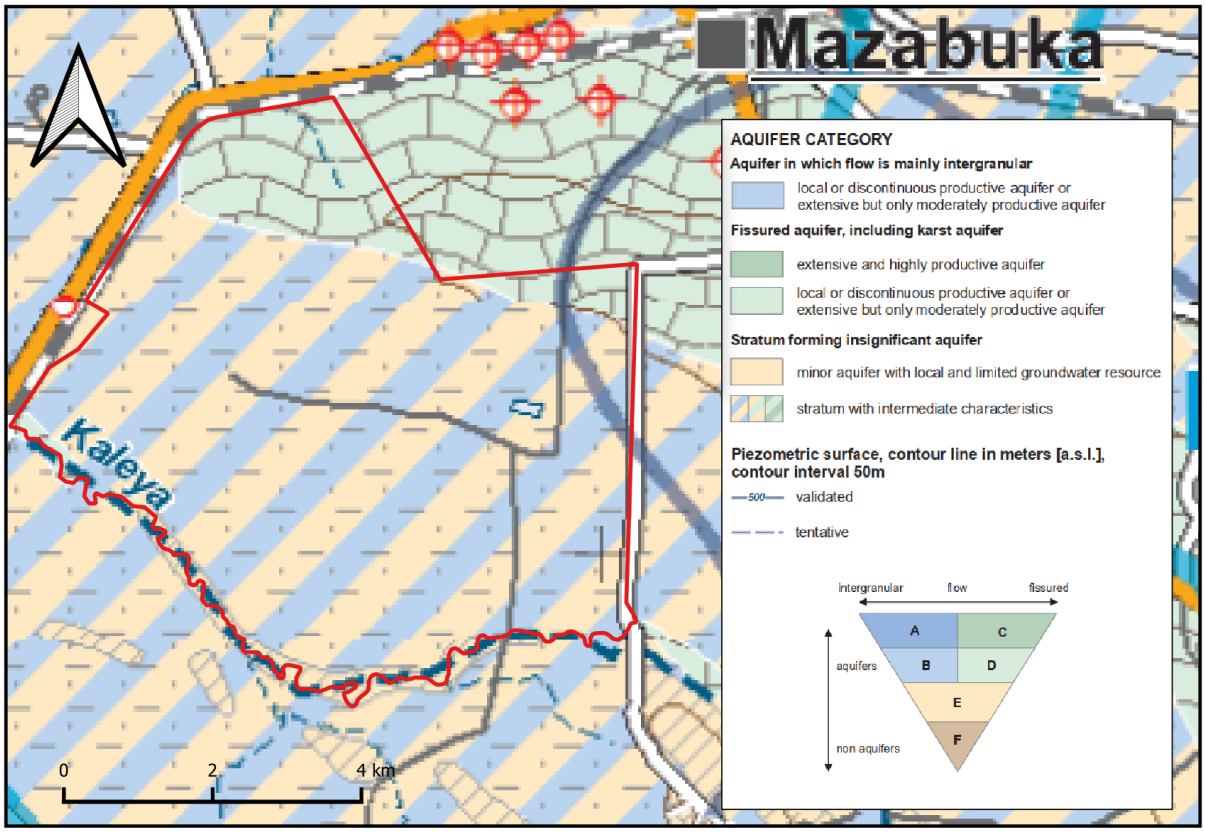

Figure 5: Hydrogeological Map of the area (Bäumle, 2012), estate boundary in red.

Boreholes drilled in this area on the estate have already resulted in yields that look promising. However, only pumping rates are available for these boreholes; important other data is lacking (see Chapter 4.3.1). A detailed assessment of the possible yields in this area requires groundwater exploration and corresponding test pumping.

The central and southern parts of the estate are characterized by ***Strata with intermediate characteristics.*** Relatively shallow sedimentary aquifers may occur within thick soils, weathered profiles, unconsolidated alluvial deposits and colluvium (hillslope deposits).

Alluvial formations of adequate thickness normally present favourable conditions for groundwater occurrence: deposits of pure, unconsolidated sands are highly transmissive. However, the hydraulic conductivity rapidly decreases in the presence of clays, even if their portion is small. Heavy clays are impermeable, even though their porosity can be as high as 50%. To evaluate the aquifer potential of alluvial deposits, the thickness and distribution of clay layers is important. Their presence will reduce the amount of recharge and effective storage, and the potential yield of a borehole.

Due to the anticipated mixture of river deposits, soils, weathered residue and colluvium, the texture of the local unconsolidated deposits is expected to be diverse and heterogeneous. In

a vertical section, the composition may suddenly change from gravelly to heavy clay. However, clayey textures are expected to be dominant. Hence, while groundwater is expected to occur at shallow to medium depths within these unconsolidated deposits, yields are expected to be relatively low, especially when compared with successful boreholes in the limestones.

In areas with a thin cover of soils, weather zones, alluvium or colluvium, the hydrogeological properties of the main aquifer are generally determined by the underlying rock formation, which are believed to be dolomites in the northern part, and less favourable quartz-muscovite rocks in the southern part of the Estate.

3. FIELD SURVEY

3.1 SITE RECONNAISSANCE

Before the start of the geophysical survey, Aquaquest performed several field visits during the Pre-Feasibility stage of the study, on 16 November 2021 and 2-3 December 2021. The purpose of these initial visional assessments was to identify any existing sources of water (such as boreholes, shallow dug wells, streams, etc.) and appraise physical site characteristics, such as geomorphology and drainage, vegetation, soils, rock outcrops and accessibility.

During the site reconnaissance, all known existing boreholes, dams and streams were mapped (see Figure 6 and Table 4). The boreholes are almost exclusively situated along the intersection between the dolomite/calcite formation in the north-northeast and the alluvial deposits in the center of the estate.

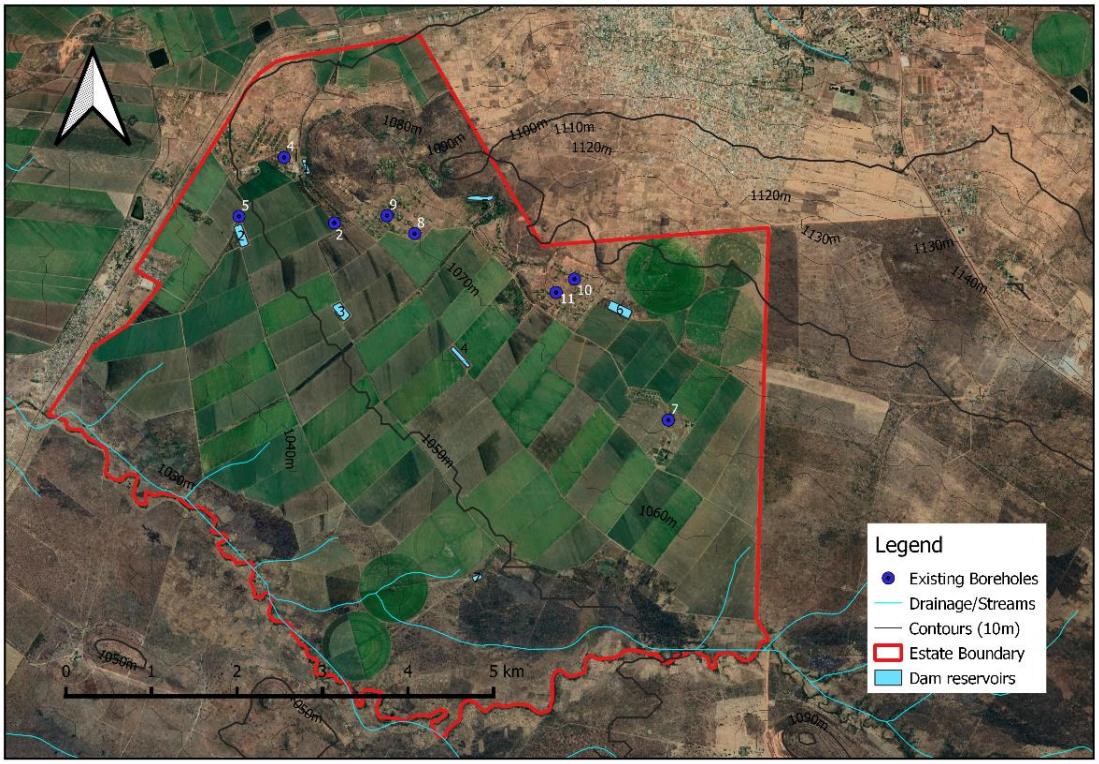

Figure 6: Reconnaissance observations: Existing boreholes, dams and streams

The existing boreholes are used for domestic purposes only. An overview of the borehole depth, pump capacity (in horsepower), size of the casing and maximum pumping rate of the installed pump is presented in Table 4 below.

Table 4: Overview of existing boreholes

S/no.	Borehole Name	Depth	Pump capacity (horse power)	Size of Casing	Pumping rate (L/s)
2	Main Borehole-2	50	6.5 HP pump	8"	20
4	Recreation Club	50	5 HP pump	4"	7.5
5	Mizinga compound	50	3 HP pump	5"	4.55
7	Tuyake borehole	50	3 HP pump	8"	4.55
8	Group 2 Borehole	50	5 HP pump	8"	7.5
9	Group 2 Borehole	50	5 HP pump	8"	7.5
10	Group 3(b)	50	2 HP pump	5"	2.72
11	Group 4(a)	50	1 HP pump	5"	1.3

Yields range from moderate to high, with an average of 6.95 l/s. It should be noted that, on basis of a pumping rate of 20 l/s from a 6.5 horsepower pump, it cannot be concluded that such a borehole would be able to provide a sustainable yield of 20 l/s, either during peak demands or throughout an entire year.

The estate is located on a relatively flat land with a few small hills on the northeastern side. Water conveyance and drainage systems on the Estate comprise a water pipeline, a man-made canal system that draws water from the Kafue River in the north and is used to irrigate the sugarcane fields, and the small Kaleya stream that flows from east to west along the southern border of the estate.

Some outcrops of dolomite were observed (Figure 7) in the northern parts of the Estate.

Figure 7: Dolomite outcrop

The vegetation of the uncultivated land consists mostly of small trees and shrubs. Soils on the estate are mainly of the (clayey) Luvisol type.

An analysis of the Dynamic Groundwater Recharge (DGR) was made during the Pre-Feasibility stage of the study (Aquaquest Report AQ21-022, 2021), using nine different scenarios with low-to-high recharge coefficients and small-to-large contributing catchment size.

3.2 GEOPHYSICAL SURVEY

The geophysical survey consisted of a combination of resistivity profiling and vertical electrical soundings, which were used to identify anomalies and other low resistivity zones (underground conductors of current), such as:

- Areas near vertical zones of fractured or faulted rock, and other zones of structural weakness and/or alteration
- Lithological boundaries
- Areas of substantial thickness of weathered overburden
- Areas with water-bearing layers

The resistivity profiles were conducted using an ABEM SAS 300 Terrameter with a current electrode spread (AB) of 180 m, resulting in an investigated depth of around 45-60 m bgl.

Resistivity profiling

Resistivity is a fundamental property that quantifies how strongly a given material opposes the flow of electrical current; consequently, it is the opposite of electrical *conductivity*. Different soil types may be distinguished by looking at the resistivity of the soil. High resistivity readings indicate the presence of compact rock formations, like fresh granite and gneiss, while low resistivity readings indicate fractured and/or weathered rock formations, water-bearing and soft formations, unconsolidated formations and/or materials with a high clay content. Low resistivities are therefore indicative of a certain likelihood to encounter groundwater at a given location.

Resistivity is a function of the resistance and the dimensions of the object the electric current is passing through and can be expressed as in the following equation:

$$R = \frac{U}{I} = \rho \frac{l}{A}$$

Where R is the resistance in ohm (Ω), U is the voltage in volt (V), I is the current in ampere (A), ρ is the resistivity in ohm metre (Ωm), l is length of the sample (m) and A is the cross sectional area of the sample (m^2).

The ground resistivity cannot simply be measured by simultaneously measuring the current and the voltage between a single pair of electrodes, because the contact resistance between the electrodes and the soil is relatively large. Instead, the voltage is measured by a separate

pair of electrodes connected to a high-impedance voltmeter, which draws almost no current - thus making the voltage drop over the potential electrodes (MN) negligible. The resistivity measured by an array may be interpreted as a constant resistivity if the soil is homogeneous. This constant resistivity is called the *apparent resistivity*.

There are multiple common electrode arrays to measure the resistivity of the soil. The Schlumberger array is selected as the most appropriate method for the case presented in this report. Figure 8 shows a schematic visualisation of the Schlumberger array.

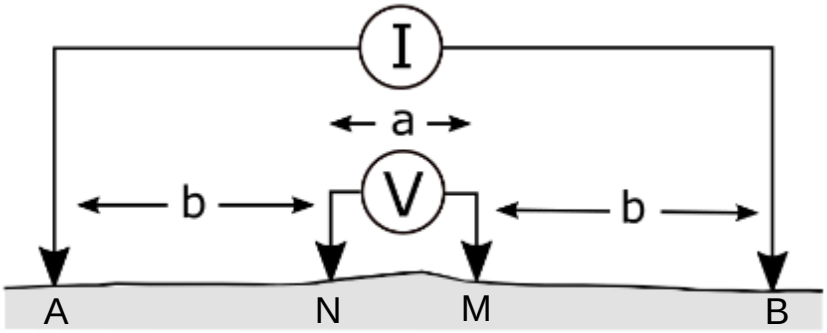

Figure 8: Schlumberger array

The apparent resistivity can be calculated from the known geometric factors. For the Schlumberger method, the apparent resistivity is expressed by the following equation:

$$\rho = \pi \frac{b(b+a)}{a} \frac{V}{I} \approx \pi \frac{b^2}{a} \frac{V}{I} \quad [if \;\; a \ll b]$$

In the Schlumberger method, the distance b is much larger than the distance a, which allows for the simplification of the equation.

Resistivity profiles show the values of apparent resistivity at a certain probing-depth, as well as the variations along the investigated transect. Sudden changes in resistivity along a horizontal profile (and in particular: low-resistivity anomalies) are indicative of changes in geological material, possible faults, and occurrence of underground water.

The interpretation of results from the resistivity method requires a number of assumptions. These assumptions might not always be realistic in the field. For instance, soil materials are never completely homogeneous. That is why the resistivity measurements should always be used in combination with other data sources, like geological maps, satellite imagery, field visits, and practical observations by a trained hydrogeologist.

Vertical electrical sounding (VES)

This method is used to identify vertical variations of resistivity with depth at a certain location, and to identify the depth to bedrock, which can be derived from the resulting VES-

graph of apparent resistivity as a function of AB/2 (note: AB/2 represents an indication of depth, but importantly, it does not indicate an actual depth).

The VES are usually set at promising anomalies and transitions derived from the resistivity profiles, and other points of interest. Where there is control data available from borehole drilling, VES results can be used to infer subsurface conditions by interpolating between known points. The investigated depth is related to the spread of the electrodes (potential electrodes MN/2 and current electrodes AB/2). The VES survey was used with a maximum spread of 400 m, resulting in a depth of investigation up to about 100-120 m bgl.

3.3 SURVEY RESULTS

The geophysical survey was performed from 19 to 29 January 2022. A total of 15 resistivity profiles were executed, covering a combined length of 11.2 km, with measurements taken at an interval of every 10 meter. After plotting and analysis of the profile results, 100 sites were considered of interest, of which 30 were selected for VES measurements.

Figure 9 to Figure 12 provide schematic overviews of the profile results, with low resistivities indicated in blue, and relatively high values shown in red color. Plotted field data (profile graphs) are included in Annex I.

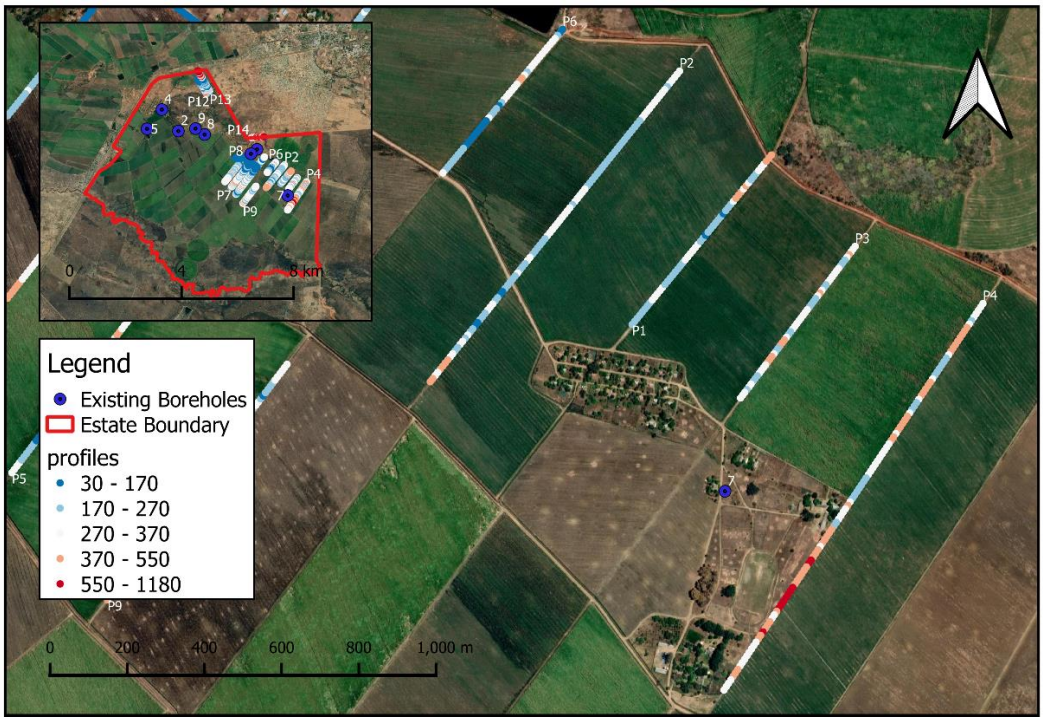

Figure 9: Geophysical survey profiles (1-4 & 6)

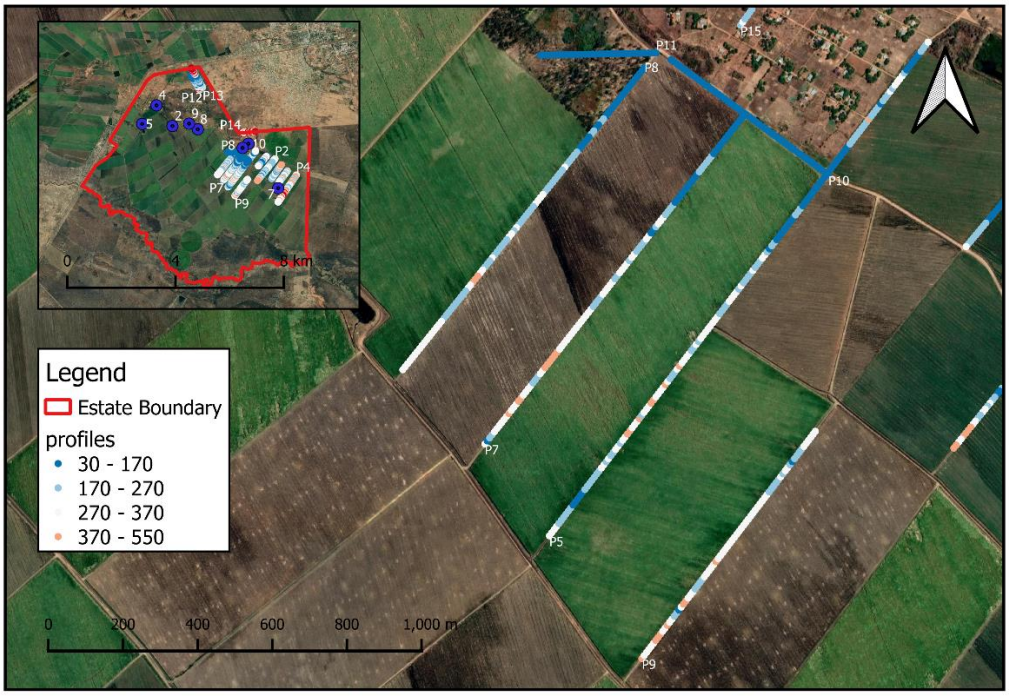

Figure 10: Geophysical profiles (5, 7-11)

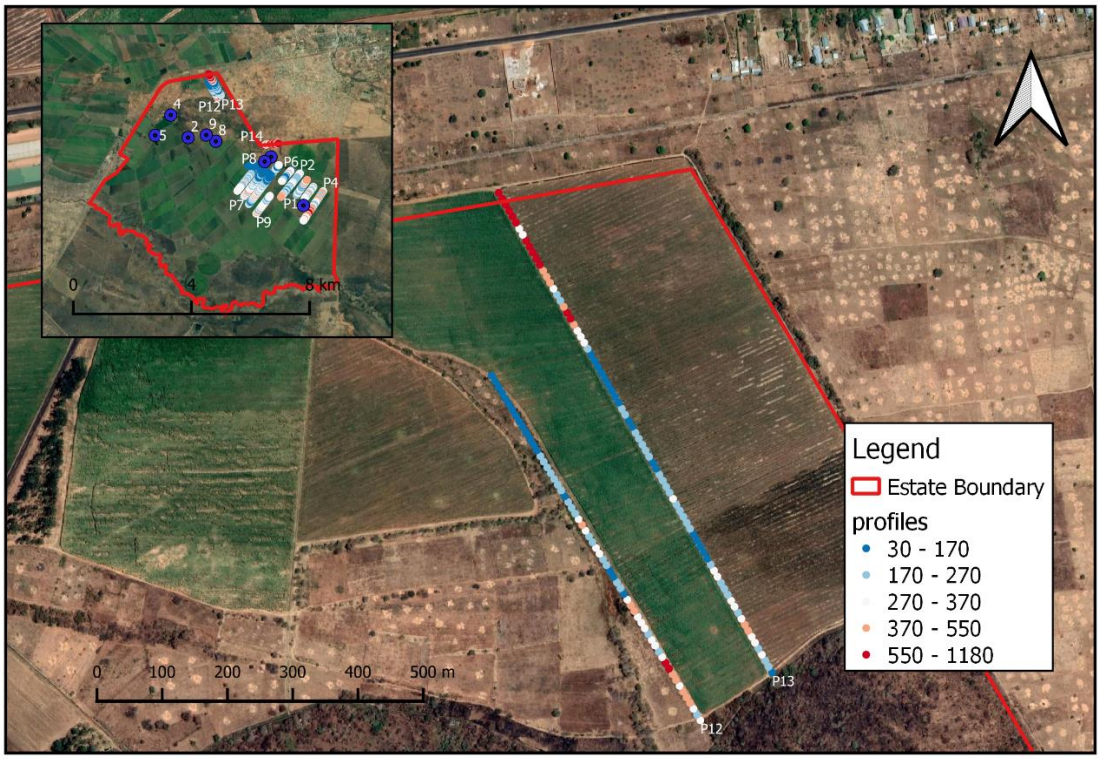

Figure 11: Geophysical profiles (12 & 13)

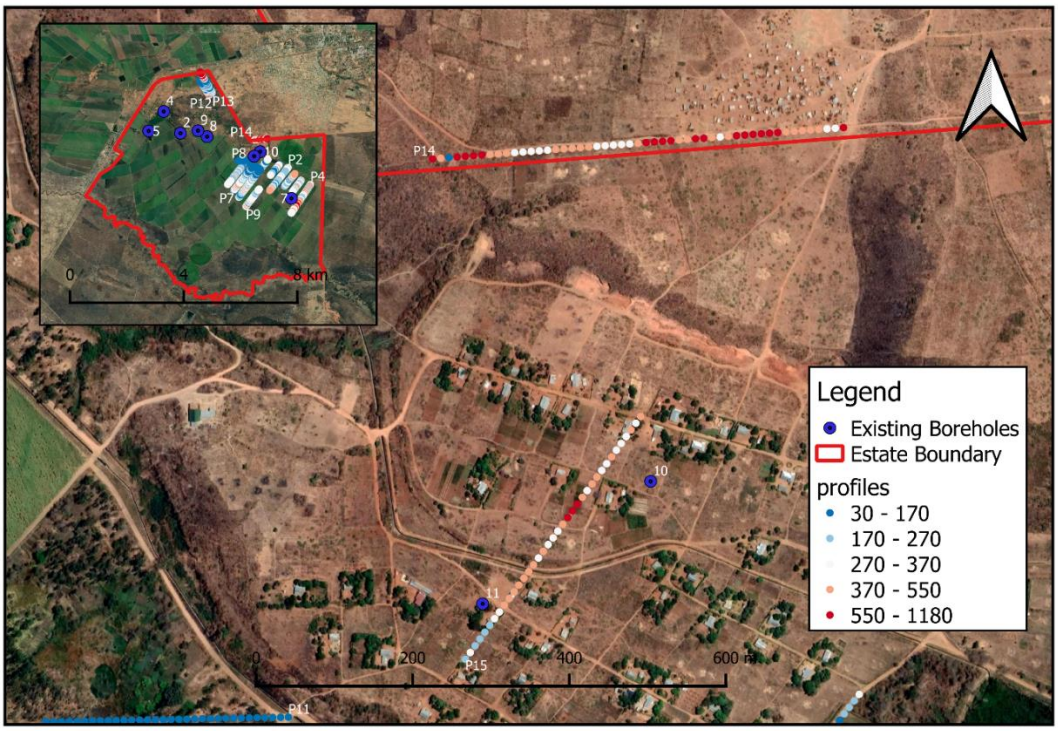

Figure 12: Geophysical profiles (14 & 15)

General observations and indications derived from the survey results are as follows:

- Lower resistivity values usually indicate relatively deep weathering, and/or the presence of faults, joints and fractures, which could be water-bearing;
- High resistivity values are attributed to massive rocks, which are not conductive and generally do not contain significant amounts of groundwater;
- From the 11.19 km of profiles done on the Farm, 100 interesting sites (anomalies) were considered. Among these, 30 were selected for Vertical Electrical Soundings.
- Low resistivity values were generally observed on the profiles that are close to the sugarcane fields: this could be attributed to the overlaying alluvial formation on which the cultivation occurs, as well as the high soil moisture content, or even water-logging. Following the heavy rains experienced during the month prior to the survey, the alluvial material and clayey soils will be characterized by relatively good electrical conductivity, and hence, low resistivity.
- The profiles on which readings are relatively high are those in areas where outcrops of the dolomite can be seen at the surface (P12, P13, P14).

In total, 30 VES were carried out at the most promising low resistivity points ("anomalies") obtained from the profile lines (see Figure 13 and Figure 14). VES results are shown in Annex II.

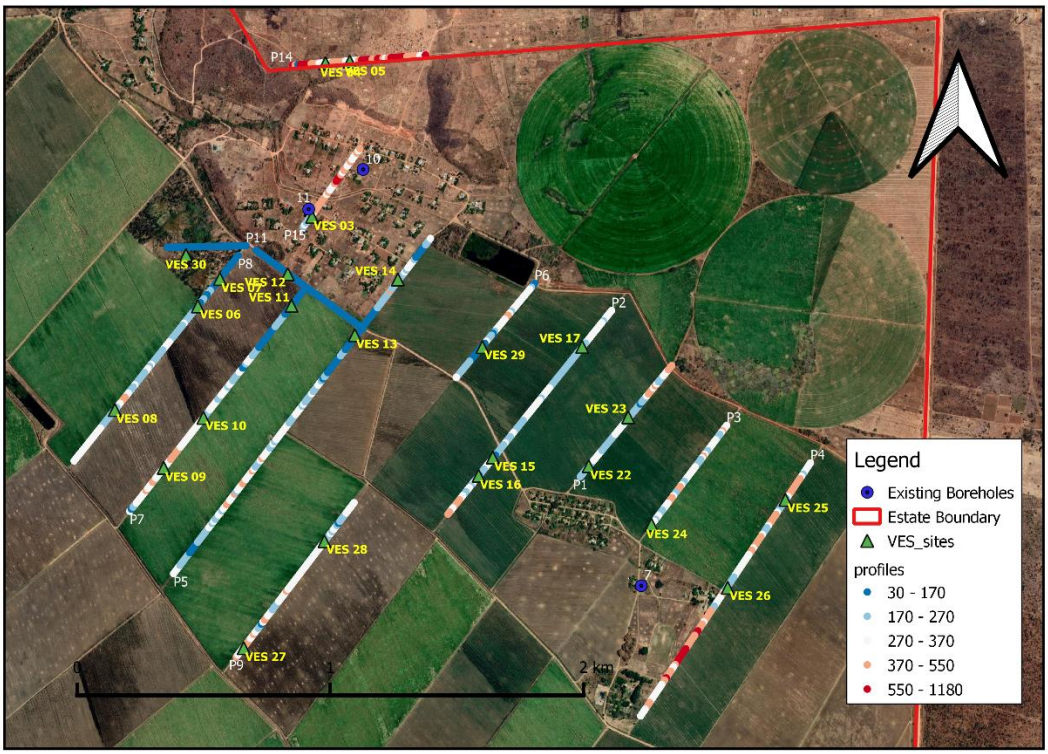

Figure 13: VES sites

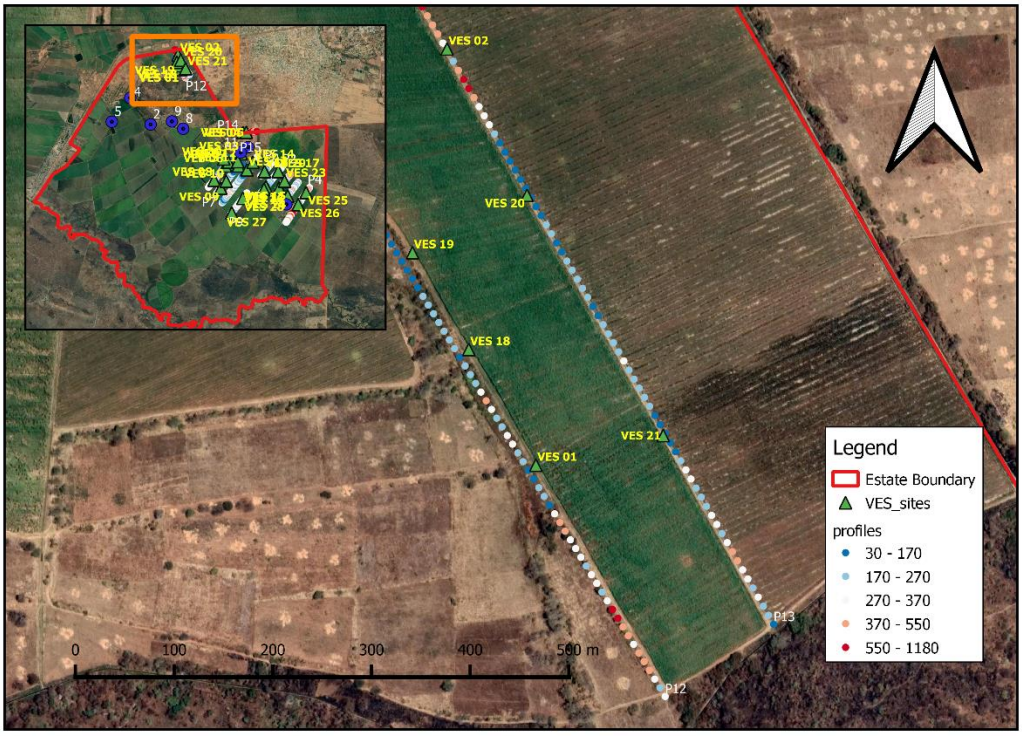

Figure 14: VES sites on Profile 12 &13.

3.4 SITE RANKING

Site selection was done initially during the survey. After running the more than 11 km of profiles, 30 promising sites with the best anomalous characteristics were chosen for the vertical electrical sounding (VES). The purpose of the VES is to observe the vertical characteristics of the selected site, assess aquifer potential at the points of interest, determine drilling depths, and approximate aquifer thickness.

A rating table was prepared, in which each location was rated and ranked, based on the general resistivity values, the anomality obtained from the resistivity profile, the VES interpretation, and additional collected data (geological maps, hydrogeological maps, aerial photographs, current infrastructure, vegetation trends and other field observations).

The top-ranked 13 sites are shown in Table 3Error! Reference source not found.; from these relatively promising sites, the first 5 to 8 are recommended for pilot drilling, ie. VES 12, 05, 11, 01, 20, as well as VES 06, 29 and 14. Five further sites for possible consideration (depending on the initial results) are VES 02, 07, 25, 26 and 30. The exploratory drilling should follow a flexible approach, whereby the results of the initial pilot holes should determine the next site(s) to be drilled from the list best ranked locations.

Table 5. Site ranking for exploratory drilling on the estate

Rank	VES	Site	Profile	Combined rating	UTMX	UTMY
1	VES 12	68	10	7.5	577933	8242883
2-3	VES 05	92	14	7.25	578178	8243722
2-3	VES 11	51	7	7.25	577948	8242758
4-5	VES 01	78	12	7	576302	8245522
4-5	VES 20	87	13	7	576293	8245795
6-7	VES 06	55	8	6.75	577578	8242756
6-7	VES 29	39	6	6.75	578702	8242595
8	VES 14	34	5	6.5	578368	8242862
9-13	VES 02	88	13	6	576212	8245943
9-13	VES 07	54	8	6	577665	8242864
9-13	VES 25	16	4	6	579899	8241992
9-13	VES 26	19	4	6	579671	8241645
9-13	VES 30	72	11	6	577531	8242958

Coordinate system used: UTM Arc 1950 Zone 35S

The complete list for the 30 ranked VES sites is included in **Annex III– Ranking and List** of sites.

In general, VES with similar characteristics that are located at close distance from each other (e.g., VES 11 and 12) need not both be drilled during a relatively small pilot drilling programme with a limited number of attempts. In this case, it is better to spread the exploration efforts over more widely distributed sites that look promising, are marked by different VES-signatures, but that are located at greater distance from each other. In this approach, the benefits of a pilot drilling exercise will be better distributed throughout the project area, resulting in better insights into spatial variations, and more choices for the eventual development of the production boreholes.

Figure 15: Final best ranked VES sites (01, 02, 18, 20 & 21)

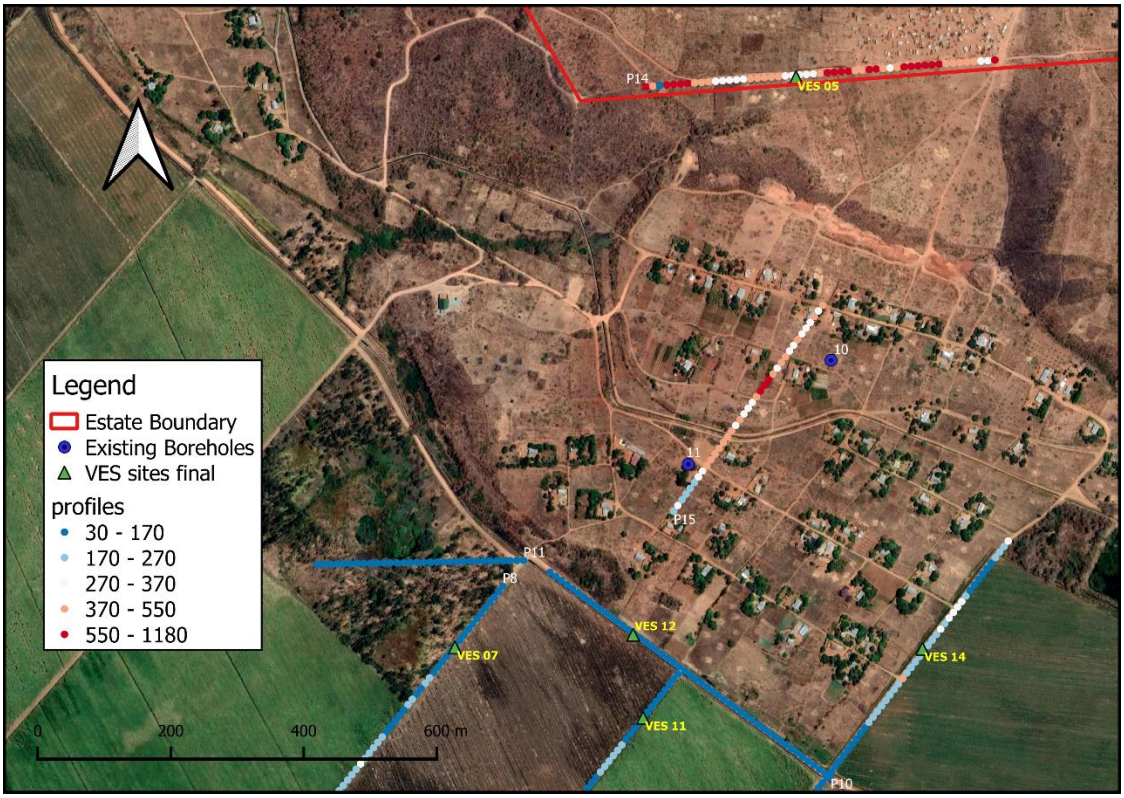

Figure 16: Final best ranked VES sites (05, 07, 11, 12 & 14)

4. CONCLUSIONS AND RECOMMENDATIONS

4.1 CONCLUSIONS

As part of a broader Feasibility Study for Irrigation System Development, Aquaquest was contracted by Kaleya Smallholders Company Ltd to conduct a hydrogeological and geophysical survey at their Estate in Mazabuka District, Southern Province. A total of 15 geo-electrical profiles were run with a combined length of 11.2 km, while 30 Vertical Electrical Soundings (VES) were carried out. The results of the survey and a review of existing data have been compiled to identify sites with the best possible prospects for pilot borehole drilling and future groundwater abstraction.

The geology of the area consists mostly of carbonate rocks (dolomites and limestones), overlain by a relatively thin layer unconsolidated soils, weathered materials or alluvial sediments. The potential for groundwater development in carbonate rocks is usually high, due to presence of fractures and karst features.

According to the geohydrological map, the northern part of the estate, which is underlain by limestone/dolomite, is characterized by a *local discontinuous productive aquifer or an extensive but only moderately productive aquifer*. The central and southern parts of the estate are characterized by *Strata with intermediate characteristics.*

Further to Aquaquest's review of the available data and the overall hydrogeological setting, we believe that the potential for groundwater development at Kaleya Estate is in fact relatively good. The area underlain by dolomites and crystalline limestones (also where these are covered by overburden) is indeed marked by a discontinuous fracture and karst aquifer. Where this aquifer is penetrated by boreholes, expected yields are relatively high: sustainable abstractions in the range of 15-30m^3/hr should be feasible from properly sited and professionally drilled production wells.

The geophysical survey results are fairly promising, even though most of the VES suggest the presence of massive crystalline rocks at relatively shallow to moderate depths. Locally, conspicuous profile anomalies and interrupted rising limbs of VES curves at moderate to relatively great depths suggest that there are fracture systems and karst features between depths of 30 and 90 m bgl. In this regard, 13 sites (see Table 3) were selected asError! Reference source not found. relatively promising sites. Among these, the first 5 to 8 best sites are recommended for pilot drilling, ie. VES 12, 05, 11, 01, 20, as well as VES 06, 29 and 14. Five further sites for possible consideration (depending on the initial results) are VES 02, 07, 25, 26 and 30. The exploratory drilling should follow a flexible approach, whereby the results of the initial pilot holes should determine the next site(s) to be drilled from the list best ranked locations.

4.2 RECOMMENDATIONS

Bed on the results from the geophysical surveys and the hydrogeological analysis of the area, Aquaquest recommends the following borehole development works:

- Commence with the drilling of 5 highest-ranked pilot holes using the recommended VES survey points. Consider 3 additional sites if drilling budget allows.
- Engage an experienced and competent drilling contractor. The construction of a borehole is an expensive exercise, which carries a relatively high risk. Poor workmanship and application of substandard designs and materials may lead to very disappointing results, even at potentially high-yielding sites. A good contractor, applying proper drilling standards and good quality installation materials, will generally be able to construct a higher yielding and more sustainable borehole than a relatively poor contractor.
- It is expected that the drilling will encounter weak and unstable ground conditions, which may result in collapsing of the borehole. The selected driller should therefore be experienced and well-equipped: this includes the availability of sufficient quantities of temporary casings to adequately deal with collapsing conditions.
- For the 5 selected pilot holes at the currently identified sites, it is recommended to execute an exploratory drilling program, with 6-inch pilot holes drilled at the most favourable sites shown Table 5. Subsequently, only the highest yielding pilot holes (e.g. those with a yield in excess of 3 l/s or > $10m^3$/hr) should be developed (reamed, cased and tested) into production boreholes, in order to save costs and obtain the most productive boreholes for future groundwater abstraction.
- Based on the results of the exploratory drilling, the ranking of sites should be regularly reviewed (initially, after every completed pilot hole) and further improved, to adjust the site selection in line with the actual findings, increase the success rate, and optimize the borehole yields;
- Collect and keep a full and detailed record during the drilling of the pilot holes and the subsequent development of production boreholes. This will form the baseline for the most effective well-design, guide any future rehabilitation works that may be required, and assist in the roll-out of further groundwater development scenarios at the Kaleya Estate;
- Engage a competent hydrogeologist to provide an independent verification of drilling and follow-up well construction activities, provide professional supervision on behalf of the client, assist the contractor in identifying 'productive' zones, to collect detailed data during the drilling process, and to design the most efficient well for the encountered hydrogeological conditions. The hydrogeologist will also be able to review and adapt the drill site selection as needed, in line with the results from the completed pilot holes; The supervision service also provides an independent verification of both standards and quantities of completed work, installed materials

and consumables used during the drilling process. This is essential to avoid potential shortcuts by the contractor and to guarantee best value for money throughout the project;

- Every new borehole should be test pumped for at least 24 hours at constant discharge to determine the sustainable pumping rate, select the correct type of pump and its depth-setting in the borehole. The constant discharge test should be preceded by a 4-6 hour step-drawdown test at gradually increasing yield steps (e.g. at 4 steps of 1, 2, 4 and 6 l/s). Regular water level monitoring will increase the lifespan of the pump and also allow monitoring of the water resource over time;
- Boreholes must be registered with the Water Management Authority (WARMA).

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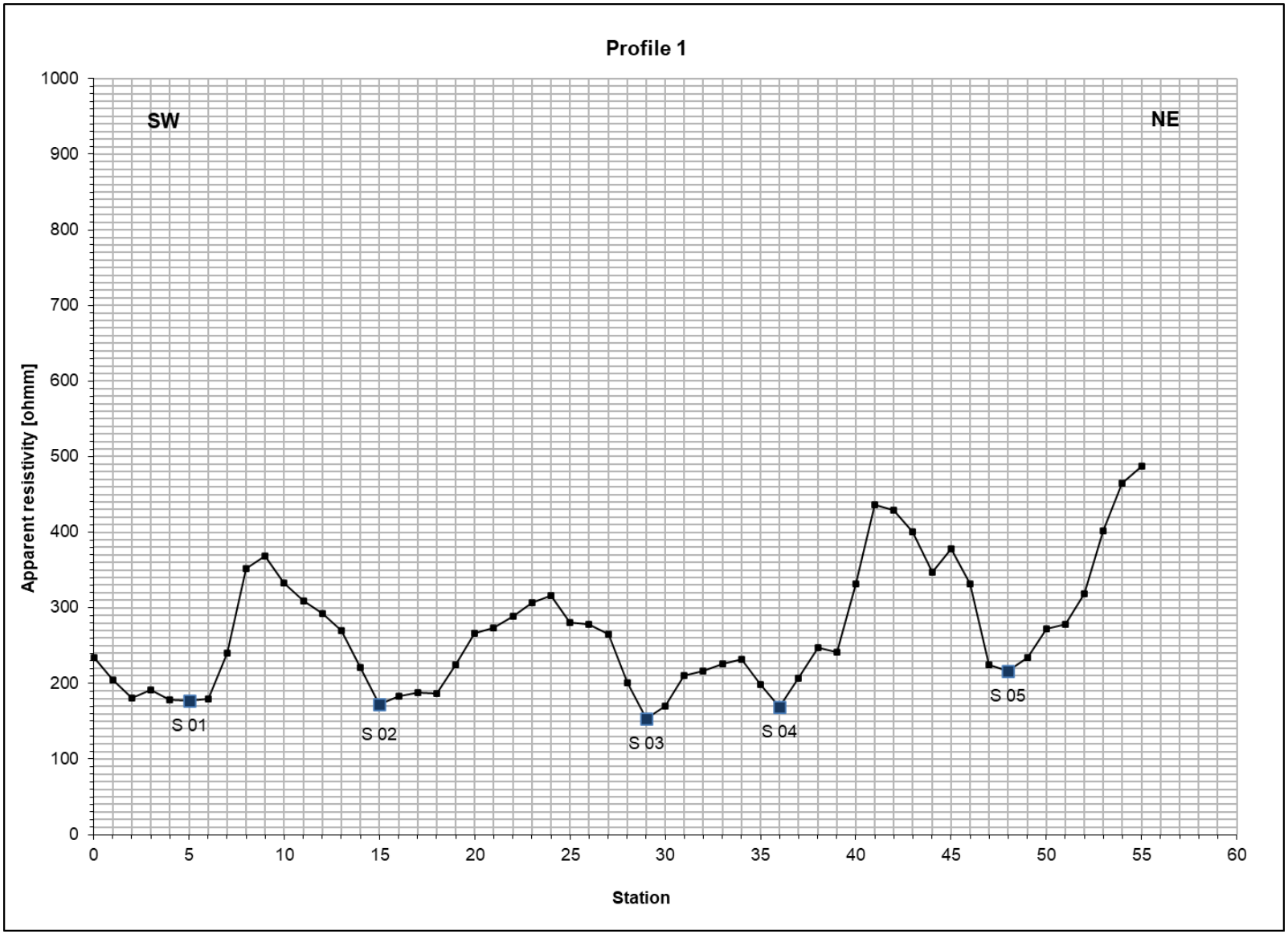
[5] https://en.climate-data.org/africa/zambia/southern-province/mazabuka-23259/

[6] https://www.mindat.org/climate.php

ANNEX I - GEOPHYSICAL SURVEY RESULTS – PROFILES

- Profile 1
- Profile 2
- Profile 3
- Profile 4
- Profile 5
- Profile 6
- Profile 7
- Profile 8
- Profile 9
- Profile 10
- Profile 11
- Profile 12
- Profile 13
- Profile 14
- Profile 15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200
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20
25
30
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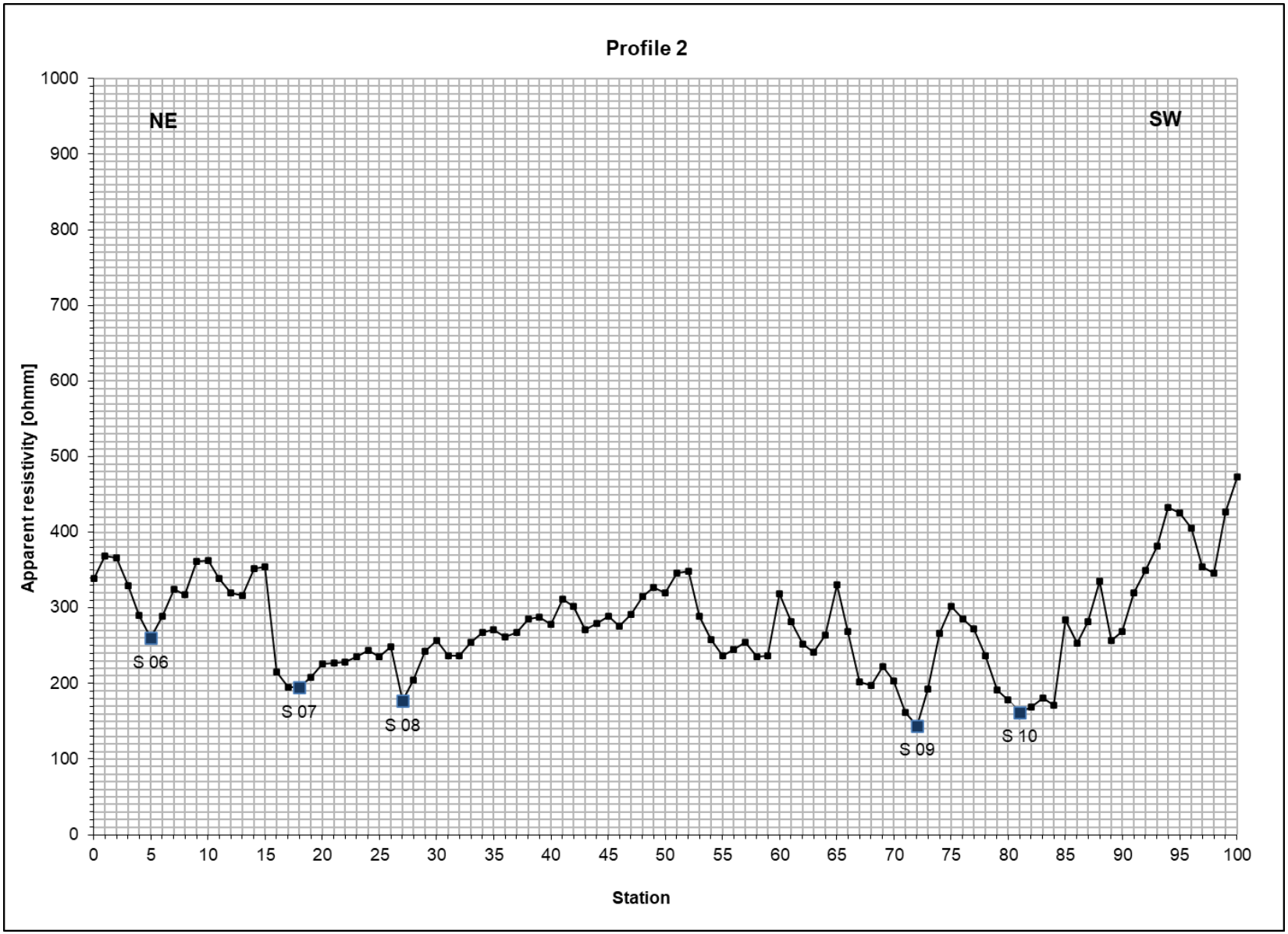
40
45
50
55
60
S 01
S 02
S 03
S 04
S 05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S 08
S 09
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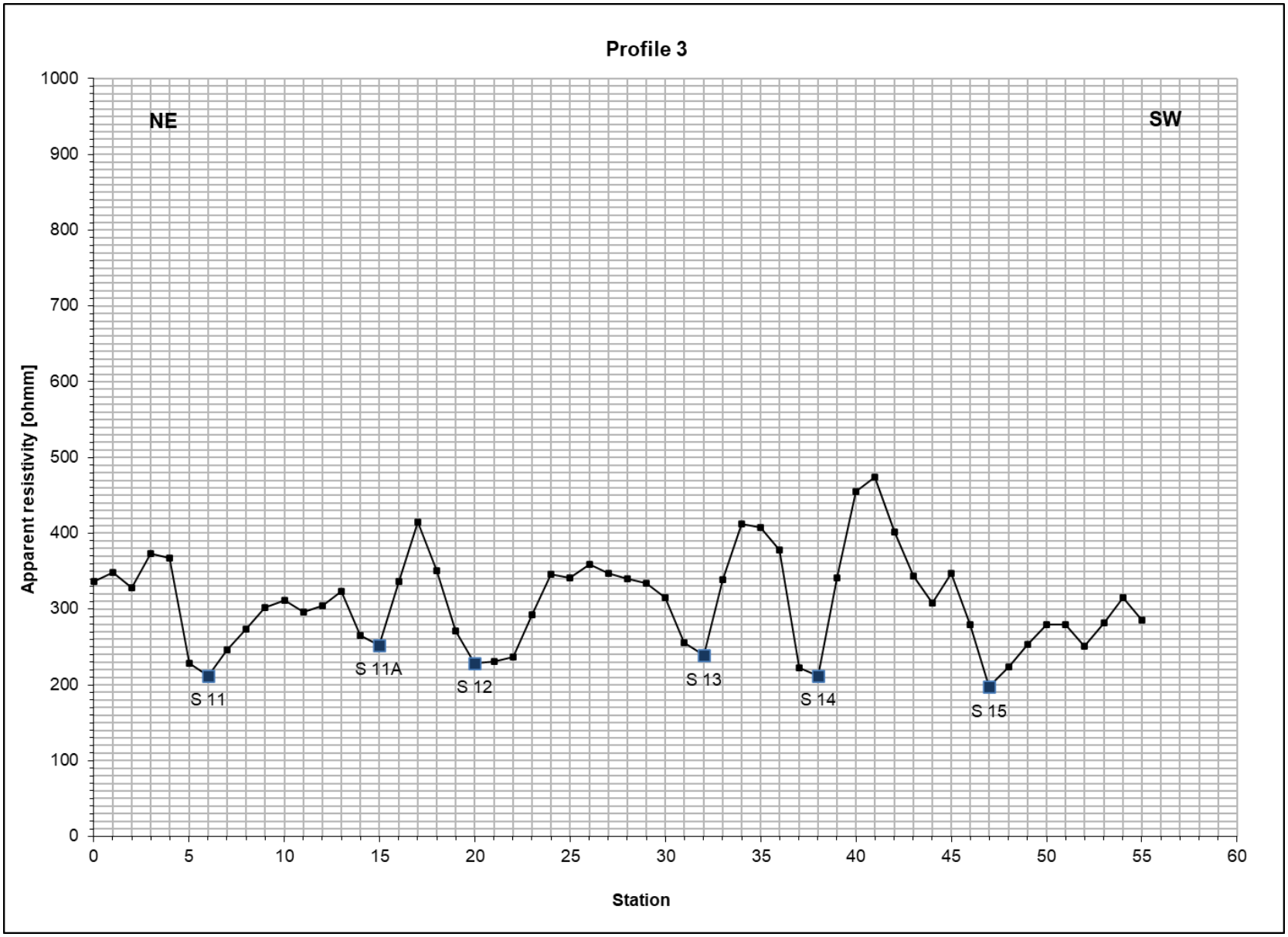
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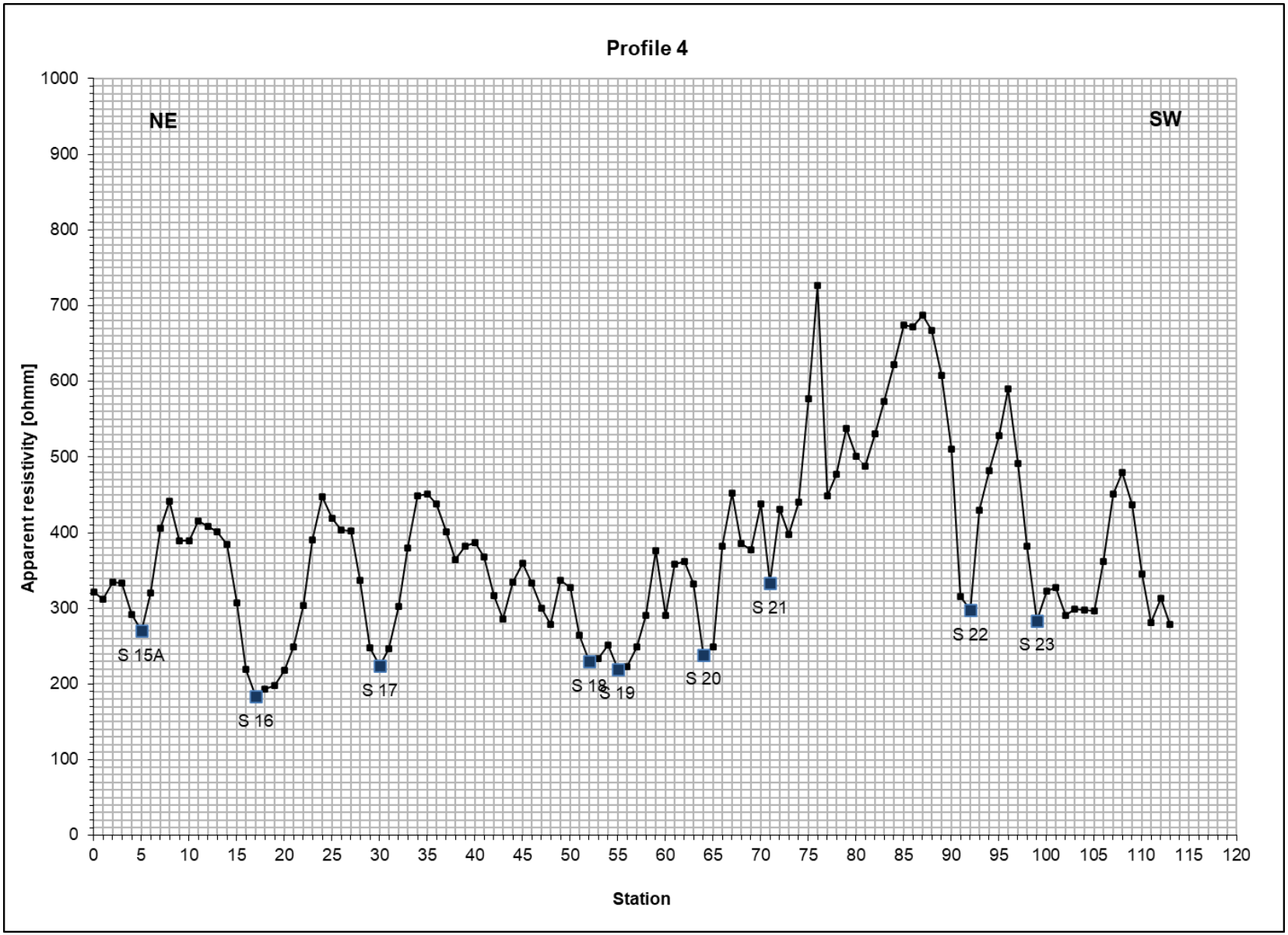
Station
S 11
S 11A
S 12
S 13
S 14
S 15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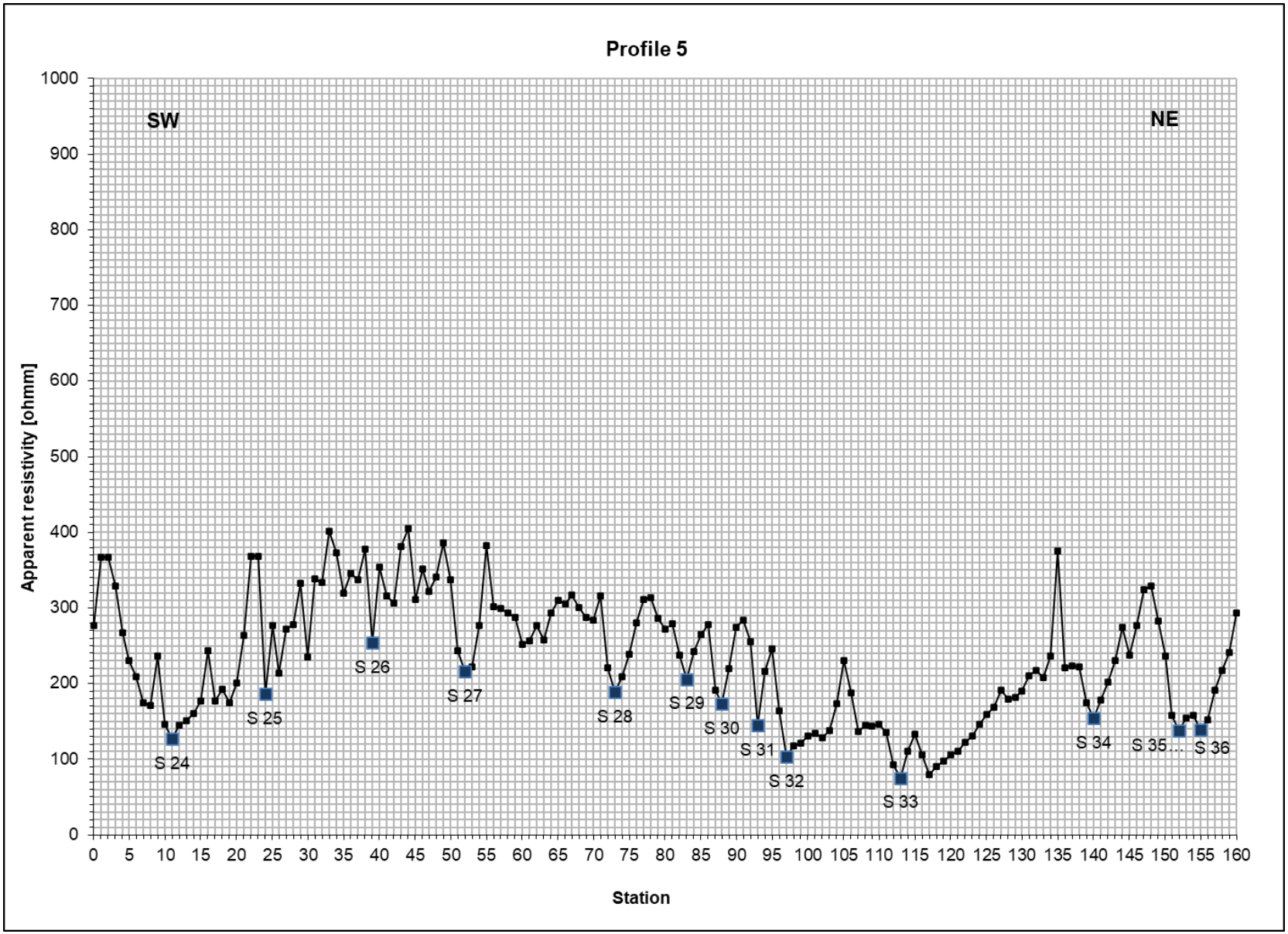
S 16
S 17
S 18
S 19
S 20
S 21
S 22
S 23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S 26
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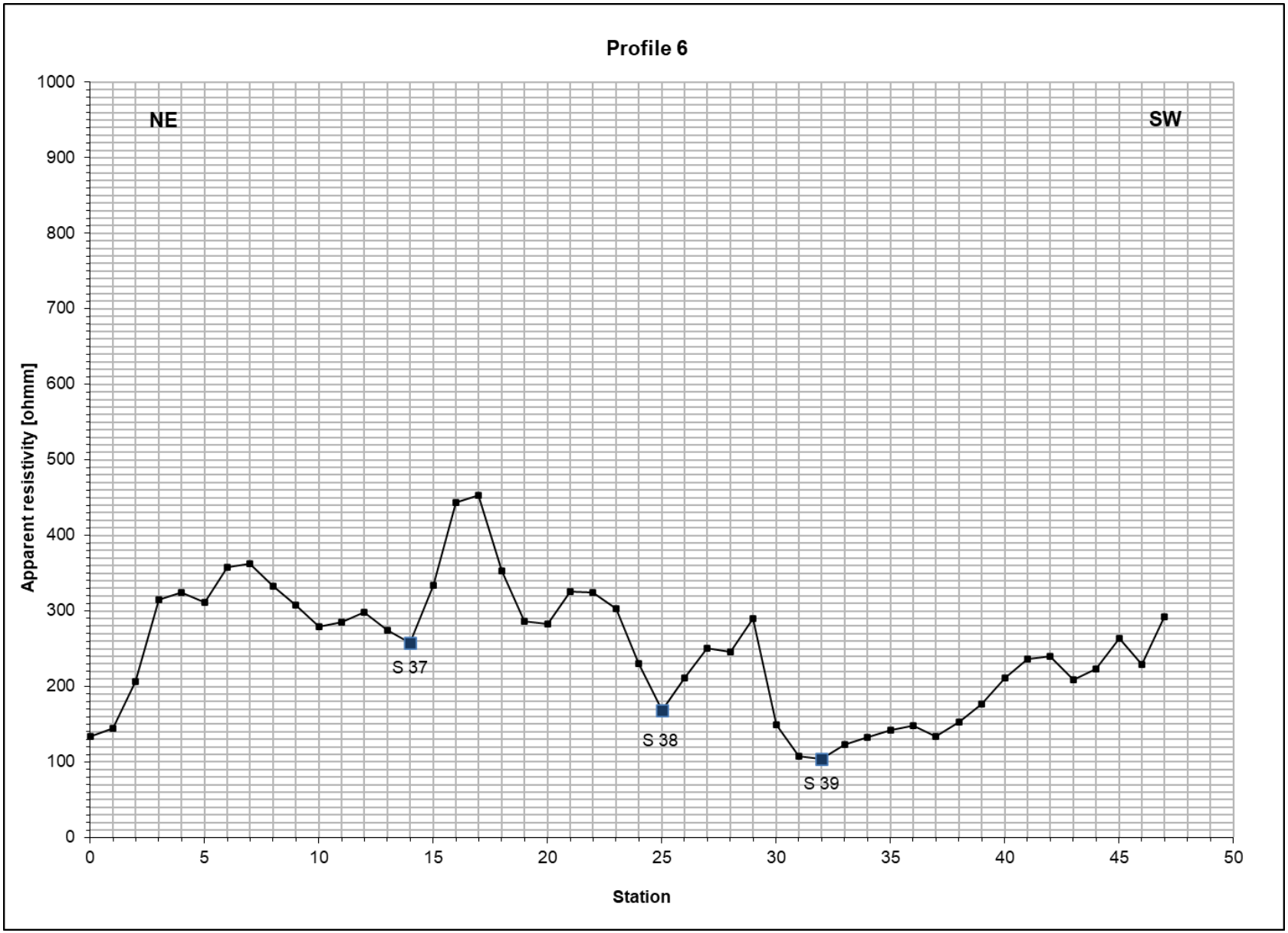
S 29
S 30
S 31
S 32
S 33
S 34
S 35...
S 36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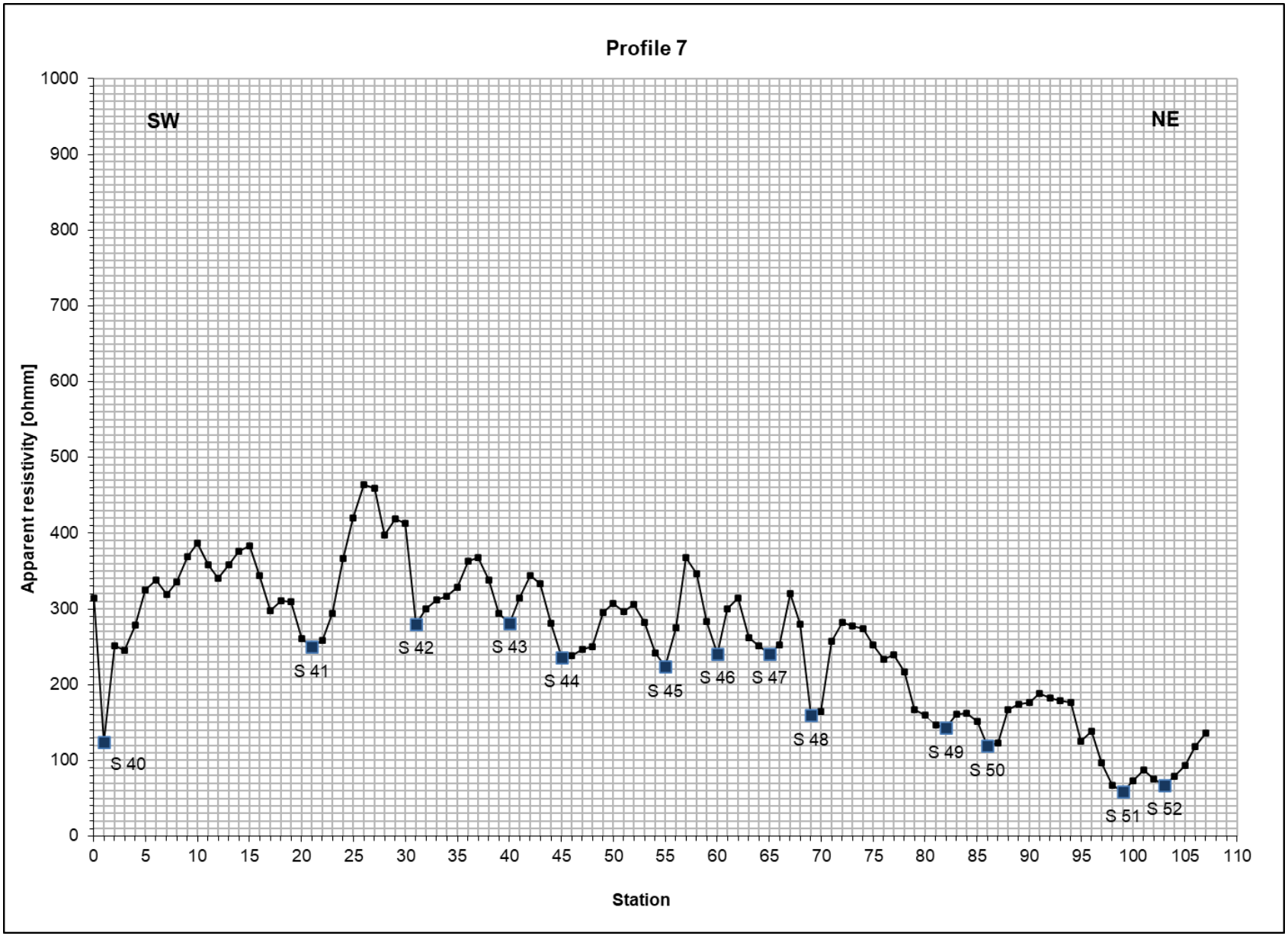
Station
S 37
S 38
S 39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75
80
85
90
95
100
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S 42
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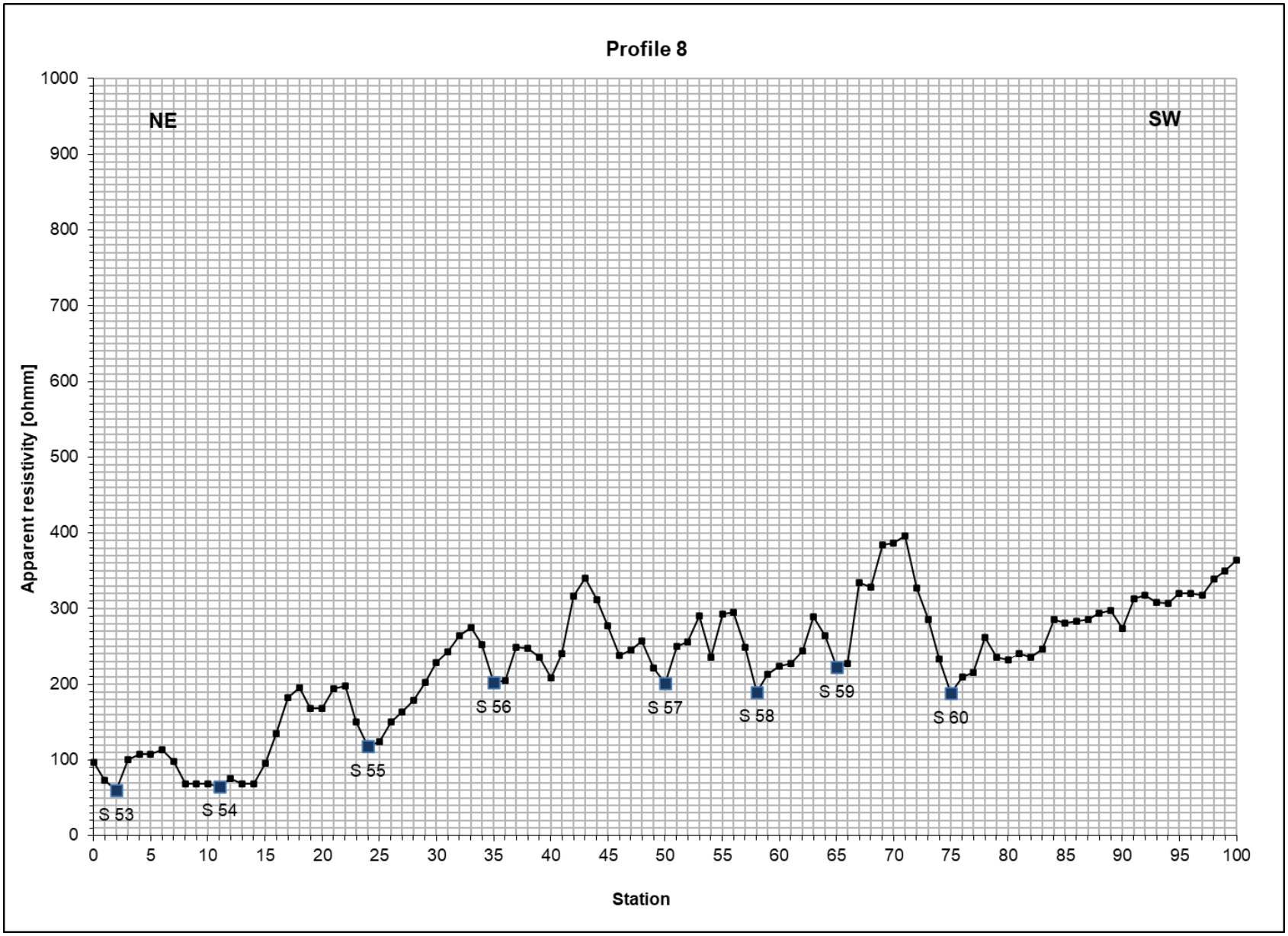
S 44
S 45
S 46
S 47
S 48
S 49
S 50
S 51
S 52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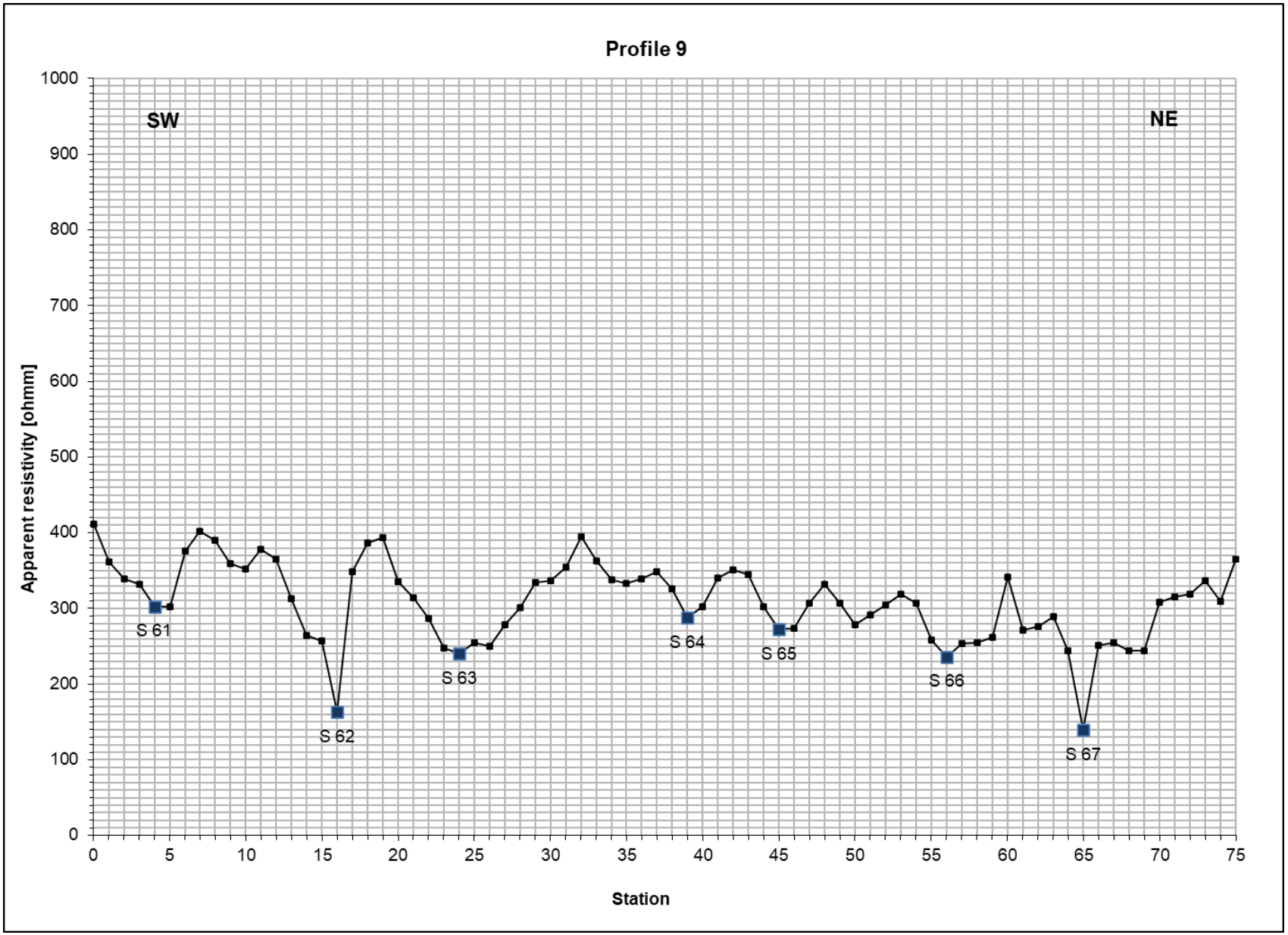
S 53
S 54
S 55
S 56
S 57
S 58
S 59
S 60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Apparent resistivity [ohmm]
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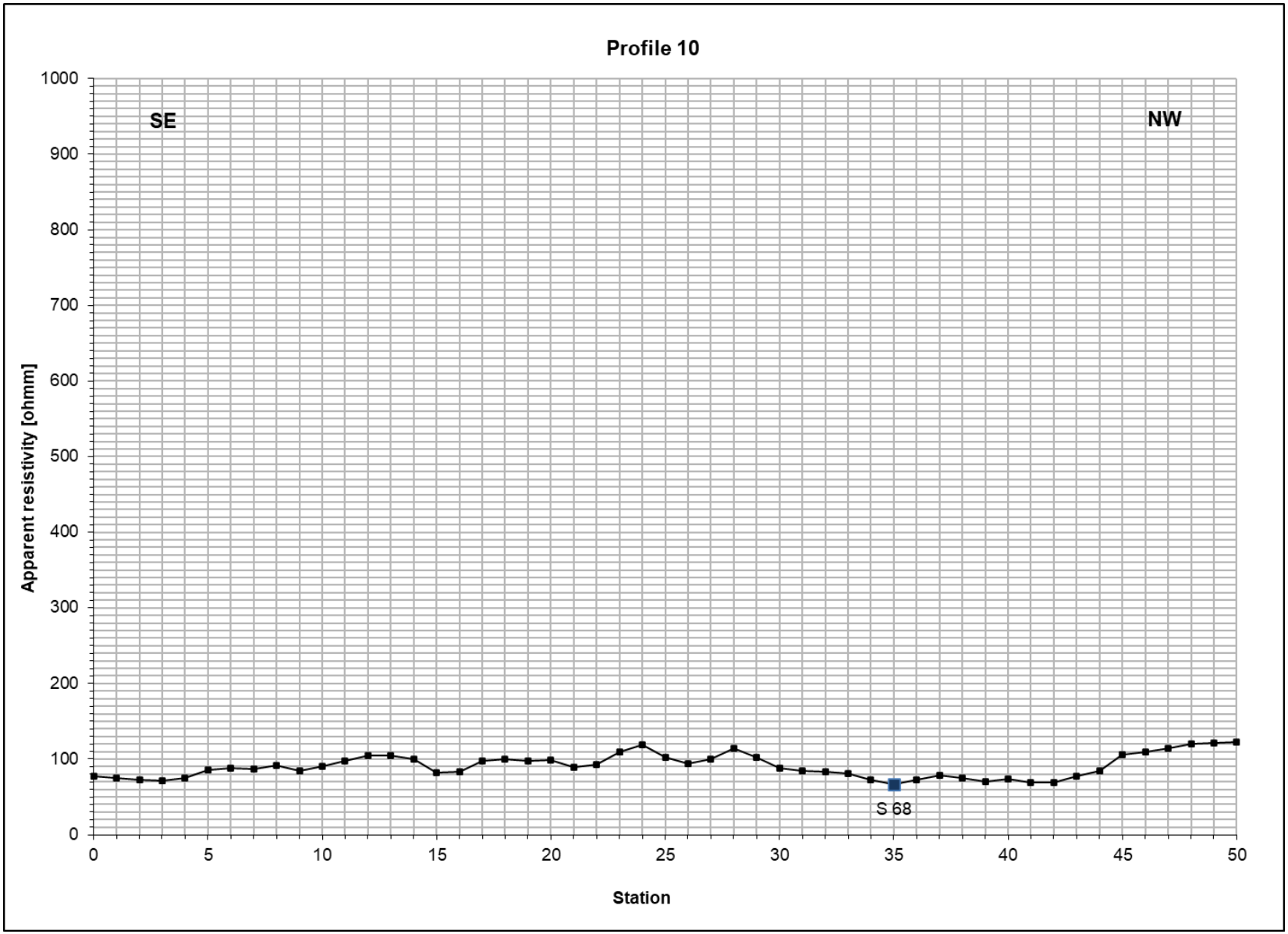
S 63
S 64
S 65
S 66
S 67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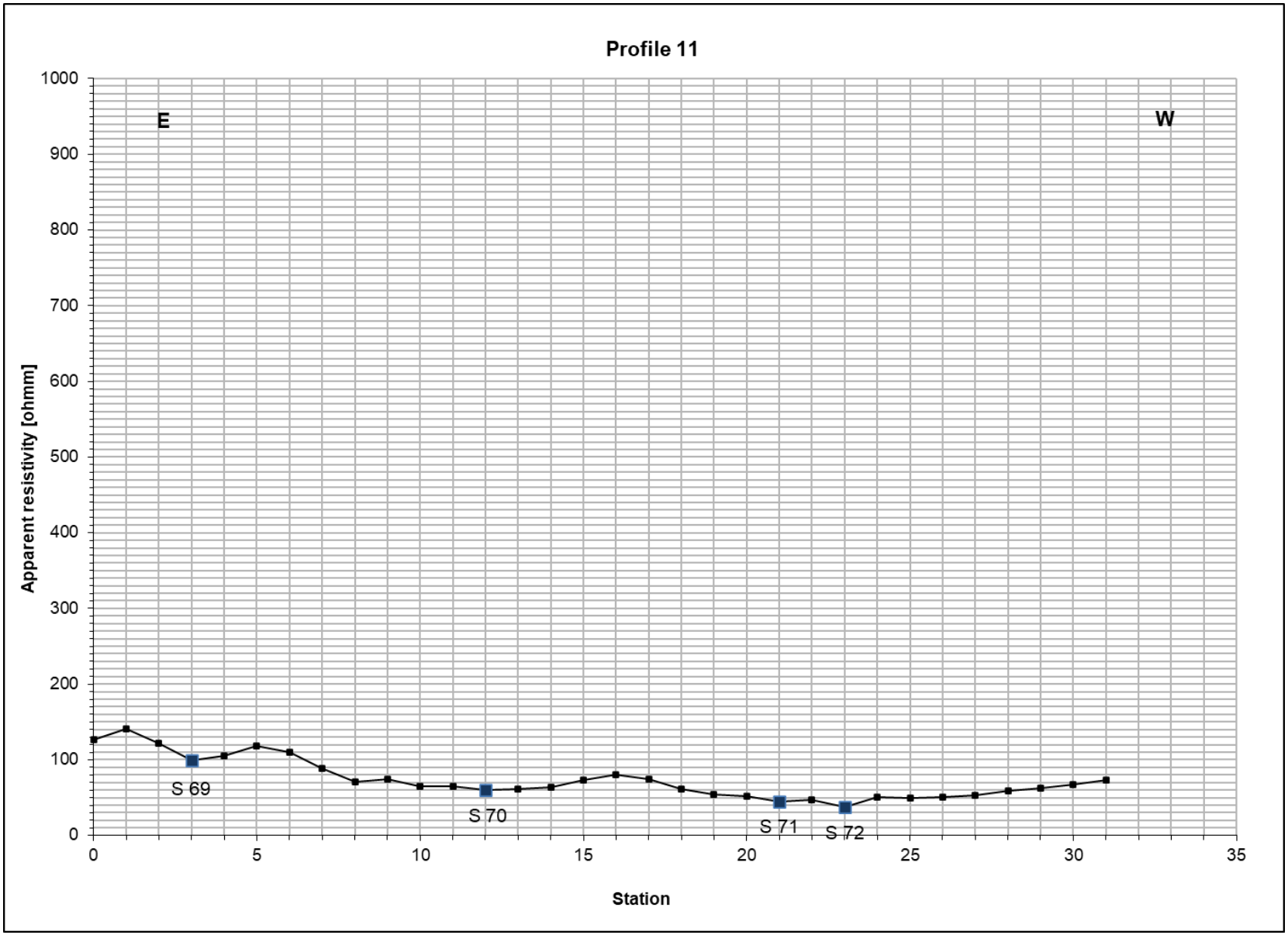
Station
S 68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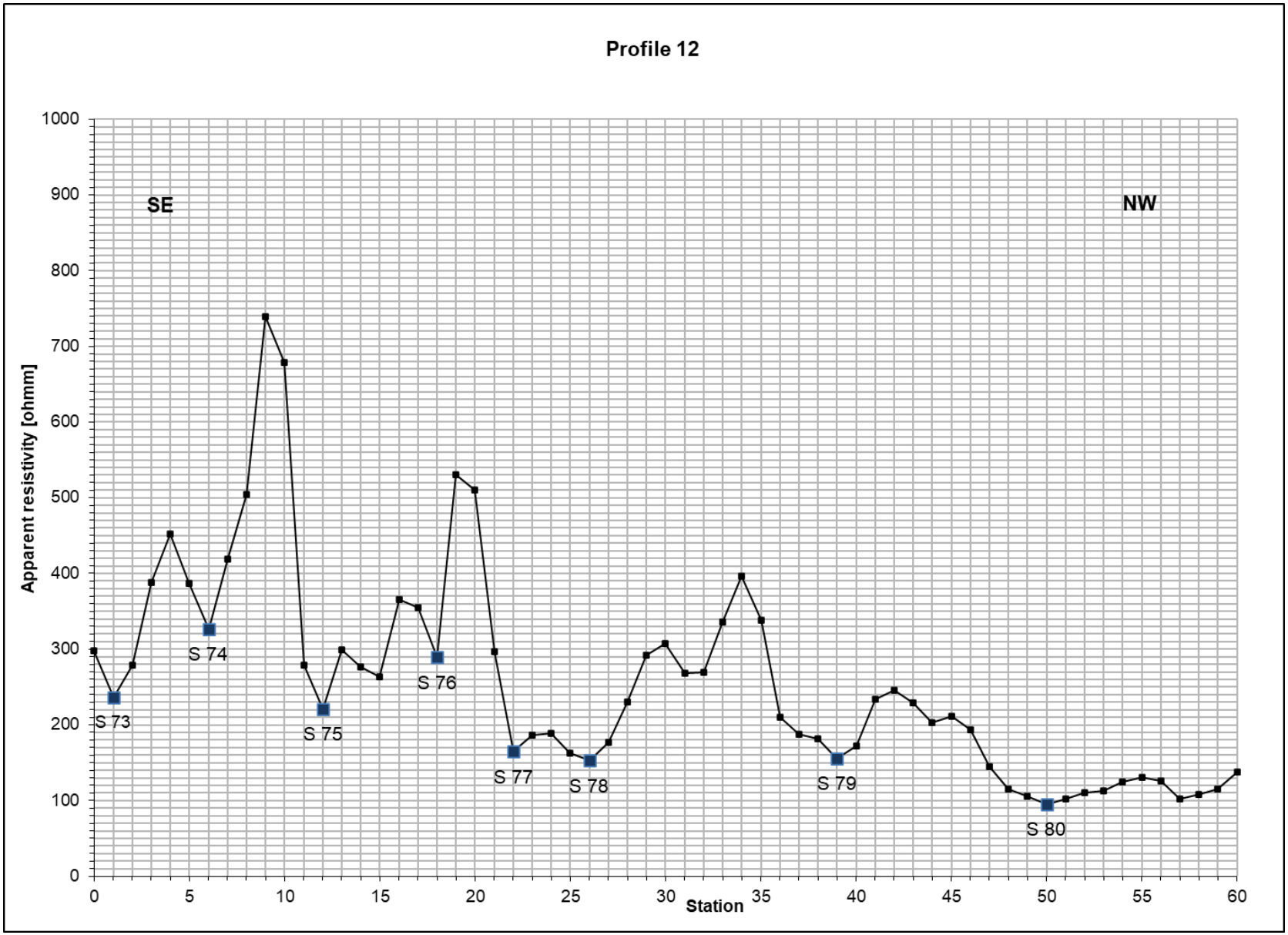
Station
S 69
S 70
S 71
S 72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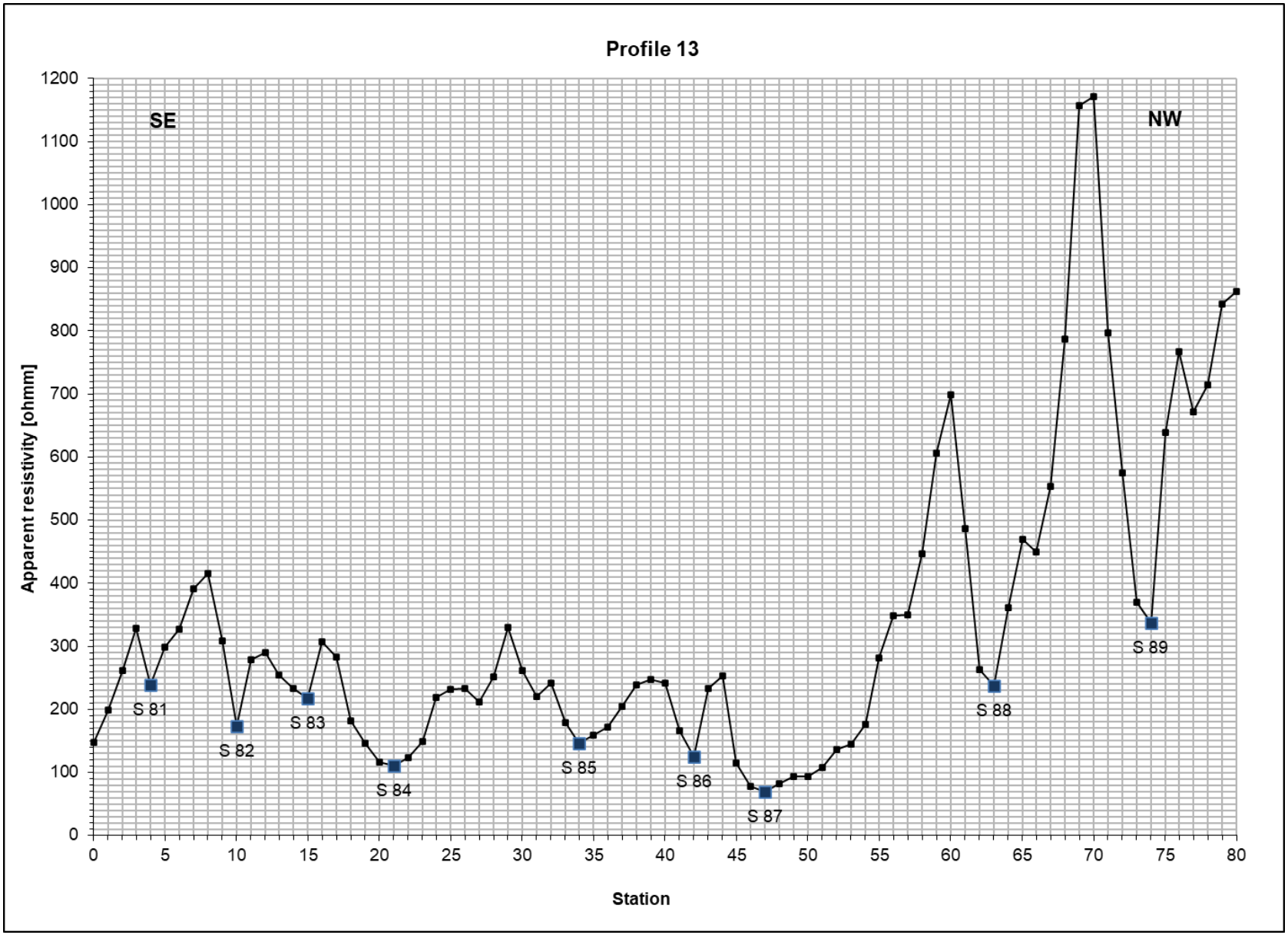
S 80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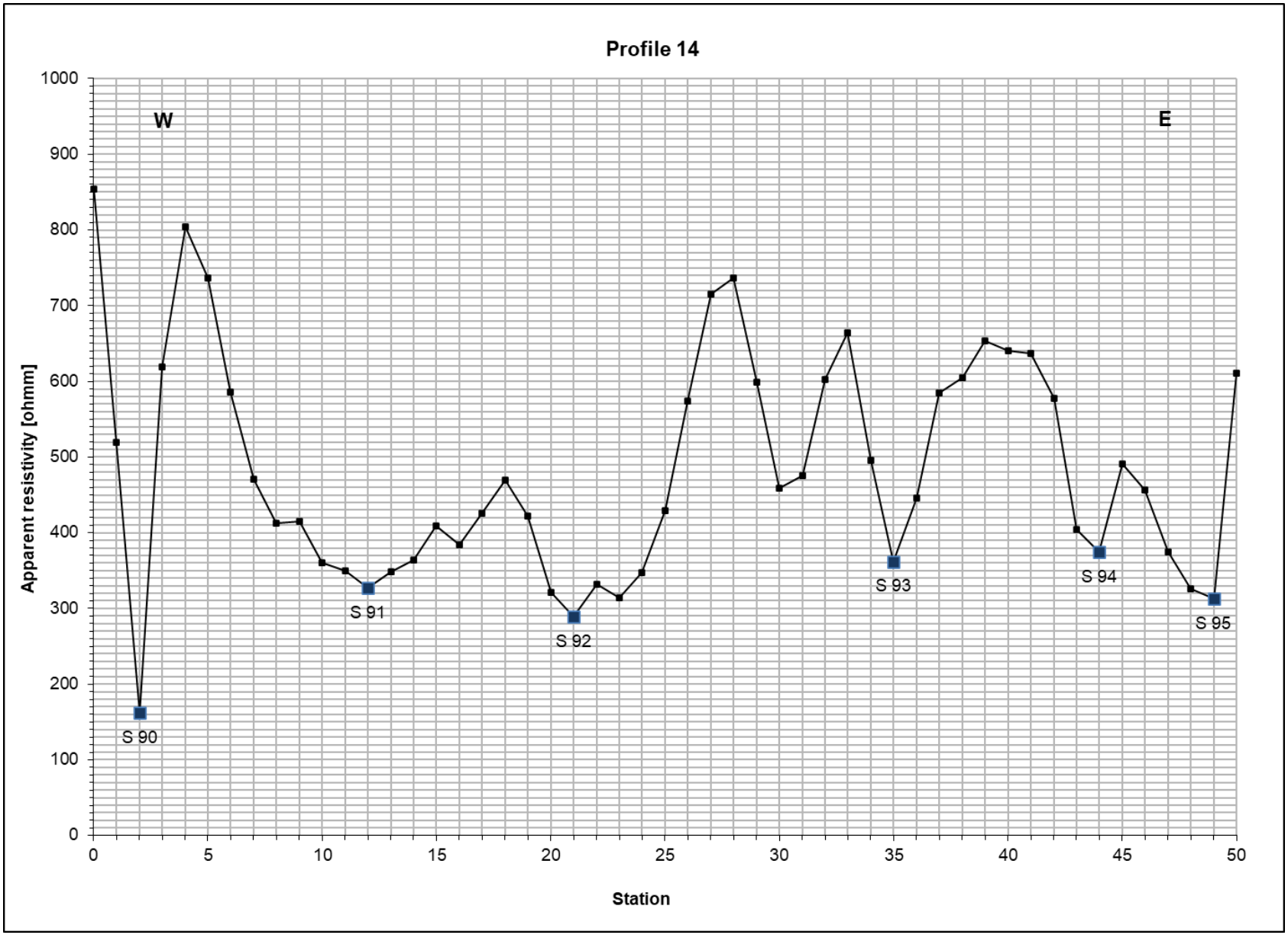
S 89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S 92
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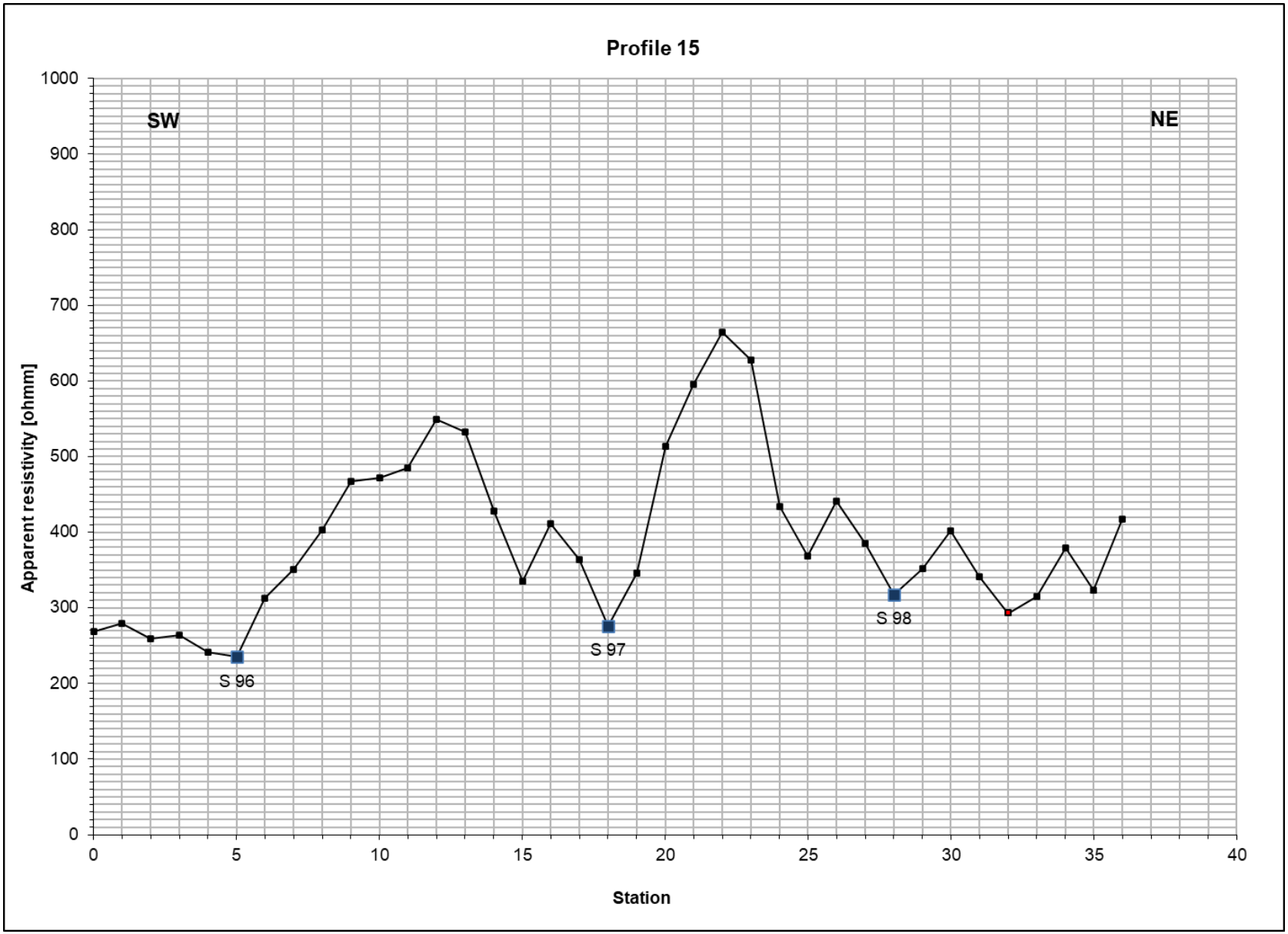
S 94
S 95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Station
S 96
S 97
S 98

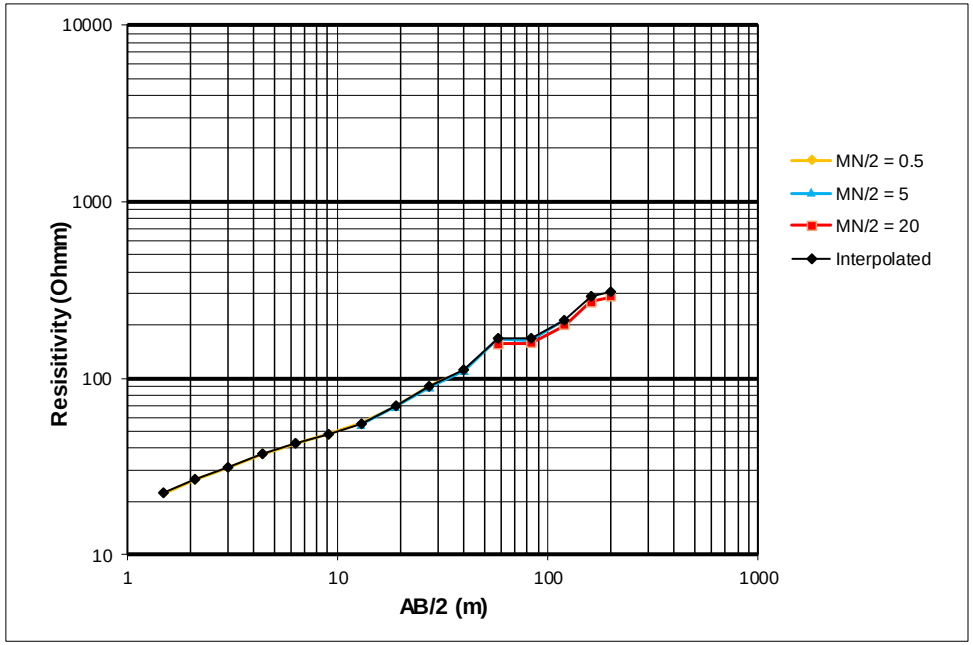
ANNEX II – GEOPHYSICAL SURVEY RESULTS – VERTICAL ELECTRICAL SOUNDINGS (VES)

ID	VES	UTMX	UTMY	PROFILE	SITE
1	VES 01	576302	8245522	12	78
2	VES 02	576212	8245943	13	88
3	VES 03	578029	8243109	15	96
4	VES 04	578082	8243716	14	91
5	VES 05	578178	8243722	14	92
6	VES 06	577578	8242756	8	55
7	VES 07	577665	8242864	8	54
8	VES 08	577250	8242347	8	60
9	VES 09	577443	8242118	7	41
10	VES 10	577600	8242316	7	44
11	VES 11	577948	8242758	7	51
12	VES 12	577933	8242883	10	68
13	VES 13	578198	8242642	5	33
14	VES 14	578368	8242862	5	34
15	VES 15	578743	8242159	2	9
16	VES 16	578687	8242087	2	10
17	VES 17	579096	8242596	2	7
18	VES 18	576234	8245639	12	79
19	VES 19	576177	8245737	12	80
20	VES 20	576293	8245795	13	87
21	VES 21	576431	8245552	13	84
22	VES 22	579122	8242125	1	1
23	VES 23	579278	8242318	1	3
24	VES 24	579370	8241894	3	15
25	VES 25	579899	8241992	4	16
26	VES 26	579671	8241645	4	19
27	VES 27	577759	8241407	9	61
28	VES 28	578078	8241828	9	66
29	VES 29	578702	8242595	6	39
30	VES 30	577531	8242958	11	72

Project	AQ22-003
Date	25/01/2022
Surveyor	NS/MB
Location	Kaleya, Mazabuka

VES-name	VES 01		
Orientation	70/250		
GPS	576302	8245522	1062 m
Station	78	Profile	12

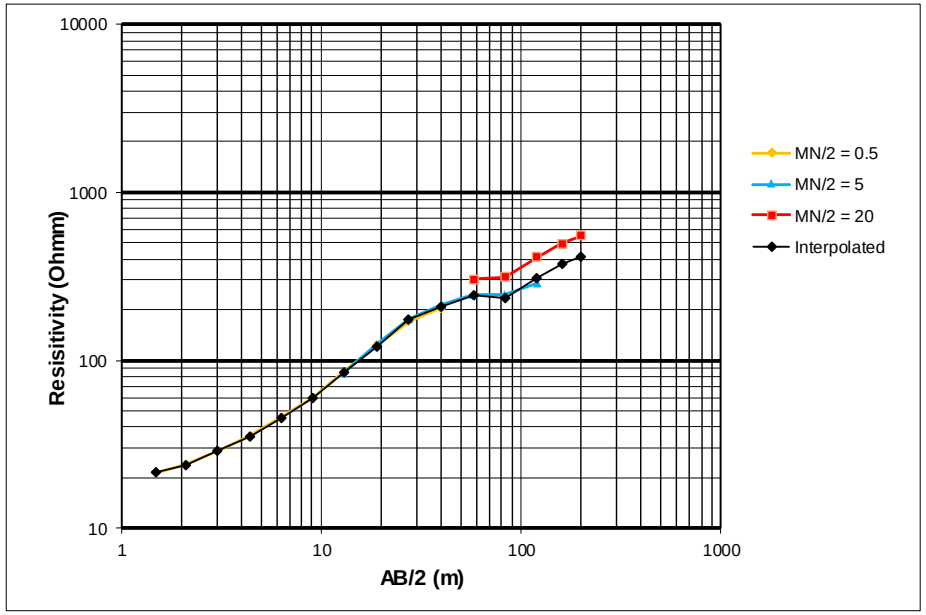
Station	AB/2	MN/2	C	**Reading**	App. Ress	Deviation	Average deviation		**Interpolated App. Ress.**
1	1.5	0.5	6.28	**3.56**	22				**22**
2	2.1	0.5	13.1	**2.04**	27				**27**
3	3	0.5	27.5	**1.135**	31				**31**
4	4.4	0.5	60	**0.618**	37				**37**
5	6.3	0.5	124	**0.344**	43				**43**
6	9.1	0.5	259	**0.187**	48				**48**
7	13	0.5	546	**0.102**	56				**56**
	13	5	46.9	**1.171**	55	1.01			
8	19	5	106	**0.655**	69				**70**
	19	0.5	1133	**0.061**	69	1.00			
9	27.5	0.5	2375	**0.038**	90				
	27.5	5	230	**0.385**	89	1.02			**89**
10	40	5	495	**0.224**	111				**112**
	40	0.5	5025	**0.022**	111	1.00	1.01		
11	58	5	1049	**0.16**	168				**169**
	58	20	233	**0.672**	157	1.08			
12	83	20	510	**0.311**	159				**170**
	83	5	2155	**0.076**	164	1.04			
13	120	5	4516	**0.048**	217				
	120	20	1100	**0.181**	199	1.10	1.07		**213**
14	160	20	1979	**0.136**	269				**288**
15	200	20	3110	**0.093**	289				**310**



Project	AQ22-003
Date	25/01/2022
Surveyor	NS/MB
Location	Kaleya, Mazabuka

VES-name	VES 02		
Orientation	60/240		
GPS	576212	8245943	1066 m
Station	88	Profile	13

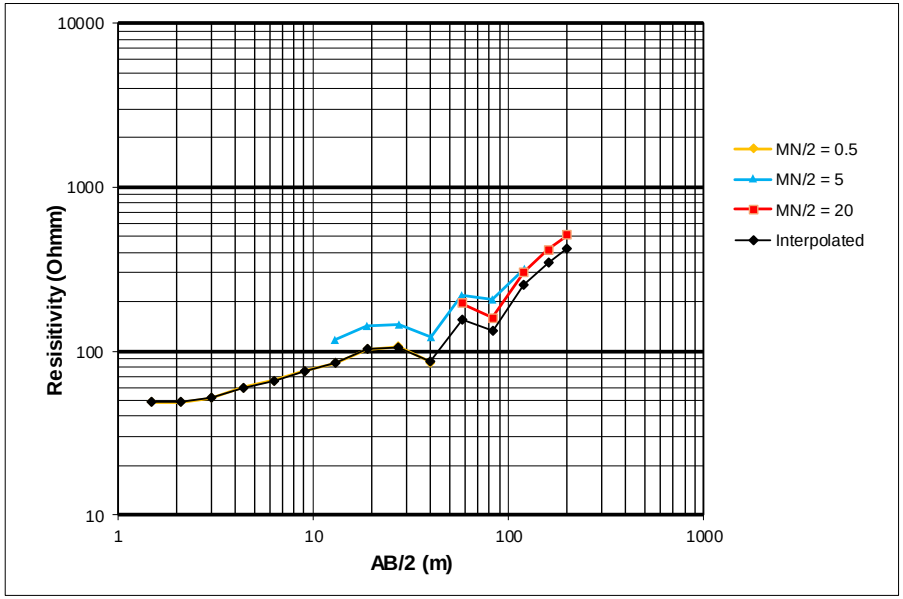
Station	AB/2	MN/2	C	**Reading**	App. Ress	Deviation	Average deviation		**Interpolated App. Ress.**
1	1.5	0.5	6.28	**3.42**	21				**21**
2	2.1	0.5	13.1	**1.833**	24				**24**
3	3	0.5	27.5	**1.048**	29				**29**
4	4.4	0.5	60	**0.591**	35				**35**
5	6.3	0.5	124	**0.368**	46				**46**
6	9.1	0.5	259	**0.232**	60				**60**
7	13	0.5	546	**0.156**	85				**85**
	13	5	46.9	**1.79**	84	1.01			
8	19	5	106	**1.167**	124				**121**
	19	0.5	1133	**0.108**	122	0.99			
9	27.5	0.5	2375	**0.072**	171				
	27.5	5	230	**0.774**	178	0.96			**175**
10	40	5	495	**0.434**	215				**211**
	40	0.5	5025	**0.041**	206	0.96	0.98		
11	58	5	1049	**0.235**	247				**242**
	58	20	233	**1.303**	304	0.80			
12	83	20	510	**0.611**	312				**234**
	83	5	2155	**0.114**	246	0.77			
13	120	5	4516	**0.064**	289				
	120	20	1100	**0.376**	414	0.69	0.75		**311**
14	160	20	1979	**0.251**	497				**373**
15	200	20	3110	**0.178**	554				**416**



Project	AQ22-003
Date	25/01/2022
Surveyor	NS/MB
Location	Kaleya, Mazabuka

VES-name	VES 03		
Orientation	310/130		
GPS	578029	8243109	1088 m
Station	96	Profile	15

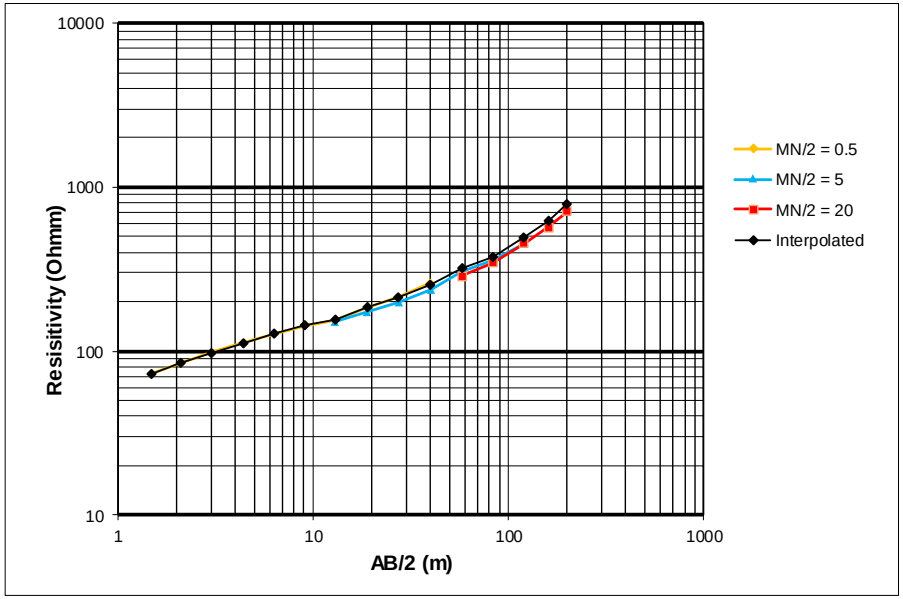
Station	AB/2	MN/2	C	**Reading**	App. Ress	Deviation	Average deviation		**Interpolated App. Ress.**
1	1.5	0.5	6.28	**7.8**	49				**49**
2	2.1	0.5	13.1	**3.71**	49				**49**
3	3	0.5	27.5	**1.874**	52				**52**
4	4.4	0.5	60	**0.999**	60				**60**
5	6.3	0.5	124	**0.532**	66				**66**
6	9.1	0.5	259	**0.294**	76				**76**
7	13	0.5	546	**0.154**	84				**84**
	13	5	46.9	**2.48**	116	0.72			
8	19	5	106	**1.356**	144				**103**
	19	0.5	1133	**0.091**	103	0.72			
9	27.5	0.5	2375	**0.045**	107				
	27.5	5	230	**0.636**	146	0.73			**105**
10	40	5	495	**0.244**	121				**87**
	40	0.5	5025	**0.017**	85	0.71	0.72		
11	58	5	1049	**0.208**	218				**157**
	58	20	233	**0.842**	196	0.80			
12	83	20	510	**0.312**	159				**132**
	83	5	2155	**0.095**	205	0.93			
13	120	5	4516	**0.071**	321				
	120	20	1100	**0.276**	304	0.76	0.83		**252**
14	160	20	1979	**0.211**	418				**346**
15	200	20	3110	**0.164**	510				**423**



Project	AQ22-003
Date	25/01/2022
Surveyor	NS/MB
Location	Kaleya, Mazabuka

VES-name	VES 04		
Orientation	10/190		
GPS	578082	8243716	m
Station	91	Profile	14

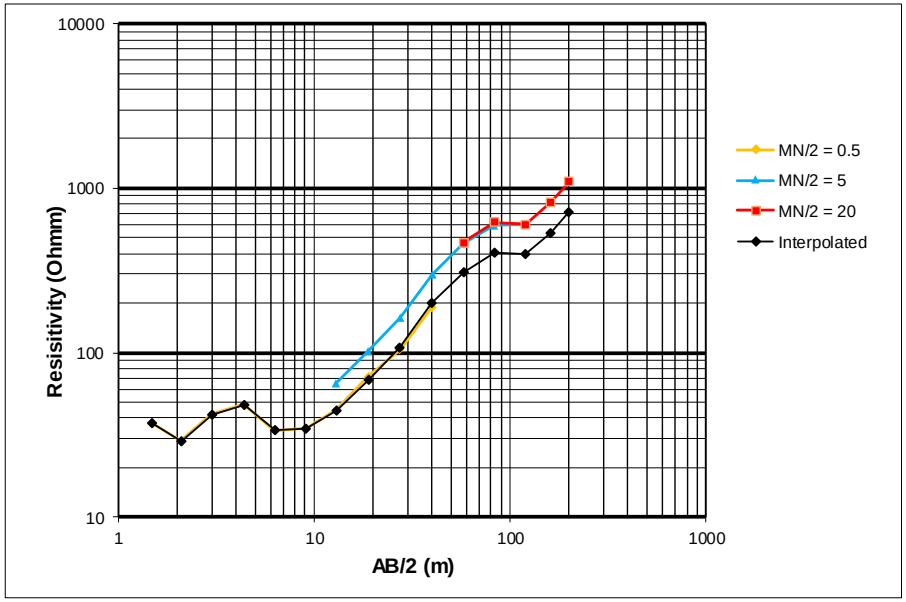
Station	AB/2	MN/2	C	**Reading**	App. Ress	Deviation	Average deviation		**Interpolated App. Ress.**
1	1.5	0.5	6.28	**11.61**	73				**73**
2	2.1	0.5	13.1	**6.46**	85				**85**
3	3	0.5	27.5	**3.57**	98				**98**
4	4.4	0.5	60	**1.878**	113				**113**
5	6.3	0.5	124	**1.028**	127				**127**
6	9.1	0.5	259	**0.553**	143				**143**
7	13	0.5	546	**0.285**	156				**156**
	13	5	46.9	**3.22**	151	1.03			
8	19	5	106	**1.642**	174				**185**
	19	0.5	1133	**0.163**	185	1.06			
9	27.5	0.5	2375	**0.09**	214				
	27.5	5	230	**0.863**	198	1.08			**211**
10	40	5	495	**0.483**	239				**255**
	40	0.5	5025	**0.052**	261	1.09	1.07		
11	58	5	1049	**0.289**	303				**323**
	58	20	233	**1.227**	286	1.13			
12	83	20	510	**0.674**	344				**378**
	83	5	2155	**0.165**	356	1.10			
13	120	5	4516	**0.1**	452				
	120	20	1100	**0.411**	452	1.06	1.10		**497**
14	160	20	1979	**0.286**	566				**622**
15	200	20	3110	**0.229**	712				**782**



Project	AQ22-003
Date	25/01/2022
Surveyor	NS/MB
Location	Kaleya, Mazabuka

VES-name	VES 05		
Orientation	10/190		
GPS	578178	8243722	m
Station	92	Profile	14

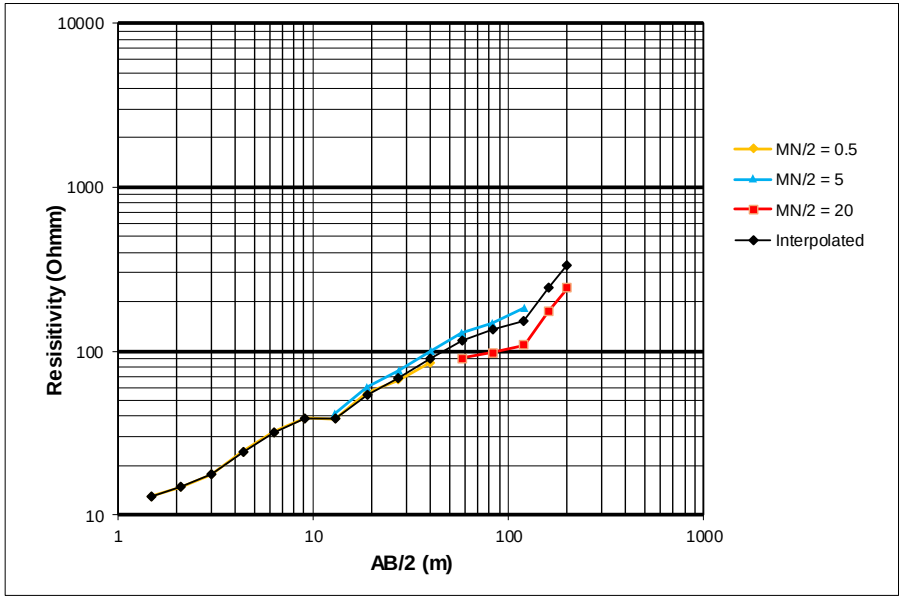
Station	AB/2	MN/2	C	**Reading**	App. Ress	Deviation	Average deviation		**Interpolated App. Ress.**
1	1.5	0.5	6.28	**5.92**	37				**37**
2	2.1	0.5	13.1	**2.22**	29				**29**
3	3	0.5	27.5	**1.538**	42				**42**
4	4.4	0.5	60	**0.809**	49				**49**
5	6.3	0.5	124	**0.271**	34				**34**
6	9.1	0.5	259	**0.134**	35				**35**
7	13	0.5	546	**0.082**	45				**45**
	13	5	46.9	**1.381**	65	0.69			
8	19	5	106	**0.972**	103				**69**
	19	0.5	1133	**0.063**	71	0.69			
9	27.5	0.5	2375	**0.044**	105				
	27.5	5	230	**0.704**	162	0.65			**108**
10	40	5	495	**0.603**	298				**199**
	40	0.5	5025	**0.038**	191	0.64	0.67		
11	58	5	1049	**0.439**	461				**307**
	58	20	233	**2**	466	0.66			
12	83	20	510	**1.218**	621				**407**
	83	5	2155	**0.275**	593	0.64			
13	120	5	4516	**0.134**	605				
	120	20	1100	**0.548**	603	0.67	0.66		**395**
14	160	20	1979	**0.411**	813				**533**
15	200	20	3110	**0.352**	1095				**717**



Project	AQ22-003
Date	25/01/2022
Surveyor	NS/MB
Location	Kaleya, Mazabuka

VES-name	VES 06		
Orientation	160/340		
GPS	577578	8242756	1074 m
Station	55	Profile	8

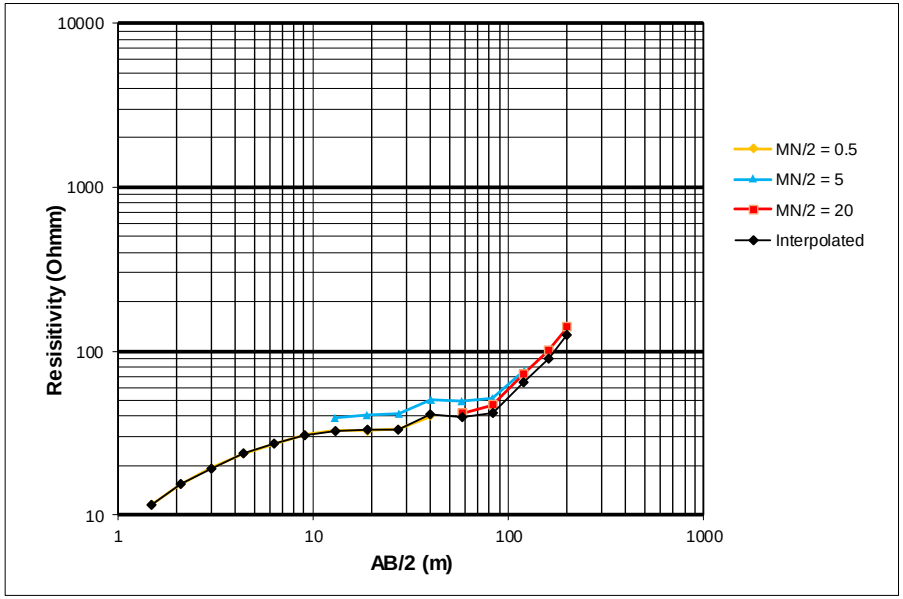
Station	AB/2	MN/2	C	**Reading**	App. Ress	Deviation	Average deviation		**Interpolated App. Ress.**
1	1.5	0.5	6.28	**2.08**	13				**13**
2	2.1	0.5	13.1	**1.128**	15				**15**
3	3	0.5	27.5	**0.641**	18				**18**
4	4.4	0.5	60	**0.407**	24				**24**
5	6.3	0.5	124	**0.258**	32				**32**
6	9.1	0.5	259	**0.15**	39				**39**
7	13	0.5	546	**0.071**	39				**39**
	13	5	46.9	**0.878**	41	0.94			
8	19	5	106	**0.57**	60				**54**
	19	0.5	1133	**0.049**	56	0.92			
9	27.5	0.5	2375	**0.028**	67				
	27.5	5	230	**0.334**	77	0.87			**69**
10	40	5	495	**0.204**	101				**90**
	40	0.5	5025	**0.017**	85	0.85	0.89		
11	58	5	1049	**0.124**	130				**116**
	58	20	233	**0.388**	90	1.28			
12	83	20	510	**0.191**	97				**135**
	83	5	2155	**0.069**	149	1.36			
13	120	5	4516	**0.041**	185				
	120	20	1100	**0.099**	109	1.52	1.39		**151**
14	160	20	1979	**0.088**	174				**242**
15	200	20	3110	**0.078**	243				**337**



Project	AQ22-003
Date	25/01/2022
Surveyor	NS/MB
Location	Kaleya, Mazabuka

VES-name	VES 07		
Orientation	160/340		
GPS	577665	8242864	1075 m
Station	54	Profile	8

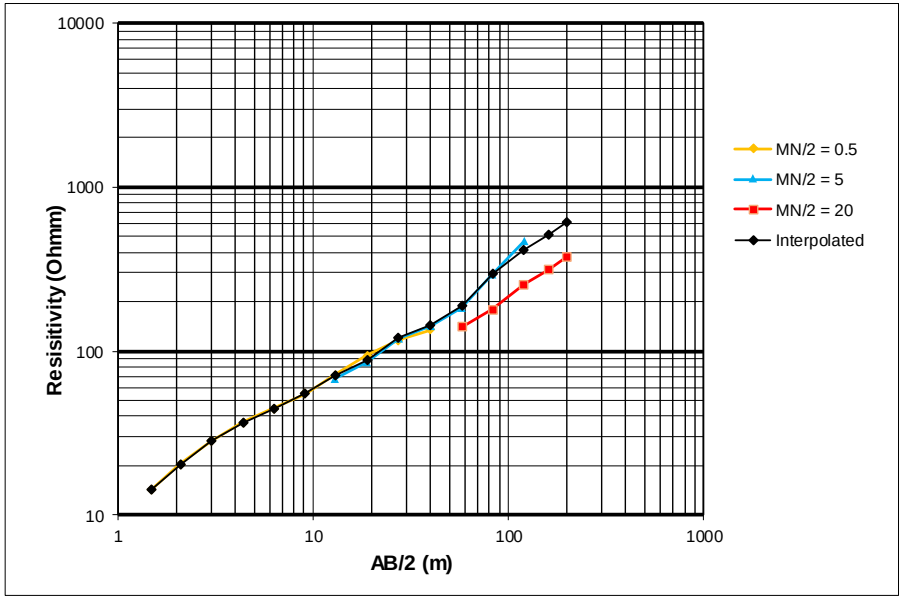
Station	AB/2	MN/2	C	**Reading**	App. Ress	Deviation	Average deviation		**Interpolated App. Ress.**
1	1.5	0.5	6.28	**1.842**	12				**12**
2	2.1	0.5	13.1	**1.178**	15				**15**
3	3	0.5	27.5	**0.699**	19				**19**
4	4.4	0.5	60	**0.395**	24				**24**
5	6.3	0.5	124	**0.218**	27				**27**
6	9.1	0.5	259	**0.119**	31				**31**
7	13	0.5	546	**0.06**	33				**33**
	13	5	46.9	**0.842**	39	0.83			
8	19	5	106	**0.386**	41				**33**
	19	0.5	1133	**0.029**	33	0.80			
9	27.5	0.5	2375	**0.014**	33				
	27.5	5	230	**0.18**	41	0.80			**33**
10	40	5	495	**0.103**	51				**41**
	40	0.5	5025	**0.008**	40	0.79	0.81		
11	58	5	1049	**0.047**	49				**40**
	58	20	233	**0.18**	42	0.95			
12	83	20	510	**0.092**	47				**42**
	83	5	2155	**0.024**	52	0.89			
13	120	5	4516	**0.017**	77				
	120	20	1100	**0.066**	73	0.85	0.90		**65**
14	160	20	1979	**0.051**	101				**90**
15	200	20	3110	**0.045**	140				**125**



Project	AQ22-003
Date	27/01/2022
Surveyor	NS/MB
Location	Kaleya, Mazabuka

VES-name	VES 08		
Orientation	330/150		
GPS	577250	8242347	m
Station	60	Profile	8

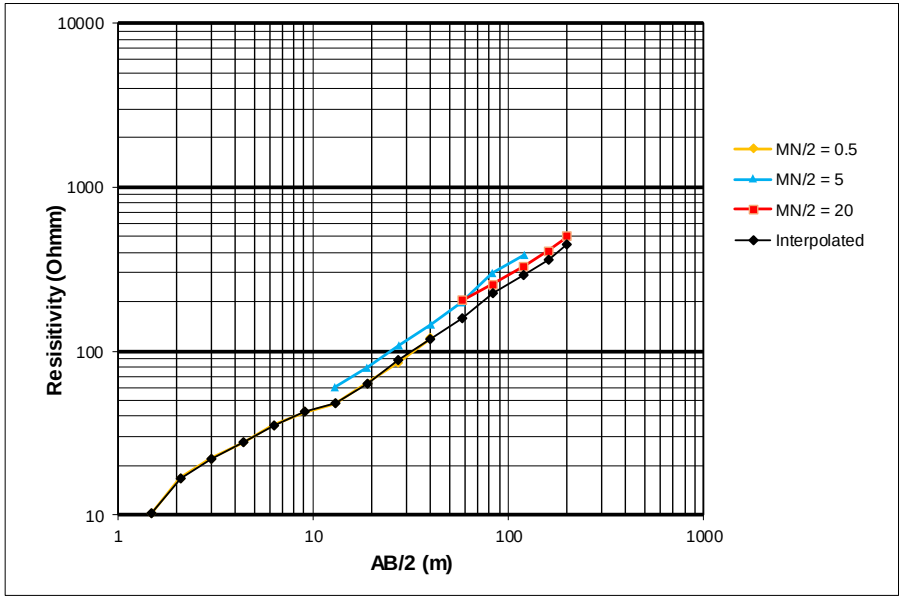
Station	AB/2	MN/2	C	**Reading**	App. Ress	Deviation	Average deviation		**Interpolated App. Ress.**
1	1.5	0.5	6.28	**2.28**	14				**14**
2	2.1	0.5	13.1	**1.564**	20				**20**
3	3	0.5	27.5	**1.03**	28				**28**
4	4.4	0.5	60	**0.61**	37				**37**
5	6.3	0.5	124	**0.36**	45				**45**
6	9.1	0.5	259	**0.213**	55				**55**
7	13	0.5	546	**0.131**	72				**72**
	13	5	46.9	**1.431**	67	1.07			
8	19	5	106	**0.812**	86				**88**
	19	0.5	1133	**0.083**	94	1.09			
9	27.5	0.5	2375	**0.049**	116				
	27.5	5	230	**0.515**	118	0.98			**121**
10	40	5	495	**0.286**	142				**145**
	40	0.5	5025	**0.027**	136	0.96	1.02		
11	58	5	1049	**0.176**	185				**189**
	58	20	233	**0.6**	140	1.35			
12	83	20	510	**0.353**	180				**295**
	83	5	2155	**0.136**	293	1.67			
13	120	5	4516	**0.104**	470				
	120	20	1100	**0.232**	255	1.89	1.64		**417**
14	160	20	1979	**0.159**	315				**515**
15	200	20	3110	**0.121**	376				**616**



Project	AQ22-003
Date	27/01/2022
Surveyor	NS/MB
Location	Kaleya, Mazabuka

VES-name	VES 09		
Orientation	160/340		
GPS	577443	8242118	m
Station	41	Profile	7

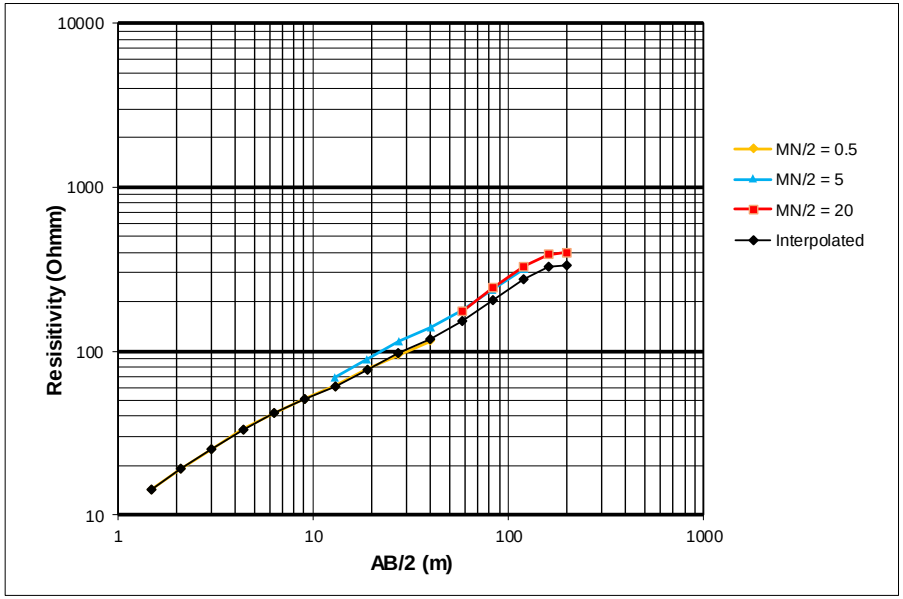
Station	AB/2	MN/2	C	**Reading**	App. Ress	Deviation	Average deviation		**Interpolated App. Ress.**
1	1.5	0.5	6.28	**1.642**	10				**10**
2	2.1	0.5	13.1	**1.287**	17				**17**
3	3	0.5	27.5	**0.801**	22				**22**
4	4.4	0.5	60	**0.462**	28				**28**
5	6.3	0.5	124	**0.285**	35				**35**
6	9.1	0.5	259	**0.165**	43				**43**
7	13	0.5	546	**0.088**	48				**48**
	13	5	46.9	**1.282**	60	0.80			
8	19	5	106	**0.741**	79				**63**
	19	0.5	1133	**0.056**	63	0.81			
9	27.5	0.5	2375	**0.036**	86				
	27.5	5	230	**0.472**	109	0.79			**87**
10	40	5	495	**0.295**	146				**118**
	40	0.5	5025	**0.024**	121	0.83	0.81		
11	58	5	1049	**0.188**	197				**159**
	58	20	233	**0.871**	203	0.78			
12	83	20	510	**0.502**	256				**227**
	83	5	2155	**0.138**	297	0.94			
13	120	5	4516	**0.085**	384				
	120	20	1100	**0.299**	329	0.94	0.89		**291**
14	160	20	1979	**0.207**	410				**363**
15	200	20	3110	**0.161**	501				**443**



Project	AQ22-003
Date	27/01/2022
Surveyor	NS/MB
Location	Kaleya, Mazabuka

VES-name	VES 10		
Orientation	160/340		
GPS	577600	8242316	m
Station	44	Profile	7

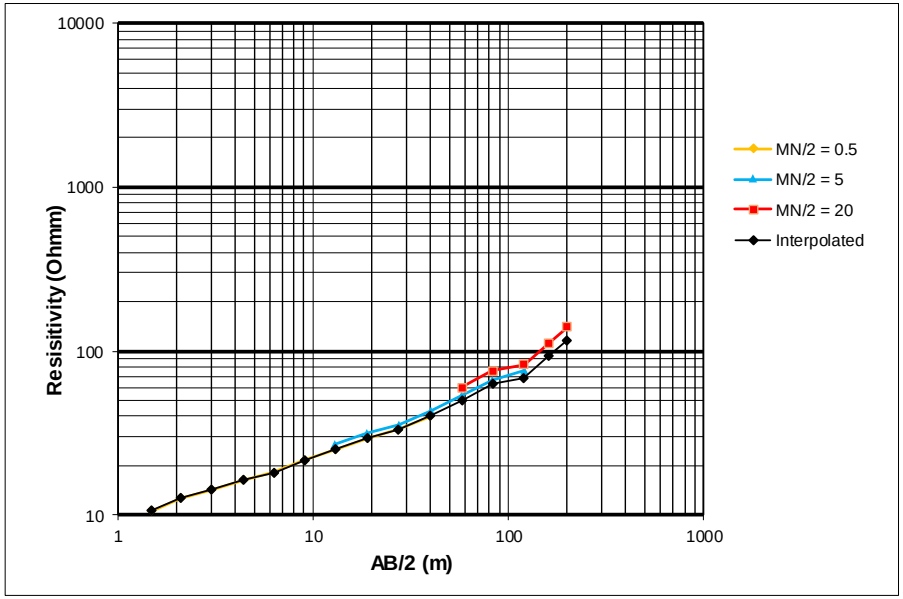
Station	AB/2	MN/2	C	**Reading**	App. Ress	Deviation	Average deviation		**Interpolated App. Ress.**
1	1.5	0.5	6.28	**2.3**	14				**14**
2	2.1	0.5	13.1	**1.454**	19				**19**
3	3	0.5	27.5	**0.912**	25				**25**
4	4.4	0.5	60	**0.554**	33				**33**
5	6.3	0.5	124	**0.337**	42				**42**
6	9.1	0.5	259	**0.198**	51				**51**
7	13	0.5	546	**0.112**	61				**61**
	13	5	46.9	**1.461**	69	0.89			
8	19	5	106	**0.843**	89				**76**
	19	0.5	1133	**0.068**	77	0.86			
9	27.5	0.5	2375	**0.04**	95				
	27.5	5	230	**0.495**	114	0.83			**97**
10	40	5	495	**0.281**	139				**119**
	40	0.5	5025	**0.023**	116	0.83	0.85		
11	58	5	1049	**0.169**	177				**152**
	58	20	233	**0.749**	175	0.87			
12	83	20	510	**0.474**	242				**203**
	83	5	2155	**0.109**	235	0.83			
13	120	5	4516	**0.07**	316				
	120	20	1100	**0.3**	330	0.82	0.84		**277**
14	160	20	1979	**0.197**	390				**327**
15	200	20	3110	**0.128**	398				**334**



Project	AQ22-003
Date	27/01/2022
Surveyor	NS/MB
Location	Kaleya, Mazabuka

VES-name	VES 11		
Orientation	160/340		
GPS	577948	8242758	m
Station	51	Profile	7

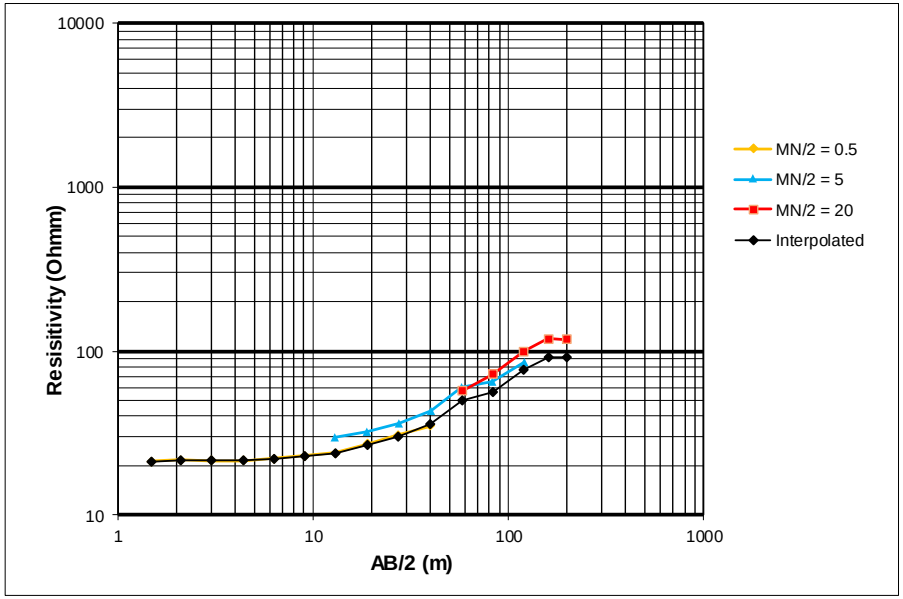
Station	AB/2	MN/2	C	**Reading**	App. Ress	Deviation	Average deviation		**Interpolated App. Ress.**
1	1.5	0.5	6.28	**1.683**	11				**11**
2	2.1	0.5	13.1	**0.963**	13				**13**
3	3	0.5	27.5	**0.52**	14				**14**
4	4.4	0.5	60	**0.272**	16				**16**
5	6.3	0.5	124	**0.147**	18				**18**
6	9.1	0.5	259	**0.084**	22				**22**
7	13	0.5	546	**0.046**	25				**25**
	13	5	46.9	**0.574**	27	0.93			
8	19	5	106	**0.297**	31				**29**
	19	0.5	1133	**0.026**	29	0.94			
9	27.5	0.5	2375	**0.014**	33				
	27.5	5	230	**0.156**	36	0.93			**33**
10	40	5	495	**0.088**	44				**40**
	40	0.5	5025	**0.008**	40	0.92	0.93		
11	58	5	1049	**0.051**	53				**50**
	58	20	233	**0.258**	60	0.83			
12	83	20	510	**0.149**	76				**64**
	83	5	2155	**0.031**	67	0.82			
13	120	5	4516	**0.017**	77				
	120	20	1100	**0.075**	83	0.87	0.84		**69**
14	160	20	1979	**0.056**	111				**93**
15	200	20	3110	**0.045**	140				**117**



Project	AQ22-003
Date	27/01/2022
Surveyor	NS/MB
Location	Kaleya, Mazabuka

VES-name	VES 12		
Orientation	30/210		
GPS	577933	8242883	1074 m
Station	68	Profile	10

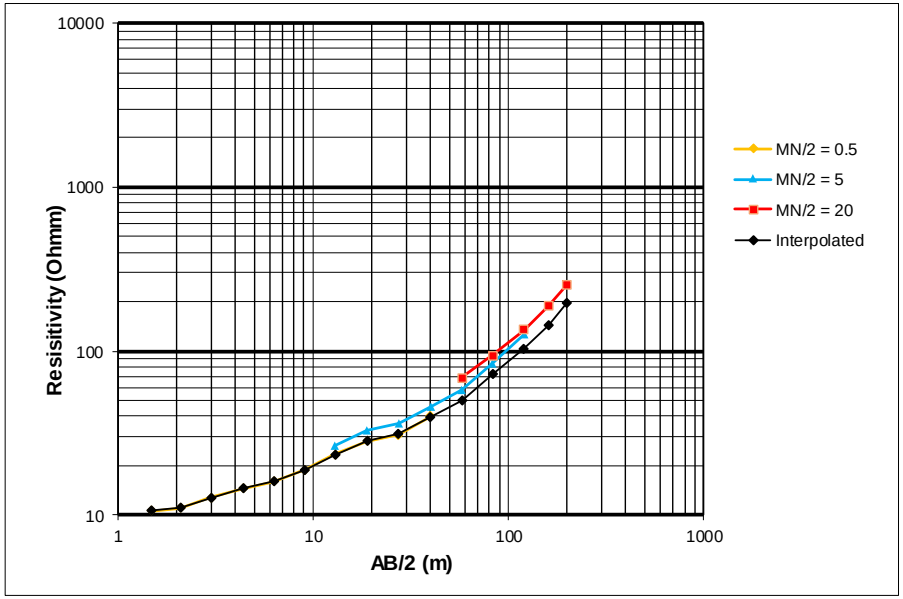
Station	AB/2	MN/2	C	**Reading**	App. Ress	Deviation	Average deviation		**Interpolated App. Ress.**
1	1.5	0.5	6.28	**3.4**	21				**21**
2	2.1	0.5	13.1	**1.662**	22				**22**
3	3	0.5	27.5	**0.779**	21				**21**
4	4.4	0.5	60	**0.358**	21				**21**
5	6.3	0.5	124	**0.178**	22				**22**
6	9.1	0.5	259	**0.089**	23				**23**
7	13	0.5	546	**0.044**	24				**24**
	13	5	46.9	**0.631**	30	0.81			
8	19	5	106	**0.306**	32				**27**
	19	0.5	1133	**0.024**	27	0.84			
9	27.5	0.5	2375	**0.013**	31				
	27.5	5	230	**0.158**	36	0.85			**30**
10	40	5	495	**0.087**	43				**36**
	40	0.5	5025	**0.007**	35	0.82	0.83		
11	58	5	1049	**0.057**	60				**50**
	58	20	233	**0.244**	57	0.87			
12	83	20	510	**0.142**	72				**56**
	83	5	2155	**0.03**	65	0.74			
13	120	5	4516	**0.019**	86				
	120	20	1100	**0.091**	100	0.71	0.77		**78**
14	160	20	1979	**0.06**	119				**92**
15	200	20	3110	**0.038**	118				**92**



Project	AQ22-003
Date	27/01/2022
Surveyor	NS/MB
Location	Kaleya, Mazabuka

VES-name	VES 13		
Orientation	310/130		
GPS	578198	8242642	1073 m
Station	33	Profile	5

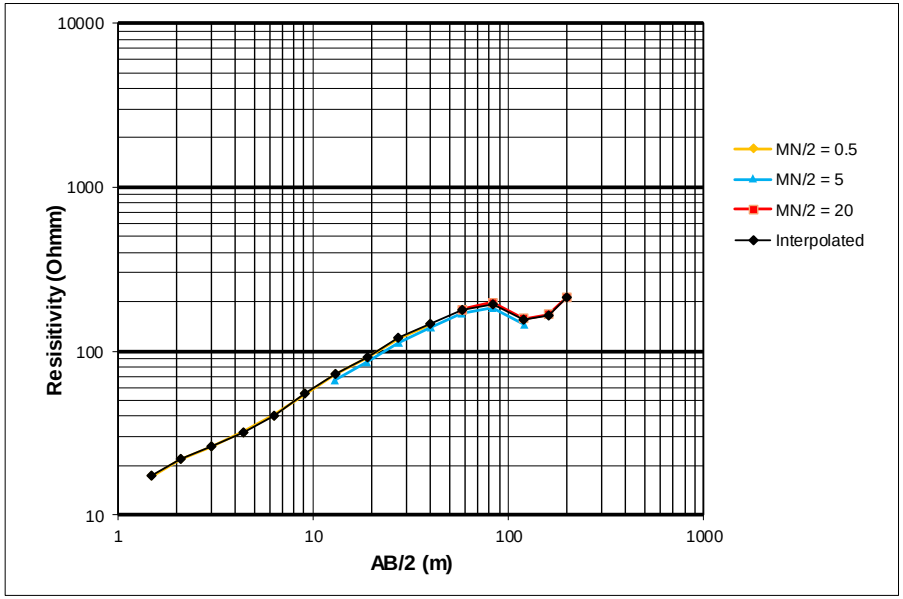
Station	AB/2	MN/2	C	**Reading**	App. Ress	Deviation	Average deviation		**Interpolated App. Ress.**
1	1.5	0.5	6.28	**1.698**	11				**11**
2	2.1	0.5	13.1	**0.84**	11				**11**
3	3	0.5	27.5	**0.466**	13				**13**
4	4.4	0.5	60	**0.243**	15				**15**
5	6.3	0.5	124	**0.129**	16				**16**
6	9.1	0.5	259	**0.073**	19				**19**
7	13	0.5	546	**0.043**	23				**23**
	13	5	46.9	**0.57**	27	0.88			
8	19	5	106	**0.309**	33				**28**
	19	0.5	1133	**0.025**	28	0.86			
9	27.5	0.5	2375	**0.013**	31				
	27.5	5	230	**0.157**	36	0.86			**31**
10	40	5	495	**0.093**	46				**40**
	40	0.5	5025	**0.008**	40	0.87	0.87		
11	58	5	1049	**0.055**	58				**50**
	58	20	233	**0.296**	69	0.73			
12	83	20	510	**0.185**	94				**73**
	83	5	2155	**0.039**	84	0.77			
13	120	5	4516	**0.028**	126				
	120	20	1100	**0.123**	135	0.81	0.77		**104**
14	160	20	1979	**0.095**	188				**145**
15	200	20	3110	**0.082**	255				**196**



Project	AQ22-003
Date	27/01/2022
Surveyor	NS/MB
Location	Kaleya, Mazabuka

VES-name	VES 14		
Orientation	310/130		
GPS	578368	8242862	1078 m
Station	34	Profile	5

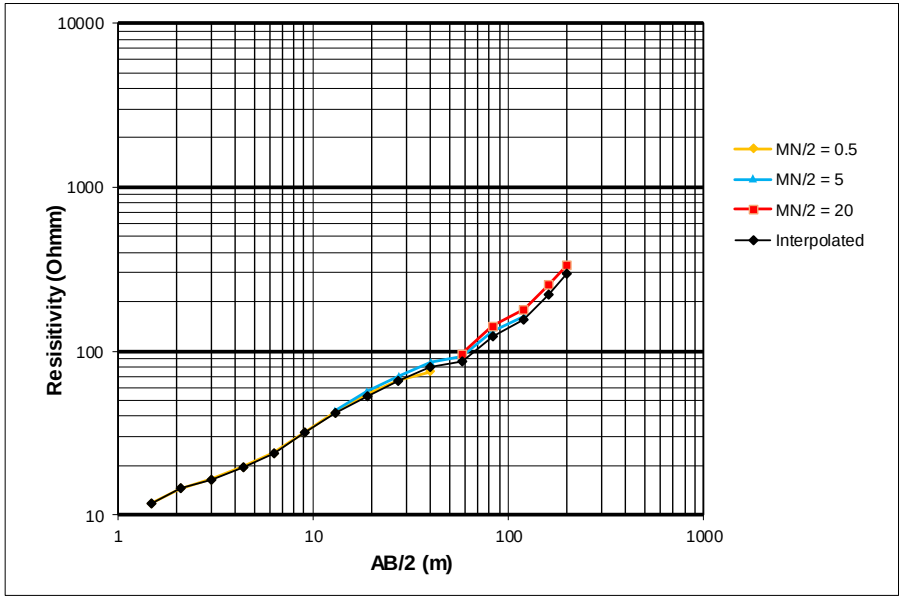
Station	AB/2	MN/2	C	**Reading**	App. Ress	Deviation	Average deviation		**Interpolated App. Ress.**
1	1.5	0.5	6.28	**2.76**	17				**17**
2	2.1	0.5	13.1	**1.67**	22				**22**
3	3	0.5	27.5	**0.946**	26				**26**
4	4.4	0.5	60	**0.533**	32				**32**
5	6.3	0.5	124	**0.326**	40				**40**
6	9.1	0.5	259	**0.211**	55				**55**
7	13	0.5	546	**0.132**	72				**72**
	13	5	46.9	**1.413**	66	1.09			
8	19	5	106	**0.809**	86				**91**
	19	0.5	1133	**0.08**	91	1.06			
9	27.5	0.5	2375	**0.05**	119				
	27.5	5	230	**0.491**	113	1.05			**120**
10	40	5	495	**0.281**	139				**148**
	40	0.5	5025	**0.029**	146	1.05	1.06		
11	58	5	1049	**0.161**	169				**179**
	58	20	233	**0.768**	179	1.00			
12	83	20	510	**0.388**	198				**195**
	83	5	2155	**0.085**	183	0.98			
13	120	5	4516	**0.032**	145				
	120	20	1100	**0.144**	158	0.97	0.98		**156**
14	160	20	1979	**0.085**	168				**165**
15	200	20	3110	**0.069**	215				**211**



Project	AQ22-003
Date	27/01/2022
Surveyor	NS/MB
Location	Kaleya, Mazabuka

VES-name	VES 15		
Orientation	320/140		
GPS	578743	8242159	1074 m
Station	9	Profile	2

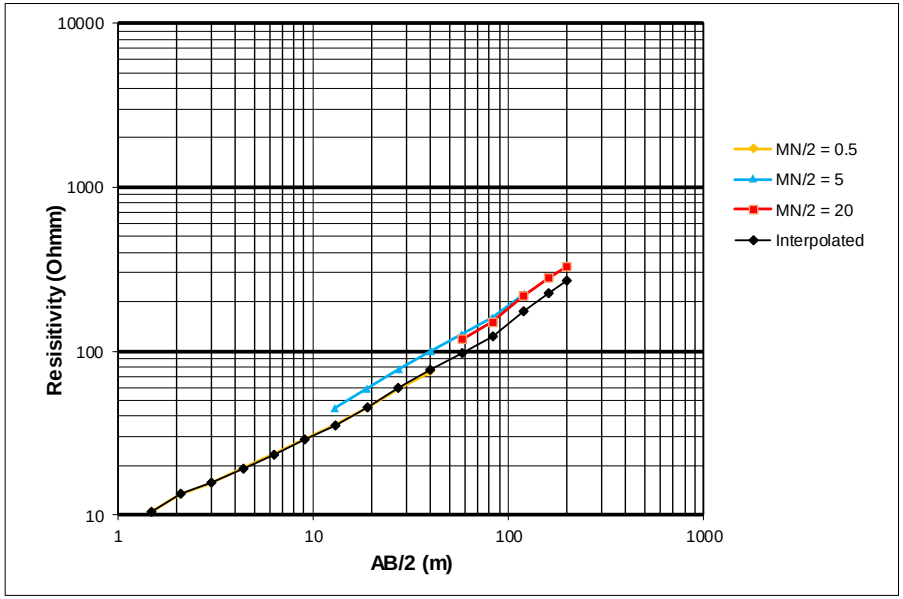
Station	AB/2	MN/2	C	**Reading**	App. Ress	Deviation	Average deviation		**Interpolated App. Ress.**
1	1.5	0.5	6.28	**1.891**	12				**12**
2	2.1	0.5	13.1	**1.107**	15				**15**
3	3	0.5	27.5	**0.597**	16				**16**
4	4.4	0.5	60	**0.328**	20				**20**
5	6.3	0.5	124	**0.193**	24				**24**
6	9.1	0.5	259	**0.124**	32				**32**
7	13	0.5	546	**0.077**	42				**42**
	13	5	46.9	**0.923**	43	0.97			
8	19	5	106	**0.538**	57				**53**
	19	0.5	1133	**0.048**	54	0.95			
9	27.5	0.5	2375	**0.028**	67				
	27.5	5	230	**0.306**	70	0.94			**66**
10	40	5	495	**0.173**	86				**80**
	40	0.5	5025	**0.015**	75	0.88	0.94		
11	58	5	1049	**0.088**	92				**87**
	58	20	233	**0.411**	96	0.90			
12	83	20	510	**0.277**	141				**124**
	83	5	2155	**0.061**	131	0.87			
13	120	5	4516	**0.036**	163				
	120	20	1100	**0.163**	179	0.85	0.88		**157**
14	160	20	1979	**0.127**	251				**220**
15	200	20	3110	**0.108**	336				**294**



Project	AQ22-003
Date	27/01/2022
Surveyor	NS/MB
Location	Kaleya, Mazabuka

VES-name	VES 16		
Orientation	320/140		
GPS	578687	8242087	1074 m
Station	10	Profile	2

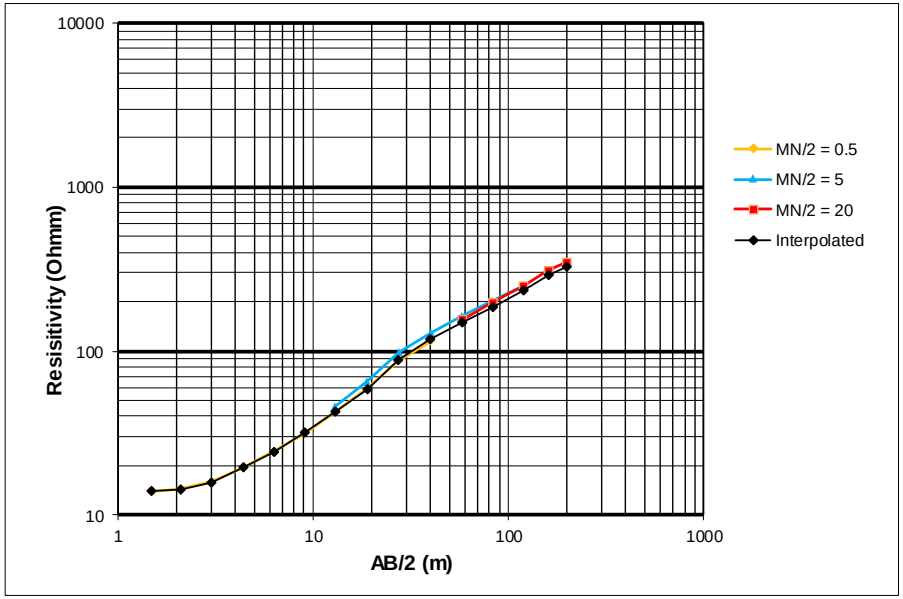
Station	AB/2	MN/2	C	**Reading**	App. Ress	Deviation	Average deviation		**Interpolated App. Ress.**
1	1.5	0.5	6.28	**1.678**	11				**11**
2	2.1	0.5	13.1	**1.03**	13				**13**
3	3	0.5	27.5	**0.57**	16				**16**
4	4.4	0.5	60	**0.32**	19				**19**
5	6.3	0.5	124	**0.19**	24				**24**
6	9.1	0.5	259	**0.112**	29				**29**
7	13	0.5	546	**0.065**	35				**35**
	13	5	46.9	**0.963**	45	0.79			
8	19	5	106	**0.555**	59				**45**
	19	0.5	1133	**0.04**	45	0.77			
9	27.5	0.5	2375	**0.025**	59				
	27.5	5	230	**0.337**	78	0.77			**60**
10	40	5	495	**0.202**	100				**77**
	40	0.5	5025	**0.015**	75	0.75	0.77		
11	58	5	1049	**0.121**	127				**98**
	58	20	233	**0.503**	117	0.83			
12	83	20	510	**0.296**	151				**122**
	83	5	2155	**0.074**	159	0.81			
13	120	5	4516	**0.049**	221				
	120	20	1100	**0.198**	218	0.78	0.81		**176**
14	160	20	1979	**0.141**	279				**226**
15	200	20	3110	**0.106**	330				**267**



Project	AQ22-003
Date	27/01/2022
Surveyor	NS/MB
Location	Kaleya, Mazabuka

VES-name	VES 17		
Orientation	150/330		
GPS	579096	8242596	1081 m
Station	7	Profile	2

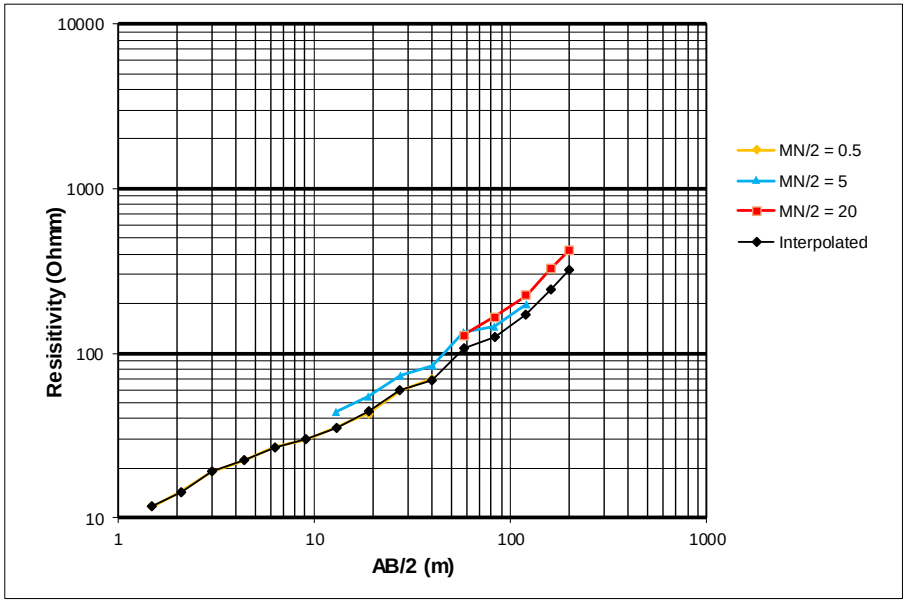
Station	AB/2	MN/2	C	**Reading**	App. Ress	Deviation	Average deviation		**Interpolated App. Ress.**
1	1.5	0.5	6.28	**2.22**	14				**14**
2	2.1	0.5	13.1	**1.096**	14				**14**
3	3	0.5	27.5	**0.576**	16				**16**
4	4.4	0.5	60	**0.323**	19				**19**
5	6.3	0.5	124	**0.196**	24				**24**
6	9.1	0.5	259	**0.123**	32				**32**
7	13	0.5	546	**0.078**	43				**43**
	13	5	46.9	**0.979**	46	0.93			
8	19	5	106	**0.612**	65				**59**
	19	0.5	1133	**0.052**	59	0.91			
9	27.5	0.5	2375	**0.037**	88				
	27.5	5	230	**0.425**	98	0.90			**89**
10	40	5	495	**0.262**	130				**118**
	40	0.5	5025	**0.023**	116	0.89	0.91		
11	58	5	1049	**0.157**	165				**149**
	58	20	233	**0.664**	155	0.96			
12	83	20	510	**0.388**	198				**185**
	83	5	2155	**0.094**	203	0.93			
13	120	5	4516	**0.056**	253				
	120	20	1100	**0.227**	250	0.92	0.94		**234**
14	160	20	1979	**0.156**	309				**289**
15	200	20	3110	**0.112**	348				**326**



Project	AQ22-003
Date	28/01/2022
Surveyor	NS/MB
Location	Kaleya, Mazabuka

VES-name	VES 18		
Orientation	70/250		
GPS	576234	8245639	1056m
Station	79	Profile	12

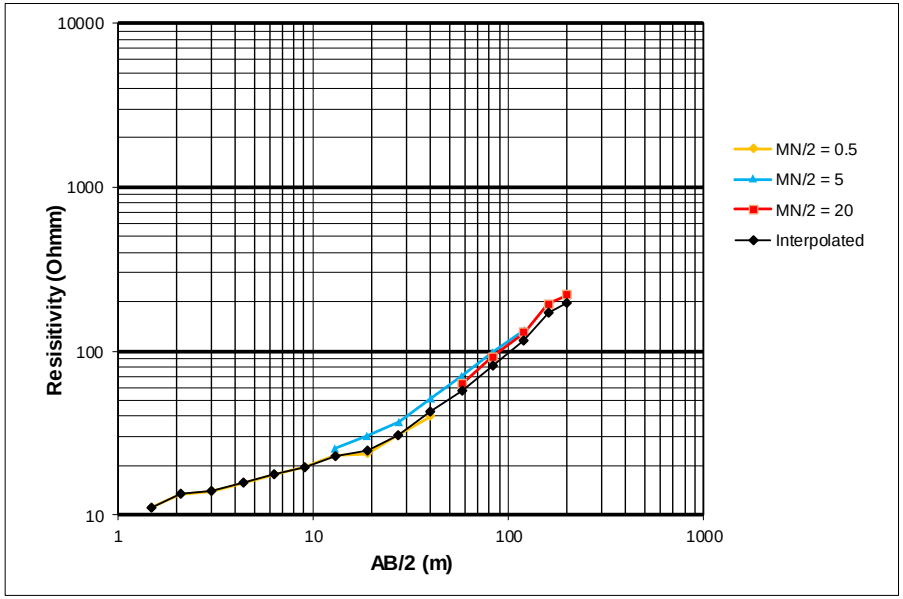
Station	AB/2	MN/2	C	**Reading**	App. Ress	Deviation	Average deviation		**Interpolated App. Ress.**
1	1.5	0.5	6.28	**1.869**	12				**12**
2	2.1	0.5	13.1	**1.095**	14				**14**
3	3	0.5	27.5	**0.694**	19				**19**
4	4.4	0.5	60	**0.373**	22				**22**
5	6.3	0.5	124	**0.216**	27				**27**
6	9.1	0.5	259	**0.116**	30				**30**
7	13	0.5	546	**0.065**	35				**35**
	13	5	46.9	**0.934**	44	0.81			
8	19	5	106	**0.513**	54				**44**
	19	0.5	1133	**0.038**	43	0.79			
9	27.5	0.5	2375	**0.025**	59				
	27.5	5	230	**0.321**	74	0.80			**60**
10	40	5	495	**0.170**	84				**68**
	40	0.5	5025	**0.014**	70	0.84	0.81		
11	58	5	1049	**0.127**	133				**108**
	58	20	233	**0.554**	129	0.84			
12	83	20	510	**0.326**	166				**126**
	83	5	2155	**0.068**	147	0.71			
13	120	5	4516	**0.044**	199				
	120	20	1100	**0.205**	226	0.71	0.76		**170**
14	160	20	1979	**0.164**	325				**245**
15	200	20	3110	**0.137**	426				**322**



Project	AQ22-003
Date	28/01/2022
Surveyor	NS/MB
Location	Kaleya, Mazabuka

VES-name	VES 19		
Orientation	80/260		
GPS	576177	8245737	1054 m
Station	80	Profile	12

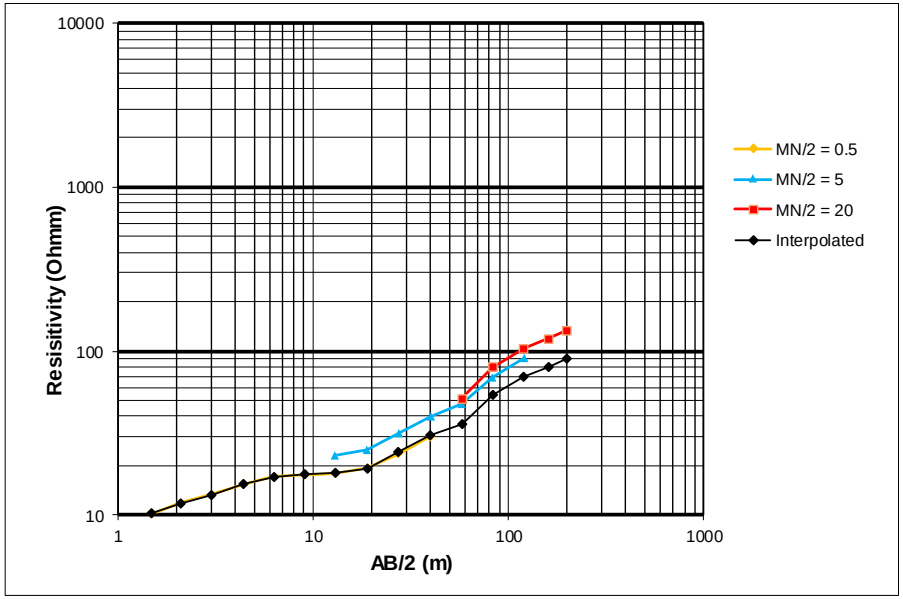
Station	AB/2	MN/2	C	**Reading**	App. Ress	Deviation	Average deviation		**Interpolated App. Ress.**
1	1.5	0.5	6.28	**1.777**	11				**11**
2	2.1	0.5	13.1	**1.025**	13				**13**
3	3	0.5	27.5	**0.51**	14				**14**
4	4.4	0.5	60	**0.263**	16				**16**
5	6.3	0.5	124	**0.143**	18				**18**
6	9.1	0.5	259	**0.076**	20				**20**
7	13	0.5	546	**0.042**	23				**23**
	13	5	46.9	**0.545**	26	0.90			
8	19	5	106	**0.284**	30				**25**
	19	0.5	1133	**0.021**	24	0.79			
9	27.5	0.5	2375	**0.013**	31				
	27.5	5	230	**0.162**	37	0.83			**31**
10	40	5	495	**0.104**	51				**42**
	40	0.5	5025	**0.008**	40	0.78	0.82		
11	58	5	1049	**0.067**	70				**58**
	58	20	233	**0.27**	63	0.92			
12	83	20	510	**0.181**	92				**82**
	83	5	2155	**0.046**	99	0.89			
13	120	5	4516	**0.03**	135				
	120	20	1100	**0.118**	130	0.86	0.89		**115**
14	160	20	1979	**0.098**	194				**172**
15	200	20	3110	**0.071**	221				**196**



Project	AQ22-003
Date	28/01/2022
Surveyor	NS/MB
Location	Kaleya, Mazabuka

VES-name	VES 20		
Orientation	70/250		
GPS	576293	8245795	1058 m
Station	87	Profile	13

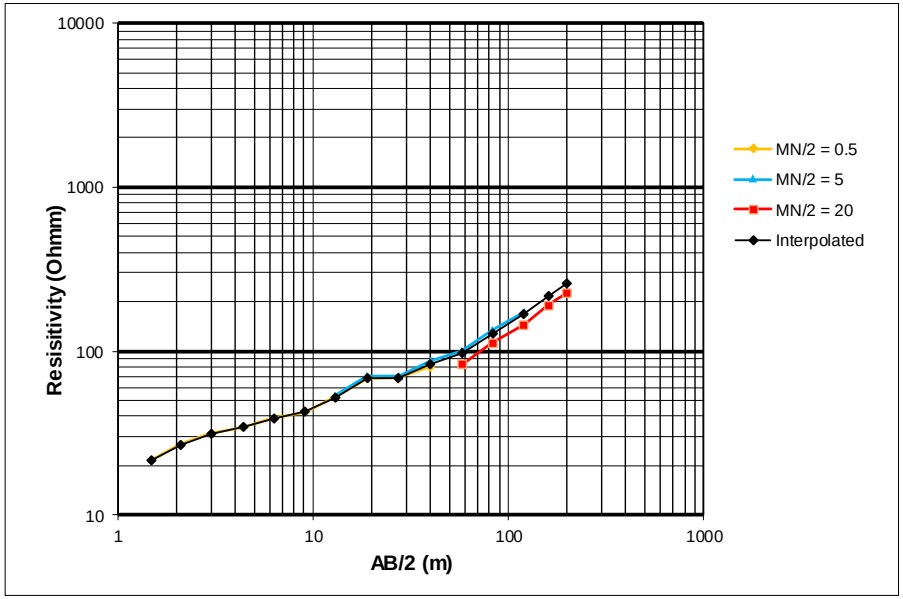
Station	AB/2	MN/2	C	**Reading**	App. Ress	Deviation	Average deviation		**Interpolated App. Ress.**
1	1.5	0.5	6.28	**1.619**	10				**10**
2	2.1	0.5	13.1	**0.899**	12				**12**
3	3	0.5	27.5	**0.484**	13				**13**
4	4.4	0.5	60	**0.257**	15				**15**
5	6.3	0.5	124	**0.138**	17				**17**
6	9.1	0.5	259	**0.068**	18				**18**
7	13	0.5	546	**0.033**	18				**18**
	13	5	46.9	**0.495**	23	0.78			
8	19	5	106	**0.238**	25				**19**
	19	0.5	1133	**0.017**	19	0.76			
9	27.5	0.5	2375	**0.01**	24				
	27.5	5	230	**0.138**	32	0.75			**24**
10	40	5	495	**0.081**	40				**30**
	40	0.5	5025	**0.006**	30	0.75	0.76		
11	58	5	1049	**0.045**	47				**36**
	58	20	233	**0.22**	51	0.70			
12	83	20	510	**0.156**	80				**54**
	83	5	2155	**0.032**	69	0.66			
13	120	5	4516	**0.02**	90				
	120	20	1100	**0.094**	103	0.66	0.67		**70**
14	160	20	1979	**0.06**	119				**80**
15	200	20	3110	**0.043**	134				**90**



Project	AQ22-003
Date	28/01/2022
Surveyor	NS/MB
Location	Kaleya, Mazabuka

VES-name	VES 21		
Orientation	70/250		
GPS	576431	8245552	1062 m
Station	84	Profile	13

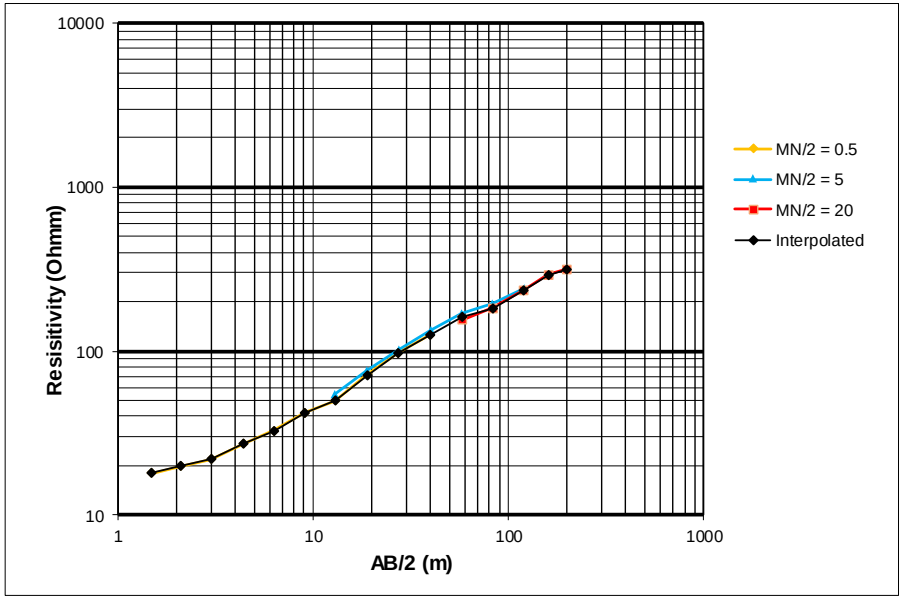
Station	AB/2	MN/2	C	**Reading**	App. Ress	Deviation	Average deviation		**Interpolated App. Ress.**
1	1.5	0.5	6.28	**3.46**	22				**22**
2	2.1	0.5	13.1	**2.06**	27				**27**
3	3	0.5	27.5	**1.141**	31				**31**
4	4.4	0.5	60	**0.571**	34				**34**
5	6.3	0.5	124	**0.314**	39				**39**
6	9.1	0.5	259	**0.165**	43				**43**
7	13	0.5	546	**0.096**	52				**52**
	13	5	46.9	**1.144**	54	0.98			
8	19	5	106	**0.666**	71				**68**
	19	0.5	1133	**0.06**	68	0.96			
9	27.5	0.5	2375	**0.029**	69				
	27.5	5	230	**0.308**	71	0.97			**68**
10	40	5	495	**0.175**	87				**83**
	40	0.5	5025	**0.016**	80	0.93	0.96		
11	58	5	1049	**0.096**	101				**97**
	58	20	233	**0.356**	83	1.17			
12	83	20	510	**0.22**	112				**129**
	83	5	2155	**0.062**	134	1.14			
13	120	5	4516	**0.038**	172				
	120	20	1100	**0.132**	145	1.13	1.15		**167**
14	160	20	1979	**0.096**	190				**218**
15	200	20	3110	**0.073**	227				**261**



Project	AQ22-003
Date	28/01/2022
Surveyor	NS/MB
Location	Kaleya, Mazabuka

VES-name	VES 22		
Orientation	330/150		
GPS	579122	8242125	1073 m
Station	1	Profile	1

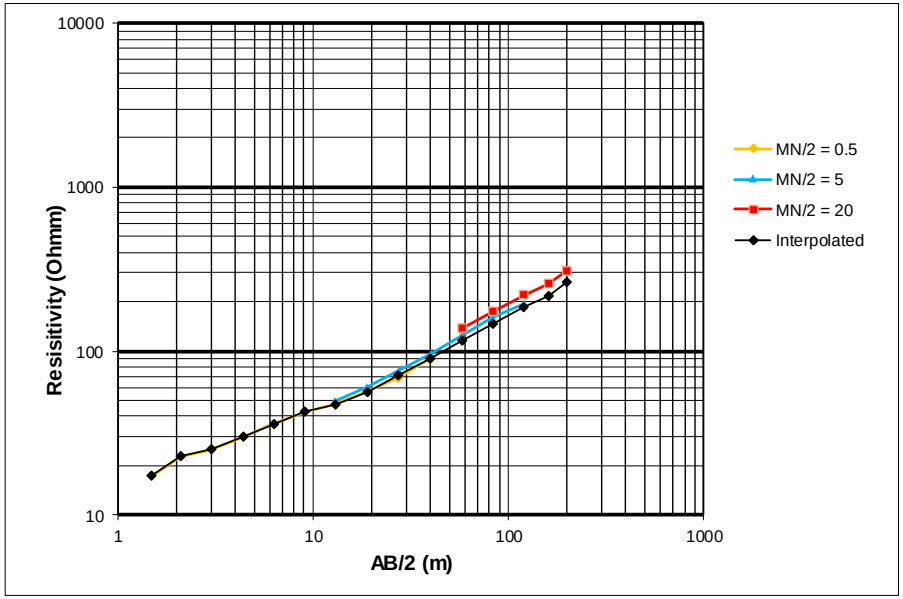
Station	AB/2	MN/2	C	**Reading**	App. Ress	Deviation	Average deviation		**Interpolated App. Ress.**
1	1.5	0.5	6.28	**2.86**	18				**18**
2	2.1	0.5	13.1	**1.522**	20				**20**
3	3	0.5	27.5	**0.793**	22				**22**
4	4.4	0.5	60	**0.453**	27				**27**
5	6.3	0.5	124	**0.263**	33				**33**
6	9.1	0.5	259	**0.163**	42				**42**
7	13	0.5	546	**0.091**	50				**50**
	13	5	46.9	**1.171**	55	0.90			
8	19	5	106	**0.712**	75				**71**
	19	0.5	1133	**0.064**	73	0.96			
9	27.5	0.5	2375	**0.041**	97				
	27.5	5	230	**0.447**	103	0.95			**97**
10	40	5	495	**0.269**	133				**125**
	40	0.5	5025	**0.025**	126	0.94	0.94		
11	58	5	1049	**0.163**	171				**161**
	58	20	233	**0.665**	155	1.04			
12	83	20	510	**0.36**	184				**183**
	83	5	2155	**0.09**	194	0.99			
13	120	5	4516	**0.054**	244				
	120	20	1100	**0.215**	237	0.97	1.00		**236**
14	160	20	1979	**0.148**	293				**293**
15	200	20	3110	**0.102**	317				**317**



Project	AQ22-003
Date	28/01/2022
Surveyor	NS/MB
Location	Kaleya, Mazabuka

VES-name	VES 23		
Orientation	330/150		
GPS	579278	8242318	1078 m
Station	3	Profile	1

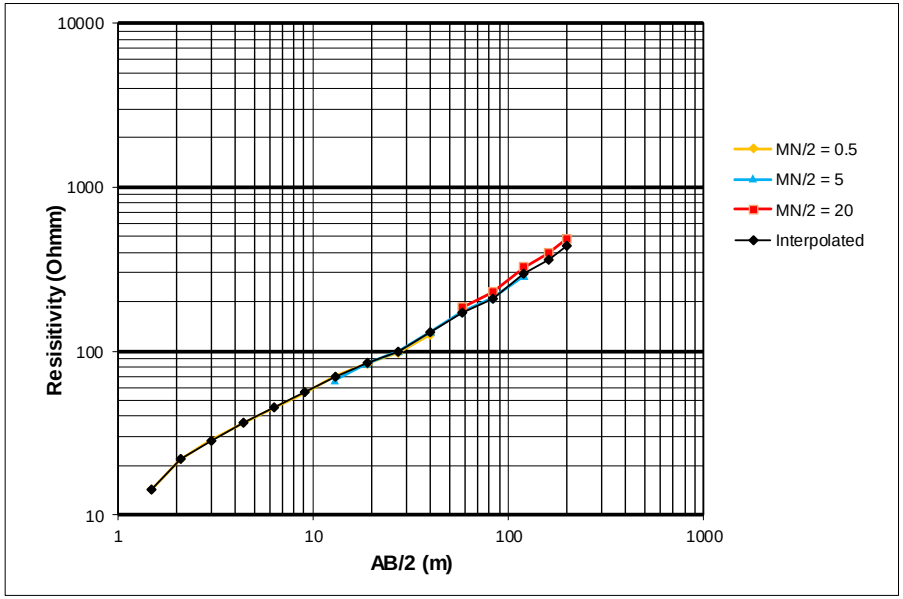
Station	AB/2	MN/2	C	**Reading**	App. Ress	Deviation	Average deviation		**Interpolated App. Ress.**
1	1.5	0.5	6.28	**2.76**	17				**17**
2	2.1	0.5	13.1	**1.73**	23				**23**
3	3	0.5	27.5	**0.914**	25				**25**
4	4.4	0.5	60	**0.5**	30				**30**
5	6.3	0.5	124	**0.292**	36				**36**
6	9.1	0.5	259	**0.164**	42				**42**
7	13	0.5	546	**0.087**	48				**48**
	13	5	46.9	**1.053**	49	0.96			
8	19	5	106	**0.569**	60				**56**
	19	0.5	1133	**0.05**	57	0.94			
9	27.5	0.5	2375	**0.029**	69				
	27.5	5	230	**0.332**	76	0.90			**71**
10	40	5	495	**0.196**	97				**91**
	40	0.5	5025	**0.018**	90	0.93	0.93		
11	58	5	1049	**0.119**	125				**117**
	58	20	233	**0.59**	137	0.85			
12	83	20	510	**0.34**	173				**146**
	83	5	2155	**0.074**	159	0.86			
13	120	5	4516	**0.043**	194				
	120	20	1100	**0.2**	220	0.82	0.84		**186**
14	160	20	1979	**0.13**	257				**217**
15	200	20	3110	**0.1**	311				**262**



Project	AQ22-003
Date	28/01/2022
Surveyor	NS/MB
Location	Kaleya, Mazabuka

VES-name	VES 24		
Orientation	330/150		
GPS	579370	8241894	1069 m
Station	15	Profile	3

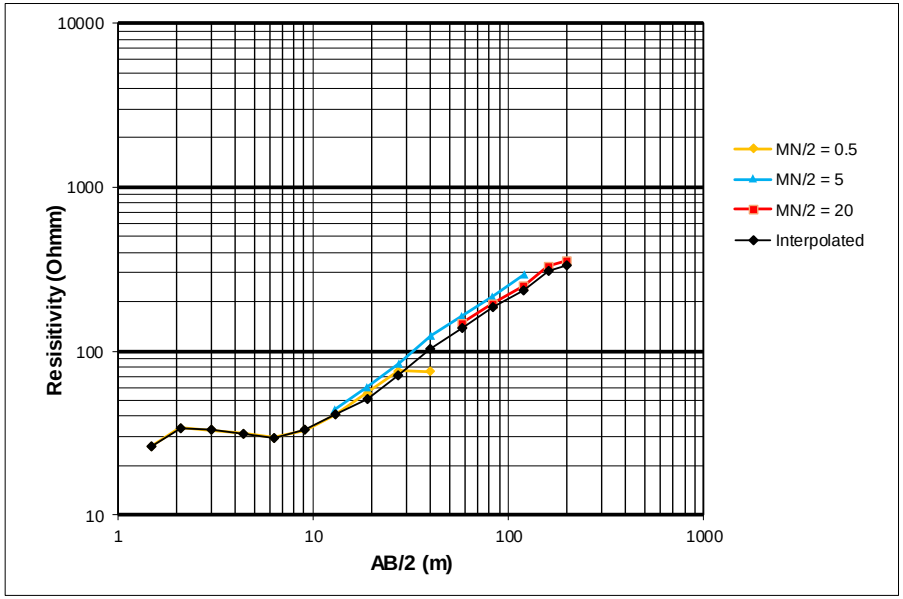
Station	AB/2	MN/2	C	**Reading**	App. Ress	Deviation	Average deviation		**Interpolated App. Ress.**
1	1.5	0.5	6.28	**2.29**	14				**14**
2	2.1	0.5	13.1	**1.67**	22				**22**
3	3	0.5	27.5	**1.042**	29				**29**
4	4.4	0.5	60	**0.609**	37				**37**
5	6.3	0.5	124	**0.364**	45				**45**
6	9.1	0.5	259	**0.217**	56				**56**
7	13	0.5	546	**0.128**	70				**70**
	13	5	46.9	**1.413**	66	1.05			
8	19	5	106	**0.799**	85				**84**
	19	0.5	1133	**0.074**	84	0.99			
9	27.5	0.5	2375	**0.041**	97				
	27.5	5	230	**0.432**	99	0.98			**99**
10	40	5	495	**0.264**	131				**130**
	40	0.5	5025	**0.025**	126	0.96	1.00		
11	58	5	1049	**0.165**	173				**172**
	58	20	233	**0.789**	184	0.94			
12	83	20	510	**0.447**	228				**208**
	83	5	2155	**0.097**	209	0.91			
13	120	5	4516	**0.064**	289				
	120	20	1100	**0.297**	327	0.88	0.91		**298**
14	160	20	1979	**0.2**	396				**361**
15	200	20	3110	**0.156**	485				**442**



Project	AQ22-003
Date	28/01/2022
Surveyor	NS/MB
Location	Kaleya, Mazabuka

VES-name	VES 25		
Orientation	330/150		
GPS	579899	8241992	1077 m
Station	16	Profile	4

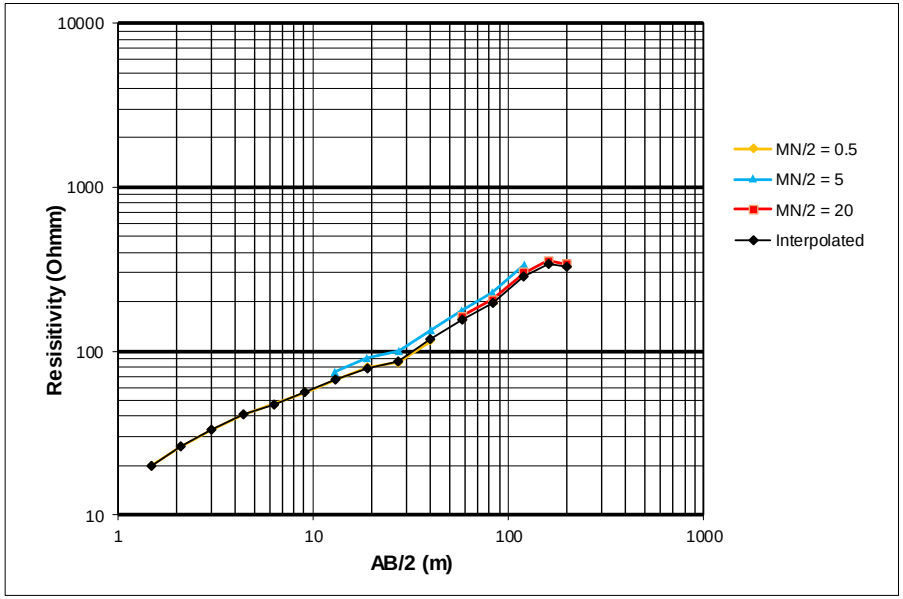
Station	AB/2	MN/2	C	**Reading**	App. Ress	Deviation	Average deviation		**Interpolated App. Ress.**
1	1.5	0.5	6.28	**4.21**	26				**26**
2	2.1	0.5	13.1	**2.6**	34				**34**
3	3	0.5	27.5	**1.197**	33				**33**
4	4.4	0.5	60	**0.522**	31				**31**
5	6.3	0.5	124	**0.239**	30				**30**
6	9.1	0.5	259	**0.128**	33				**33**
7	13	0.5	546	**0.075**	41				**41**
	13	5	46.9	**0.946**	44	0.92			
8	19	5	106	**0.572**	61				**51**
	19	0.5	1133	**0.049**	56	0.92			
9	27.5	0.5	2375	**0.032**	76				
	27.5	5	230	**0.366**	84	0.90			**71**
10	40	5	495	**0.25**	124				**104**
	40	0.5	5025	**0.015**	75	0.61	0.84		
11	58	5	1049	**0.157**	165				**138**
	58	20	233	**0.631**	147	0.94			
12	83	20	510	**0.382**	195				**184**
	83	5	2155	**0.099**	213	0.92			
13	120	5	4516	**0.065**	294				
	120	20	1100	**0.227**	250	0.98	0.95		**236**
14	160	20	1979	**0.166**	329				**311**
15	200	20	3110	**0.114**	355				**336**



Project	AQ22-003
Date	28/01/2022
Surveyor	NS/MB
Location	Kaleya, Mazabuka

VES-name	VES 26		
Orientation	340/160		
GPS	579671	8241645	1075 m
Station	19	Profile	4

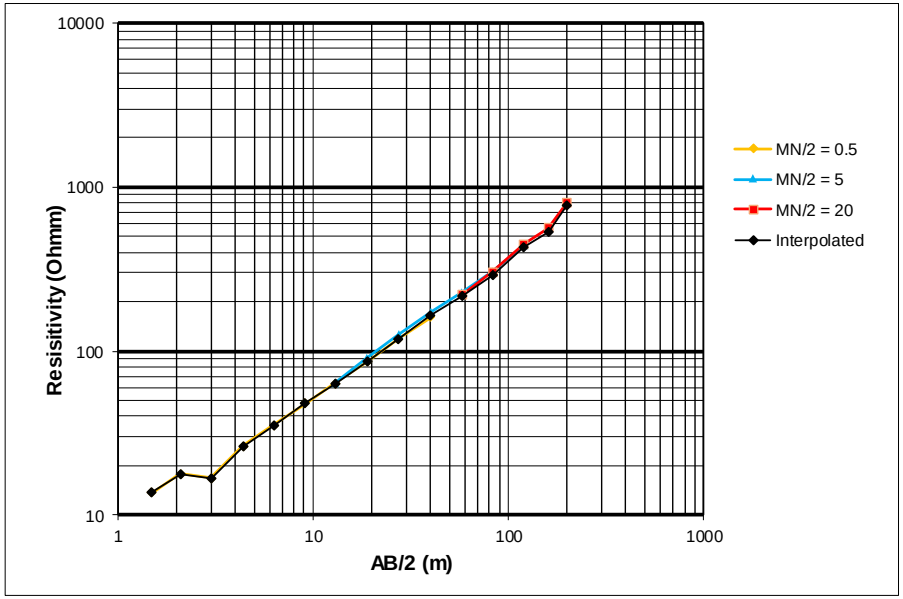
Station	AB/2	MN/2	C	**Reading**	App. Ress	Deviation	Average deviation		**Interpolated App. Ress.**
1	1.5	0.5	6.28	**3.19**	20				**20**
2	2.1	0.5	13.1	**2**	26				**26**
3	3	0.5	27.5	**1.205**	33				**33**
4	4.4	0.5	60	**0.683**	41				**41**
5	6.3	0.5	124	**0.383**	47				**47**
6	9.1	0.5	259	**0.216**	56				**56**
7	13	0.5	546	**0.122**	67				**67**
	13	5	46.9	**1.587**	74	0.89			
8	19	5	106	**0.86**	91				**79**
	19	0.5	1133	**0.07**	79	0.87			
9	27.5	0.5	2375	**0.036**	86				
	27.5	5	230	**0.438**	101	0.85			**87**
10	40	5	495	**0.273**	135				**117**
	40	0.5	5025	**0.023**	116	0.86	0.87		
11	58	5	1049	**0.17**	178				**155**
	58	20	233	**0.696**	162	0.95			
12	83	20	510	**0.405**	207				**198**
	83	5	2155	**0.105**	226	0.95			
13	120	5	4516	**0.074**	334				
	120	20	1100	**0.273**	300	0.97	0.96		**287**
14	160	20	1979	**0.18**	356				**341**
15	200	20	3110	**0.109**	339				**324**



Project	AQ22-003
Date	29/01/2022
Surveyor	NS/MB
Location	Kaleya, Mazabuka

VES-name	VES 27		
Orientation	160/340		
GPS	577759	8241407	1057 m
Station	61	Profile	9

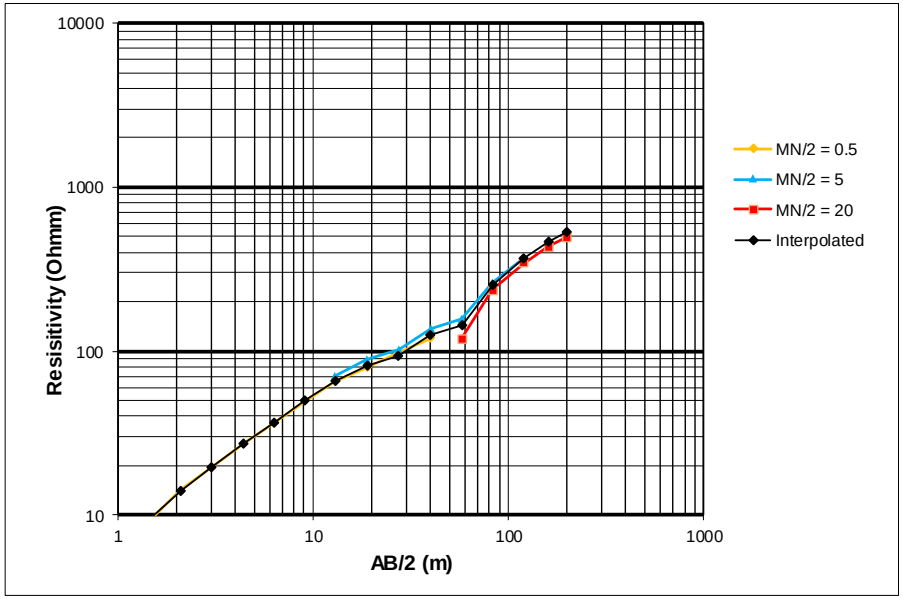
Station	AB/2	MN/2	C	**Reading**	App. Ress	Deviation	Average deviation		**Interpolated App. Ress.**
1	1.5	0.5	6.28	**2.19**	14				**14**
2	2.1	0.5	13.1	**1.365**	18				**18**
3	3	0.5	27.5	**0.612**	17				**17**
4	4.4	0.5	60	**0.44**	26				**26**
5	6.3	0.5	124	**0.284**	35				**35**
6	9.1	0.5	259	**0.184**	48				**48**
7	13	0.5	546	**0.116**	63				**63**
	13	5	46.9	**1.368**	64	0.99			
8	19	5	106	**0.864**	92				**87**
	19	0.5	1133	**0.076**	86	0.94			
9	27.5	0.5	2375	**0.05**	119				
	27.5	5	230	**0.548**	126	0.94			**119**
10	40	5	495	**0.353**	175				**166**
	40	0.5	5025	**0.032**	161	0.92	0.95		
11	58	5	1049	**0.218**	229				**217**
	58	20	233	**0.948**	221	0.98			
12	83	20	510	**0.598**	305				**292**
	83	5	2155	**0.141**	304	0.94			
13	120	5	4516	**0.099**	447				
	120	20	1100	**0.408**	449	0.94	0.96		**429**
14	160	20	1979	**0.284**	562				**537**
15	200	20	3110	**0.259**	805				**770**



Project	AQ22-003
Date	29/01/2022
Surveyor	NS/MB
Location	Kaleya, Mazabuka

VES-name	VES 28		
Orientation	160/340		
GPS	578078	8241828	1067 m
Station	66	Profile	9

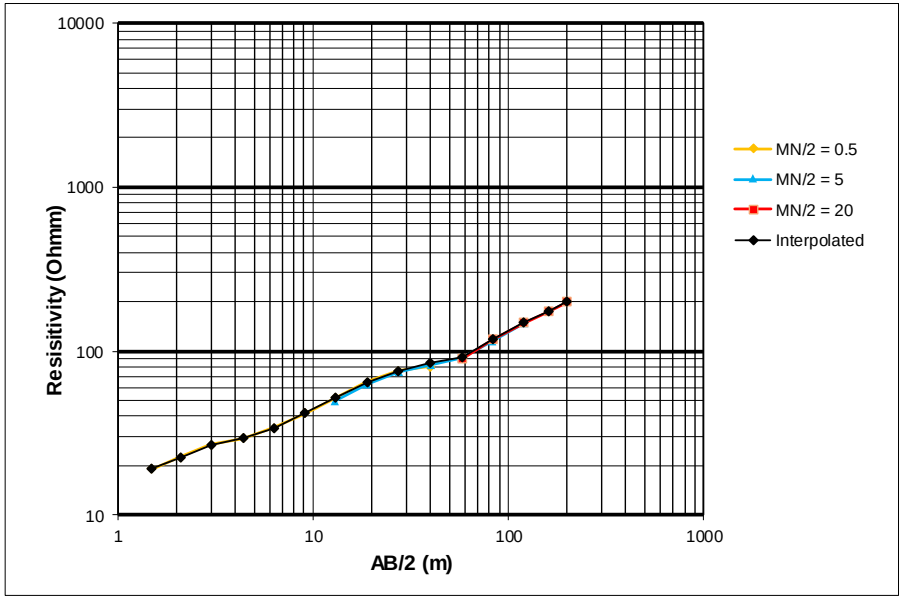
Station	AB/2	MN/2	C	**Reading**	App. Ress	Deviation	Average deviation		**Interpolated App. Ress.**
1	1.5	0.5	6.28	**1.541**	10				**10**
2	2.1	0.5	13.1	**1.08**	14				**14**
3	3	0.5	27.5	**0.707**	19				**19**
4	4.4	0.5	60	**0.451**	27				**27**
5	6.3	0.5	124	**0.294**	36				**36**
6	9.1	0.5	259	**0.192**	50				**50**
7	13	0.5	546	**0.12**	66				**66**
	13	5	46.9	**1.489**	70	0.94			
8	19	5	106	**0.837**	89				**81**
	19	0.5	1133	**0.07**	79	0.89			
9	27.5	0.5	2375	**0.041**	97				
	27.5	5	230	**0.441**	101	0.96			**93**
10	40	5	495	**0.277**	137				**126**
	40	0.5	5025	**0.024**	121	0.88	0.92		
11	58	5	1049	**0.149**	156				**143**
	58	20	233	**0.512**	119	1.20			
12	83	20	510	**0.464**	237				**253**
	83	5	2155	**0.121**	261	1.01			
13	120	5	4516	**0.083**	375				
	120	20	1100	**0.314**	345	1.00	1.07		**370**
14	160	20	1979	**0.219**	433				**464**
15	200	20	3110	**0.159**	494				**529**



Project	AQ22-003
Date	29/01/2022
Surveyor	NS/MB
Location	Kaleya, Mazabuka

VES-name	VES 29		
Orientation	120/300		
GPS	578702	8242595	1080m
Station	39	Profile	6

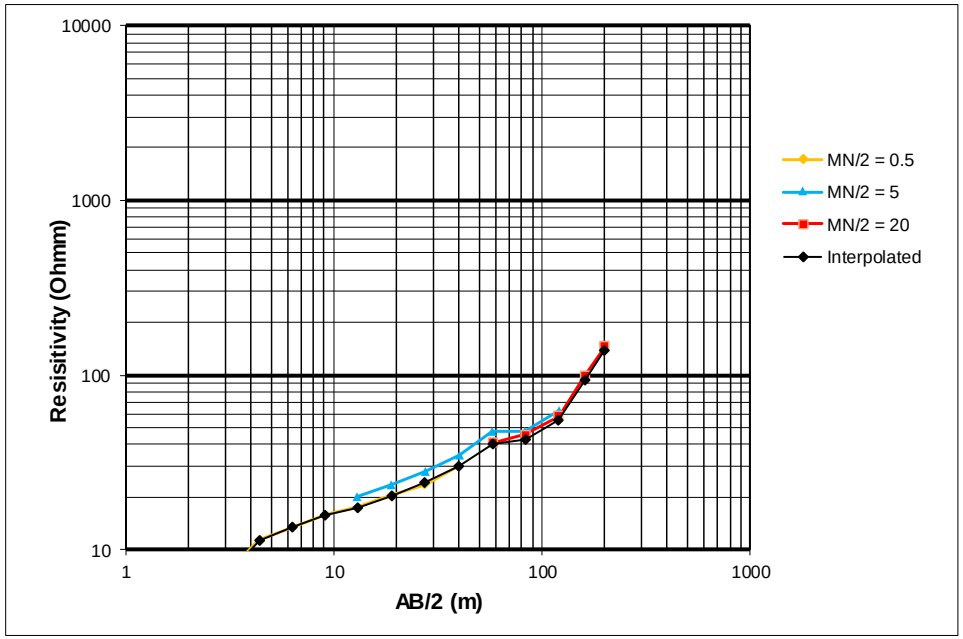
Station	AB/2	MN/2	C	**Reading**	App. Ress	Deviation	Average deviation		**Interpolated App. Ress.**
1	1.5	0.5	6.28	**3.04**	19				**19**
2	2.1	0.5	13.1	**1.722**	23				**23**
3	3	0.5	27.5	**0.976**	27				**27**
4	4.4	0.5	60	**0.49**	29				**29**
5	6.3	0.5	124	**0.274**	34				**34**
6	9.1	0.5	259	**0.161**	42				**42**
7	13	0.5	546	**0.095**	52				**52**
	13	5	46.9	**1.055**	49	1.05			
8	19	5	106	**0.595**	63				**64**
	19	0.5	1133	**0.057**	65	1.02			
9	27.5	0.5	2375	**0.032**	76				
	27.5	5	230	**0.325**	75	1.02			**76**
10	40	5	495	**0.168**	83				**84**
	40	0.5	5025	**0.016**	80	0.97	1.01		
11	58	5	1049	**0.086**	90				**91**
	58	20	233	**0.385**	90	1.02			
12	83	20	510	**0.231**	118				**118**
	83	5	2155	**0.053**	114	0.98			
13	120	5	4516	**0.033**	149				
	120	20	1100	**0.136**	150	1.01	1.00		**150**
14	160	20	1979	**0.088**	174				**175**
15	200	20	3110	**0.064**	199				**200**



Project	AQ22-003
Date	29/01/2022
Surveyor	NS/MB
Location	Kaleya, Mazabuka

VES-name	VES 30		
Orientation	10/190		
GPS	577531	8242958	1076 m
Station	72	Profile	11

Station	AB/2	MN/2	C	**Reading**	App. Ress	Deviation	Average deviation		**Interpolated App. Ress.**
1	1.5	0.5	6.28	**0.959**	6				**6**
2	2.1	0.5	13.1	**0.511**	7				**7**
3	3	0.5	27.5	**0.259**	7				**7**
4	4.4	0.5	60	**0.19**	11				**11**
5	6.3	0.5	124	**0.108**	13				**13**
6	9.1	0.5	259	**0.061**	16				**16**
7	13	0.5	546	**0.032**	17				**17**
	13	5	46.9	**0.426**	20	0.87			
8	19	5	106	**0.221**	23				**20**
	19	0.5	1133	**0.018**	20	0.87			
9	27.5	0.5	2375	**0.01**	24				
	27.5	5	230	**0.122**	28	0.85			**24**
10	40	5	495	**0.071**	35				**30**
	40	0.5	5025	**0.006**	30	0.86	0.86		
11	58	5	1049	**0.045**	47				**41**
	58	20	233	**0.176**	41	0.99			
12	83	20	510	**0.089**	45				**43**
	83	5	2155	**0.022**	47	0.90			
13	120	5	4516	**0.014**	63				
	120	20	1100	**0.053**	58	0.94	0.94		**55**
14	160	20	1979	**0.05**	99				**93**
15	200	20	3110	**0.047**	146				**138**



ANNEX III– RANKING AND LIST OF SITES

Drilling Site Ranking

ID	VES	UTMX	UTMY	PROFILE	SITE	Combined Score	Site Ranking
12	VES 12	577933	8242883	10	68	7.5	1
5	VES 05	578178	8243722	14	92	7.25	2
11	VES 11	577948	8242758	7	51	7.25	2
1	VES 01	576302	8245522	12	78	7	4
20	VES 20	576293	8245795	13	87	7	4
6	VES 06	577578	8242756	8	55	6.75	6
29	VES 29	578702	8242595	6	39	6.75	6
14	VES 14	578368	8242862	5	34	6.5	8
2	VES 02	576212	8245943	13	88	6	9
7	VES 07	577665	8242864	8	54	6	9
25	VES 25	579899	8241992	4	16	6	9
26	VES 26	579671	8241645	4	19	6	9
30	VES 30	577531	8242958	11	72	6	9
10	VES 10	577600	8242316	7	44	5.5	13
18	VES 18	576234	8245639	12	79	5.5	13
19	VES 19	576177	8245737	12	80	5.5	13
22	VES 22	579122	8242125	1	1	5.25	16
23	VES 23	579278	8242318	1	3	5.25	16
3	VES 03	578029	8243109	15	96	5	18
4	VES 04	578082	8243716	14	91	5	18
17	VES 17	579096	8242596	2	7	5	18
21	VES 21	576431	8245552	13	84	5	18
13	VES 13	578198	8242642	5	33	4.5	0
16	VES 16	578687	8242087	2	10	4.5	0
15	VES 15	578743	8242159	2	9	4.25	0
28	VES 28	578078	8241828	9	66	4.25	0
24	VES 24	579370	8241894	3	15	4	0
9	VES 09	577443	8242118	7	41	3.75	0
8	VES 08	577250	8242347	8	60	3.5	0
27	VES 27	577759	8241407	9	61	3	0

ID	UTMX	UTMY	SITE	PROFILE
1	579122	8242123	S01	P1
2	579186	8242203	S02	P1
3	579278	8242315	S03	P1
4	579326	8242370	S04	P1
5	579404	8242466	S05	P1

6	579179	8242701	S06	P2
7	579096	8242598	S07	P2
8	579038	8242527	S08	P2
9	578745	8242160	S09	P2
10	578686	8242088	S10	P2
11	579632	8242235	S11	P3
12	579572	8242162	S11A	P3
13	579544	8242122	S12	P3
14	579470	8242023	S13	P3
15	579428	8241967	S14	P3
16	579370	8241894	S15	P3
17	579965	8242089	S15A	P4
18	579901	8241992	S16	P4
19	579819	8241873	S17	P4
20	579687	8241676	S18	P4
21	579670	8241650	S19	P4
22	579618	8241571	S20	P4
23	579569	8241499	S21	P4
24	579449	8241322	S22	P4
25	579401	8241250	S23	P4
26	577551	8241793	S24	P5
27	577628	8241891	S25	P5
28	577731	8242028	S26	P5
29	577809	8242133	S27	P5
30	577946	8242313	S28	P5
31	578008	8242395	S29	P5
32	578041	8242437	S30	P5
33	578070	8242476	S31	P5
34	578096	8242511	S32	P5
35	578196	8242643	S33	P5
36	578367	8242862	S34	P5
37	578445	8242962	S35	P5
38	578463	8242985	S36	P5
39	578820	8242737	S37	P6
40	578747	8242649	S38	P6
41	578700	8242593	S39	P6
42	577313	8241954	S40	P7
43	577443	8242118	S41	P7
44	577512	8242204	S42	P7
45	577568	8242275	S43	P7
46	577600	8242316	S44	P7
47	577665	8242399	S45	P7
48	577697	8242440	S46	P7
49	577729	8242481	S47	P7

50	577756	8242512	S48	P7
51	577840	8242619	S49	P7
52	577865	8242651	S50	P7
53	577948	8242758	S51	P7
54	577974	8242790	S52	P7
55	577723	8242939	S53	P8
56	577665	8242867	S54	P8
57	577579	8242756	S55	P8
58	577509	8242671	S56	P8
59	577415	8242553	S57	P8
60	577322	8242435	S58	P8
61	577314	8242427	S59	P8
62	577250	8242347	S60	P8
63	577755	8241408	S61	P9
64	577829	8241503	S62	P9
65	577881	8241569	S63	P9
66	577972	8241689	S64	P9
67	578009	8241736	S65	P9
68	578076	8241825	S66	P9
69	578134	8241898	S67	P9
70	578102	8242760	S68	P10