2-DIMENSIONAL GEORESISTIVITY SURVEY AT CORDON, ISABELA

SWiM

SMART WATER INFRASTRUCTURE AND MANAGEMENT R&D CENTER

PHYSIOGRAPHY

The municipality of Cordon has a land area of 14,400 hectares which is about 1.10% of the total land area of the province. It is divided into 26 barangays where the eastern part is relatively flat which is suitable for agriculture and infrastructure settlement. The central to western part of the municipality namely the barangays of Taliktuk, Villamiemban, Anonang, Caquilingan, and parts of Capirpiriwan have undulating topography or mountainous regions.

LOCAL GEOLOGY

The geological composition of Cordon is dominantly comprised of the NQS Paleocene-Pleistocene formation, This formation typically includes sedimentary rocks such as sandstones, siltstones, and conglomerates that have undergone varying degrees of weathering and compaction over time. These rocks can influence groundwater movement and soil formation, making them significant for land use and agricultural planning.. The older Kpg undifferentiated Cretaceous units found in the western and southern parts may represent more consolidated rocks. These areas may have lower porosity and permeability, potentially limiting groundwater storage or flow compared to the younger NQS units.

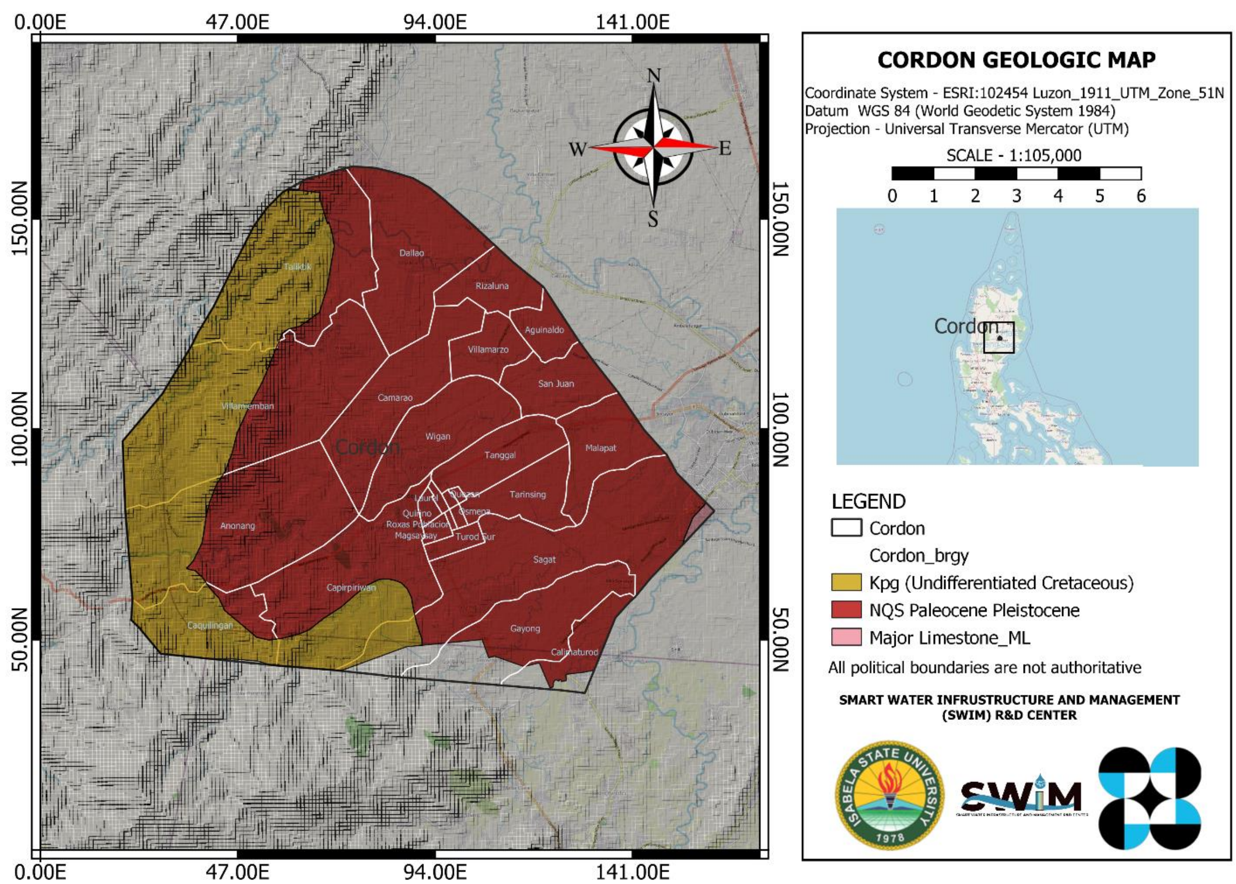

Figure 1. Cordon Geologic Map

GEOLOGICAL STRUCTURE

Cordon lies within the tectonically active region of northern Luzon, however, there are no major fault is directly mapped in the town proper. There are no perceptible geologic structures that could significantly affect the groundwater storage and flow. The only identifiable features and structures are found in the uppermost most of the soil and wells extending on the saturated zone or aquifer.

PRINCIPLES

Resistivity is a geophysical surveying technique that utilizes electrical measurements conducted on the ground surface to identify the depth and thickness of subsurface resistivity layers. In groundwater investigations, resistivity surveys help improve the understanding of underground formations and reduce the likelihood of drilling unsuccessful wells.

Since soil and rocks generally act as electrical insulators with high resistance, electrical currents primarily pass through moisture-filled pore spaces. The resistivity of these materials is influenced by factors such as porosity, permeability, the amount of pore water, and the concentration of dissolved solids. Various soil and rock types exhibit different resistivity values depending on their composition, texture, degree of fracturing or weathering, and groundwater content. This method involves injecting a known and often constant electrical current into the ground using two electrodes, called current electrodes. This process generates a potential field (voltage), which is then recorded through another pair of electrodes known as potential electrodes. The resistance obtained from these measurements is adjusted using a geometric factor to calculate the apparent resistivity.

Resistivity surveys can be conducted to analyze the sequence of resistivity layers beneath a specific location, a technique known as vertical electrical sounding (VES). The resistivity values obtained are then interpreted to determine the possible types of rock present below the surface.

RESULT

The 2D georesistivity image shown presents the results which includes three primary sections: the measured apparent resistivity pseudosection (top), the calculated apparent resistivity pseudosection (middle), and the inverse model resistivity section (bottom). The measured and calculated pseudosections indicate consistency between observed and computed data, suggesting a reliable inversion with a low RMS error of 3.4%, which implies high data accuracy. The inverse model section reveals subsurface resistivity distribution down to approximately 15 meters.

The top layer with a depth of 0-5 meter predominantly exhibit medium to high resistivity values, shown in green to blue which is around 33 to 68 ohm.m, which may correspond to dry or semi-saturated sandy or gravelly materials. At a depth of 5 to 10 meters, lower resistivity zones are observed, possibly indicating the presence of clayey or water-saturated materials. A deeper low-resistivity zone towards the center suggests a potential accumulation of groundwater or soft sediments. High resistivity areas at the bottom corners could reflect more consolidated or dry bedrock material.

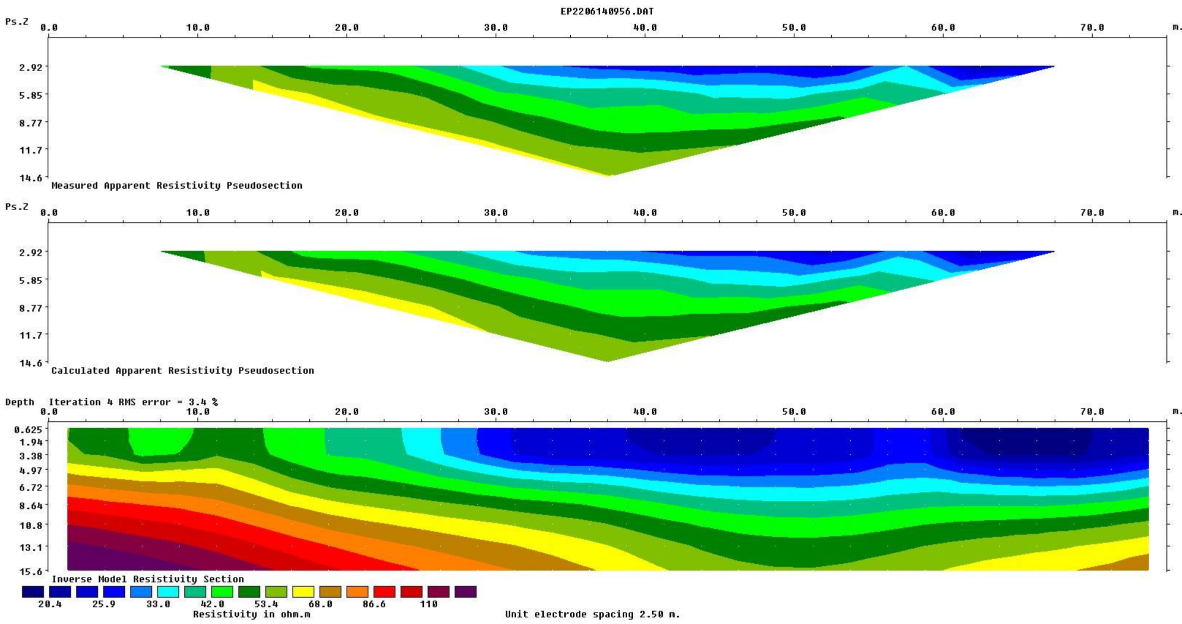

Figure 2. Two dimensional Geo-resistivity survey result

CONCLUSION

Based on the result, the ideal depth of drilling should be between 6 to 12 meters as it shows the highest water potential on this profile. Above 6 meters, the resistivity is relatively higher suggesting drier or less conductive material. Below 12–13 meters, resistivity starts increasing again in some parts, possibly indicating bedrock or less permeable material.