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Report on 'Hydrogeological survey of Palava site, Khoni village, Dombivali, (Mumbai)'

1: Introduction:

The present study was carried out to identify various litho-sections for site at Palava for M/s Lodha Group, Mumbai. The purpose of study is to find out various subsurface strata such as soil layer, weather layer, fractured layer and starting depth of hard rock strata.

For this, electrical resistivity method was adopted as geophysical survey to identify the various subsurface layers.

- Electrical Resistivity Surveys were conducted to infer subsurface geological conditions in general and thickness / depth of different layers in particular.

2: Study area

The present site is located at **Palava, Khoni village**, **Taloja bypass road, Dombivali**, Mumbai, Maharashtra state. The site is situated at eastern side Mumbai city.

Based upon the geological data available in the literature and that collected during projects carried out in the area, the regional geology is known to comprise of black cotton soil followed by Deccan Flood Basalt. The black cotton soil originated mainly due to in situ decomposition of the basalts. The thickness of soil-cap is highly variable, from 30 cm to 15 m. The soil is highly argillaceous, calcareous and very fine grained. Calcium and magnesium carbonate disseminates are present as kankar among its accessory constituents. The base-exchange capacity of this soil is fairly high. The Deccan Flood Basalts are dark grayish green to black coloured, homogeneous and cryptocrystalline vesicular rock of Cretaceous to Paleogene age. The bulk of the basalt is composed of plagioclase and augite. The amygdaloidal cavities are generally filled up by secondary minerals like calcite, quartz and zeolite. The continuity of basalt stratigraphy is generally intervened by sedimentary beds of small vertical as well as horizontal extent, known as inter-trappean beds. The basalt is highly fractured and jointed, however, it has been extremely weathered to a residual soil of grey to brown low plasticity gravelly clay.

The occurrence and availability of groundwater in this region is controlled mainly by the shrinkage jointing, presence of vesicle and fracture interconnection between fracture, joints and vesicles and presences of

inter trappean beds within the Deccan Floods basalt, which forms the aquifer. The aquifer is generally unconfined and receives across the site.

3: Methodology

3.1: Geophysical survey

The geophysical survey is completed with the help of electrical resistivity method. Within that Vertical Electrical Sounding (VES) method was adopted. Total 145 points were survey was carried out to represent total site i.e. 3 to 4 VES points per acre. The VES points were separated by 5 m intervals. The ABEM SAS 300C Terrameter was used to collect the VES data. Field resistivity structures of sounding data were determined by the software, IPIWIN (version 3.0.1) developed by the Geophysics Group Moscow State University for inverse interpretation. Data were interpreted in terms of four layer structure.

Litho-sections of **Palava, Khoni village, Dombivali** (Mumbai) site in meters

SR. NO.	S+ WR	HFR	MFR	HR
1	0.61	1.49	4.2	93.7
2	2.25	4.77	23.7	69.28
3	2.24	2.1	20.8	74.86
4	0.5	4.82	6.73	87.95
5	0.5	1.13	9.73	88.64
6	0.7	2.35	9.29	87.66
7	0.5	2.1	5.61	91.79
8	0.56	2.7	47.2	49.54
9	2.85	5.31	6.71	85.13
10	1.22	1.89	11.9	84.99
Average	**1.193**	**2.866**	**14.587**	**81.354**

Where,

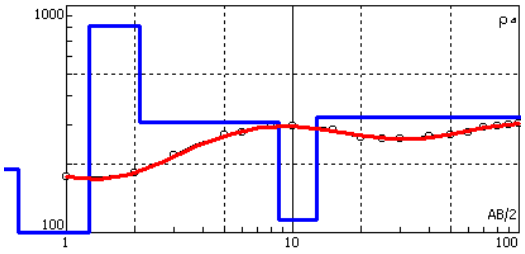
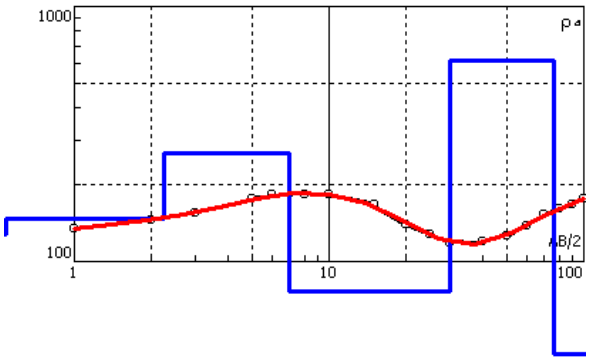
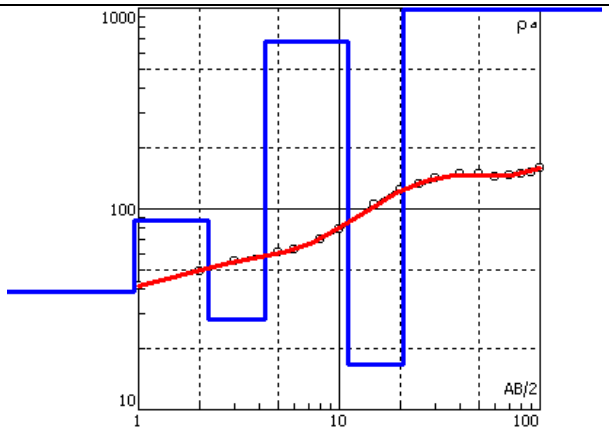
S+WR = Soil + Weathered Rock

HFR = Highly fractured rock

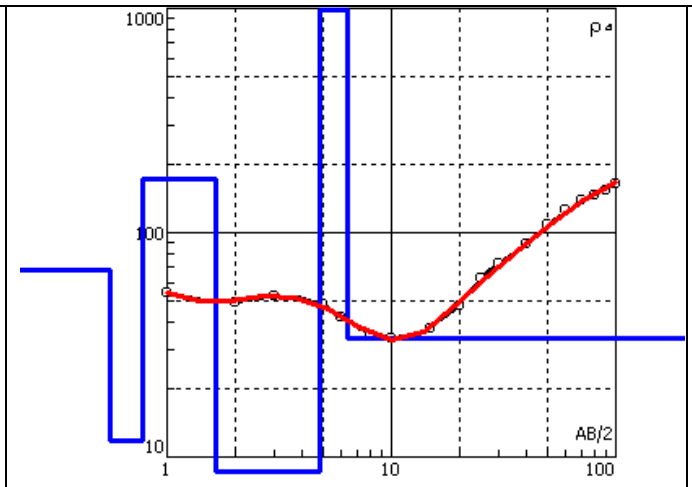
MFR = Moderately fractured rock

HR = Hard rock

4.1: Results of VES point of Palava, Dombivali site

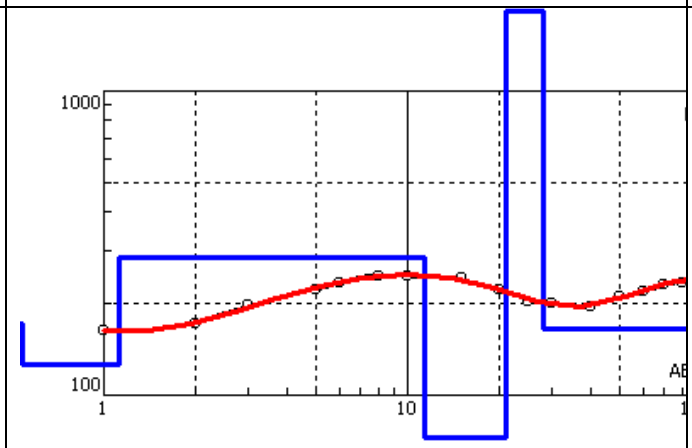
Sr. No	Graph	Value
1		N | ρ | h | d | Alt 1 | 191 | 0.611 | 0.611 | -0.6111 2 | 100 | 0.643 | 1.25 | -1.254 3 | 809 | 0.842 | 2.1 | -2.096 4 | 305 | 6.59 | 8.69 | -8.687 5 | 113 | 4.02 | 12.7 | -12.71 6 | 324
2		N | ρ | h | d | Alt 1 | 128 | 0.5 | 0.5 | -0.5 2 | 147 | 1.75 | 2.25 | -2.249 3 | 266 | 4.77 | 7.02 | -7.019 4 | 76.4 | 23 | 30 | -30.01 5 | 614 | 46.7 | 76.7 | -76.7 6 | 6.22
3		N | ρ | h | d | Alt 1 | 38.7 | 0.944 | 0.944 | -0.9443 2 | 87 | 1.29 | 2.24 | -2.235 3 | 28.3 | 2.01 | 4.25 | -4.245 4 | 679 | 6.76 | 11 | -11 5 | 16.6 | 9.76 | 20.8 | -20.76 6 | 14687

4



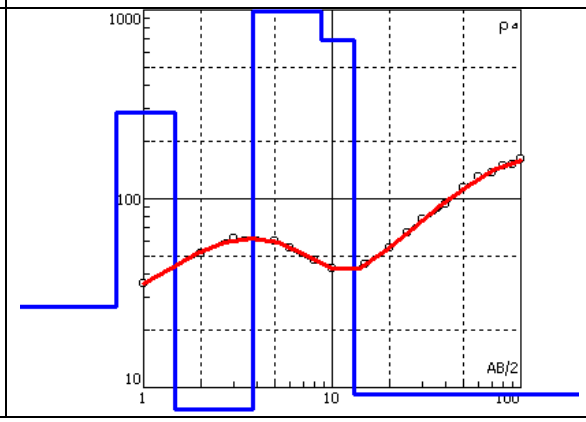
N	ρ	h	d	Alt
1	68.4	0.556	0.556	-0.5565
2	11.9	0.226	0.782	-0.7822
3	174	0.87	1.65	-1.653
4	8.67	3.17	4.82	-4.821
5	20319	1.55	6.37	-6.367
6	33.9			

5



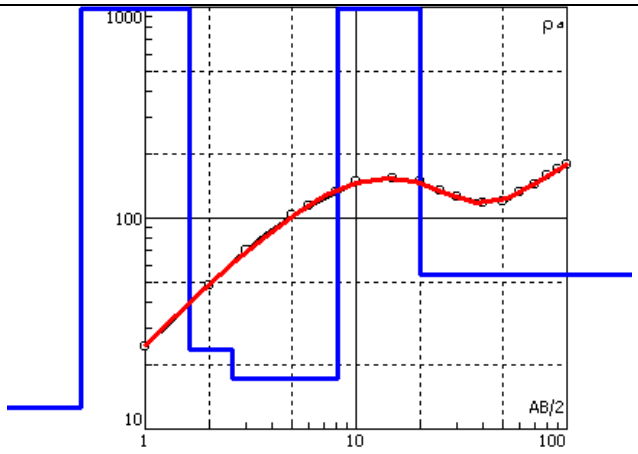
N	ρ	h	d	Alt
1	173	0.5	0.5	-0.5
2	126	0.625	1.13	-1.125
3	284	10.2	11.3	-11.31
4	72.2	9.78	21.1	-21.09
5	2099	6.77	27.9	-27.86
6	165			

6



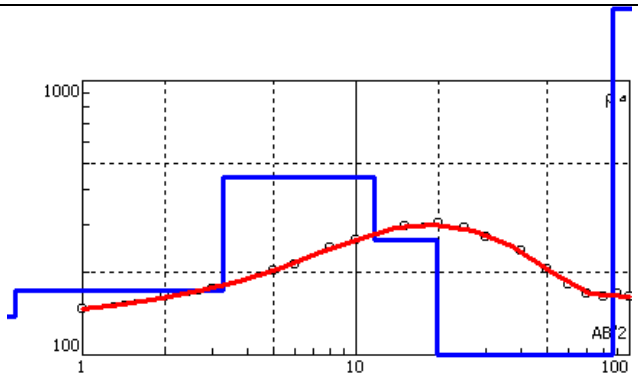
N	ρ	h	d	Alt
1	26.6	0.712	0.712	-0.7123
2	286	0.76	1.47	-1.472
3	7.24	2.35	3.82	-3.822
4	4129	4.92	8.74	-8.744
5	694	4.37	13.1	-13.12
6	9.27			

7



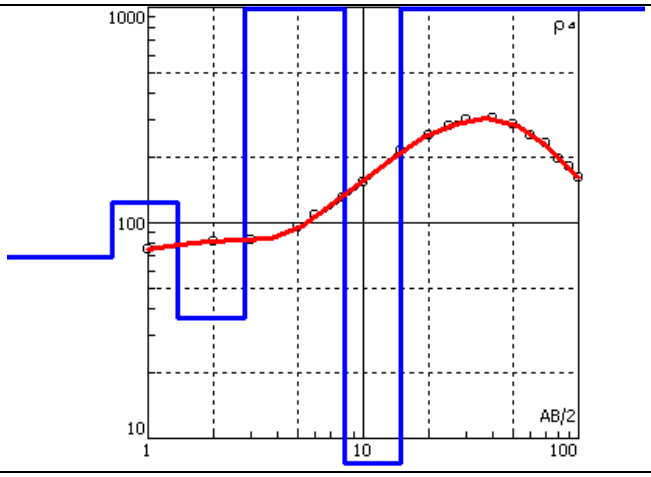
N	ρ	h	d	Alt
1	12.7	0.5	0.5	-0.5
2	1842	1.11	1.61	-1.615
3	23.9	0.981	2.6	-2.596
4	17.4	5.62	8.21	-8.215
5	3477	11.9	20.1	-20.11
6	53.8			

8



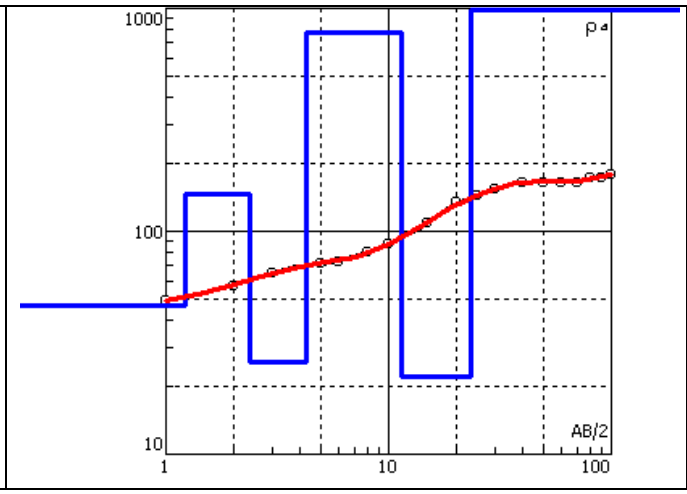
N	ρ	h	d	Alt
1	138	0.569	0.569	-0.5688
2	172	2.7	3.27	-3.273
3	442	8.47	11.7	-11.74
4	262	8.07	19.8	-19.81
5	100	67	86.8	-86.79
6	10665			

9



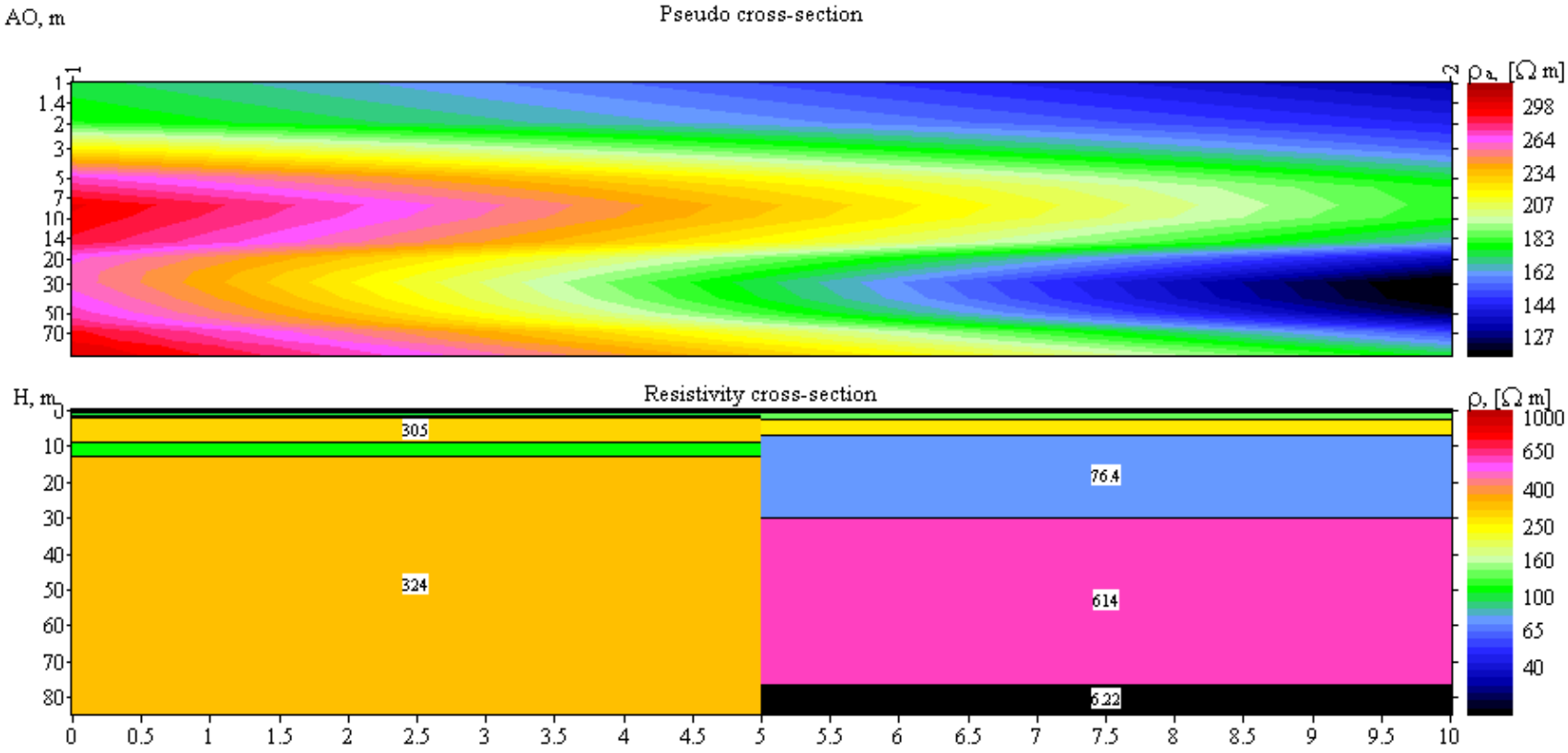
N	ρ	h	d	Alt
1	69.3	0.686	0.686	-0.6856
2	125	0.694	1.38	-1.38
3	35.9	1.44	2.82	-2.818
4	2320	5.31	8.13	-8.13
5	4.69	6.71	14.8	-14.84
6	1453			

10

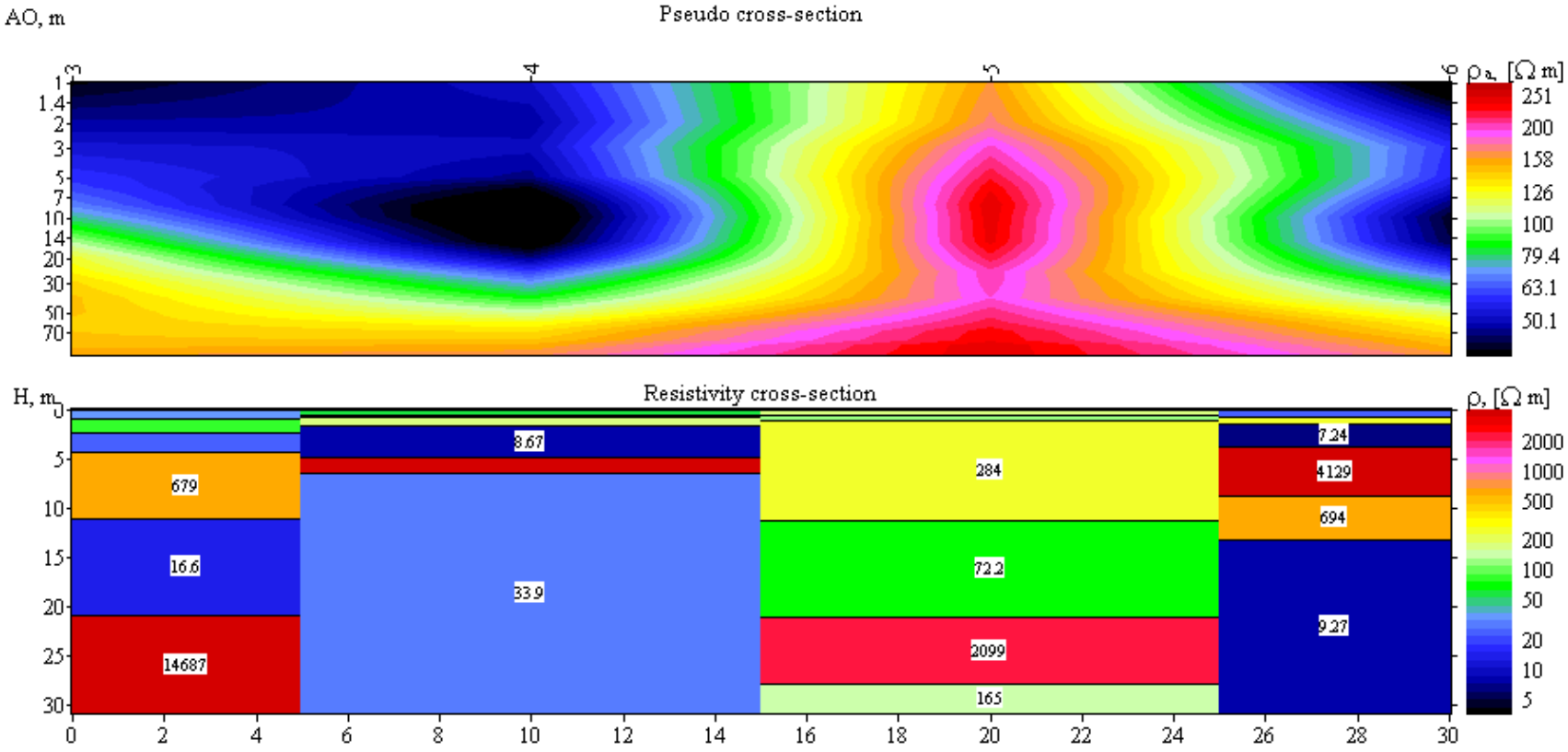


N	ρ	h	d	Alt
1	46.8	1.22	1.22	-1.223
2	147	1.14	2.37	-2.366
3	25.7	1.89	4.26	-4.26
4	778	7.15	11.4	-11.41
5	22.1	11.9	23.3	-23.31
6	16099			

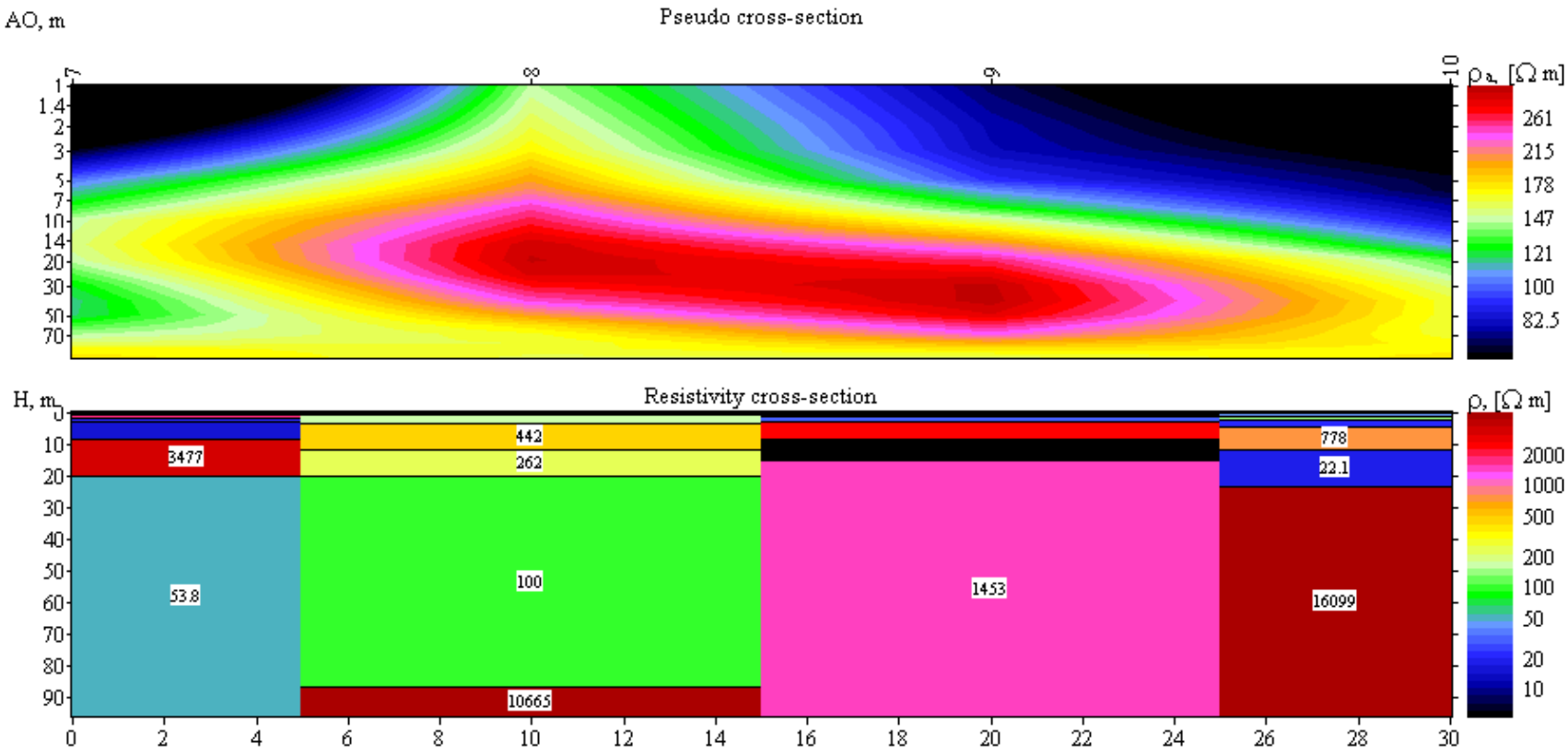
Profile 1 and 2



Profile 3 , 4, 5 and 6



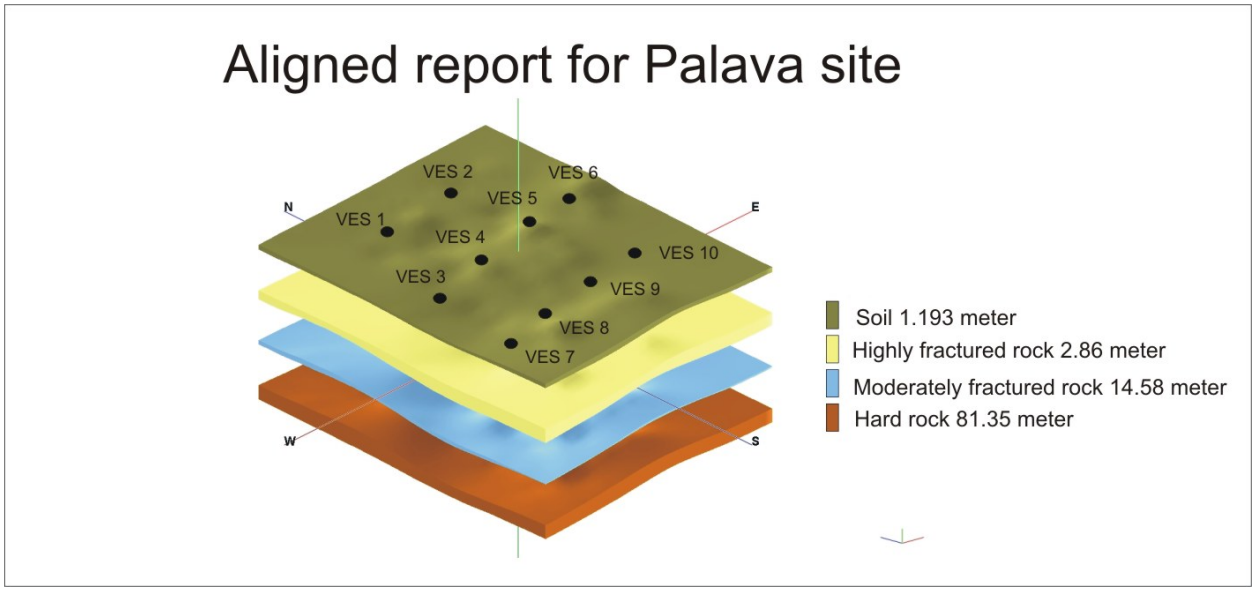
Profile 7, 8, 9 and 10



Conclusions and Recommendations

1) The VES survey of Palava site shows that majority of area is barren and rocky outcrops previous landuse.
2) Total depth was investigated for hydrogeological study is 100 meters.
3) The average depth of unconfined aquifer on Palava site is limited up to 10 to 18 meters, however, confined aquifers begins averagely from 25 meters and exceeds up to 20 meters below.
4) The average soil strata is 1.93 meter, highly fractured rock strata is 2.86 meters, moderately fractured rock strata is 14.58 meters and from below that hard rock strata begins and scanned up to 100 meters.
5) Site is suitable for rainwater harvesting and detailed investigation is required for its potential.
6) Groundwater from study site can be used for gardening, fire fighting purpose and toilet flushing use.

Aligned hydrogeological report for Palava site



Thanking You

Nirav Saraiya

Consultant: Rainwater Harvesting System.

Dr :- Kale (Geologist)