International Journal of Scientific Research in Science and Technology
Print ISSN: 2395-6011 | Online ISSN: 2395-602X (www.ijsrst.com)
doi : https://doi.org/10.32628/IJSRST22917

Geophysical Resistivity Survey (VES) for Selection of Artificial Recharge of Appropriate Artificial recharge for Augmentation of Ground Water Resources In Paithankheda Village, M. S. India

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Article Info

Volume 9, Issue 1

Page Number : 30-34

Publication Issue

January-February-2022

Article History

Accepted : 01 Jan 2022

Published : 09 Jan 2022

ABSTRACT

In this study the data generated while conducting electrical resistivity surveys through Vertical Electrical Sounding (VES) at 22 sites in different location along with a available geological &hydro-geological information of Paithan Kheda village were analyzed. The objective are (i)to understand the nature and extent of aquifer(ii)to find out the location and thickness of unsaturated zones and (iii)to evaluate and extent of appropriate artificial recharge structures at suitable locations across the village.

Interpretation of the top sounding curves indicates presence of three to four subsurface geo-electric layers across the study area. The top soil ;layer has range of resistivity values from 2 to 30-ohm m & litho logy comprise clay with kankar,lateritic sand. This is followed by the weathered and jointed Basalt layers with resistivity values 100 300-ohm m could be identified below the depth of 45m.At some places, doleritic dykes were also observed with resistivity values >300-ohms.

The interpretation of VES data when correlated with the available lithilog data indicates a prominent water bearing zone between 30 and 45 mbgl.The underlying hard and compact Basalt has very little possibility of occurrence of groundwater. The top unsaturated and unconfined granular zone up to adept of 30mts could therefore be easily recharged artificially through rainwater harvestining measures thereby augmenting the groundwater resources of the existing aquifers. Site specific artificial recharge measures from amongst counter banding ,gully plugs ,check dams, percolation tank. Recharge shafts subsurface dikes have been identified across the village for effective recharge of the aquifer especially in its north eastern &southern blockregions.Considering the deteeoriating groundwater situtio n, these initiatives would be significant in catering the needs of future generations.

Keywords : rainwater harvesting. Artificial recharge (AR) Vertical Electrical Sounding (VES) well sitting Teremeter SAS300, litholog Morar shales Schlumberger Configuration.

I. INTRODUCTION

1.1 Electrical resistivity Method

Electrical resistivity methods are of foremost importance in groundwater explorasstion, in water quality evaluation and groundwater pollution studies because the resistivity of rock is very sensitive to its water content. Although several methods can be enumerated under the geophysical methods. The electrical resistivity method has been used in the present investigation. Some of the common sedimentary rocks being ,more porous possess higher water content ;hence they normally have a lower resistivity values.wet and clay soils normally have a lower resistivity than sandy soils Resistivity of each rock depends on certain characters such as porisity.degree of water saturation and concentration of sis solved salts(kearey and Brooks1988).

1.2 Geophysical investigations

Geophysical investigations were carried out by electrical resistivity methods, using the instrument named ABEM Terrameter –SAS 300. The methods for investigation are vertical electrical sounding (VES) BY Schlumberger configuration. By way of conducting such soundings at different litho layers beneath the ground were probed to understand the thickness and apparent resistivity of each litho- layers and its capacity to bear water.

Appropriate no of soundings is done at the project location for getting litho logical characteristics variation with depth.

1.3 Analysis of VES data

The obtained readings in the field are plotted in the bi-logarithmic graph sheet and geoelectric field curve were interpreted and correlated with standard two layers master curves (Orellana and Mooney) by partial curve matching techniques to ascertain the water bearing strata benath the earth. The same was alsocross-cheked with computer software IPI2WIN.

1.4 Suggestion and recommendation

Finally, the recommendation and suggestion are made on based on the hydrological investigation of the area and subsequent geophysical data interpretation which clearly indicates the layer resistivity p1, p2, p3, & p4 and its thickness.

1.5 Geophysical Survey (VES) Conducted for the study

For the study, Vertical electrical soundings (VES) surveys had been carried out at 19 locations for structure I and 4 locations for structure II using Schlumberger electrical resistivity techniques to ascertain the nature of bedrock below the soil cover, and to delineate the layer thickness of different formations and resistivity contrast of different layers. The obtained data from the field were analyzed and interpreted to ascertain the water bearing strata beneath the earth. The analyzed data parameters from the different selected locations are given Table-2.

Table 2: Analyzed Data parameter

Apparent				**Thickness (m)**			
p1	p2	p3	p4	h1	h2	h3	h4
1. Mr Bhau Rotge land at Paithankheda (Near Kesapuri village)Paithan Kheda Block (Nearly 22Km from Aurangabad –Shegoan Road)							

13.1	40	1.33	452	1.01	2.18	2.91	-
2.Janabai Krmarkar Land at Paithenkheda (Nearly 22Km from Aurangabad –Shegoan Road)							
22.54	2.623	16.24	28.59	1.08	2.79	6.04	-
3. Ashokh Ghundre land at Paithankheda (Along the Nala)							

Electrical parameters hydrological sigficance

Sr.No.	Resistivity (Ohm-m)	Thickness (M)	Infered Lithology	Hydrological Significance
1	20-30	2-40	predominantly clay/clay with kankar Blackcotton soil	Generally,lies in unsaturated zone aquifer at good upper leve,&poor at depth
2	30-100	5-50	Highly wheathered Basalt	First Principal aquifer of the aera
3	100-300	0-48	Highly weathered & fractured Basalt	Second Principal aquifer of the aera
4	>300	Bottom Layer	Hard and Compect Basalt	Very poor aquifer,acts as brrier for grounwater movement

Where,

ƒâ1-ƒâ5 Apparent Resistivity of each litho layer in ohm-m

h1- h4 Thickness of each layer in m from the survey data analysis, majorly K and KHK types of curves were found in the area indicating the presence of multilayered inhomogeneous formation (Refer Table). Top

(1) In addition to new bore wells, defunct bore wells and dry wells in the surrounding area could be used for rainwater Collection.

(2) Rooftop and paved rainwater harvesting should be Compulsorily (legislation) done for large department / Institutional buildings of the Villagei.e Grampanchyat Building ZP school Buildings& Buildings like Samaj Mandirs etc.

(3) The rainwater collected should be put to desiltation and Filtration prior to transporting down the earth through existing or newly constructed later harvesting structures like dug wells, Bore wells, shafts, trenches etc.

(4) A detailed water management plan for the entire Village is

Required to be prepared for utilizing the maximum quantity of The available surface (rainwater) resource which is currently Going to waste. From the carried studies the broad description of the groundwater development and management plan Envisaged for Paithankheda is as under:

II. RESULTS AND DISCUSSION

The analyses of sounding curves obtained from Geophysical survey data over the areas have brought out three To four subsurface geo-electric patterns. The top layer (depth Range- 2 to 20 m) consists predominantly of clay / clay with kankar/ Black cotton Soil followed in respective order by Highly weathered & jointed Basalt (depth range- 20-55 m) and Hard & compact Basalt (depth below 55 m) which at depth (>300) Major parts of the investigated area are potential zones for ground water exploration and exploitation purposes and for long term sustainability these areas have sufficient scope for artificial recharge predominantly through the construction various appropriate water harvesting structures.

III. CONCLUSION AND RECOMMENDATIONS

As discussed above, it is concluded that field geo-electrical Survey is very rapid and reliable method to explore an area for finding out the prospect of groundwater occurrence. It helps to delineate the area precious for groundwater Development and management. Based on the above field Survey and subsurface aquifer conditions, most of the areas need artificial recharge of the aquifers by adopting appropriate measures.

Following suggestions or recommendations have been proposed for groundwater development in the city. A well-planned recharge scheme for the entire city should developed for the construction of various artificial recharge structures such as injection wells, recharge shafts, storage
Ponds and tanks etc. at suitable locations.

IV. GROUNDWATER DEVELOPMENT AND MANAGEMENT PLAN

The number of water harvesting structures should be distributed dividing balance resources equally for dug wells and tube wells and taking consideration of 100 % development of net groundwater availability in the block. Therefore, it is suggested that a scientific study at every five years' period is a must to check the impact of groundwater development on groundwater regime and accordingly number of structures should be modified. By considering these points, there are many ways to adopt this practice but the structures which are feasible in the study area & almost across Paithankheda are: contour bundings, gully plugs, check dam, percolation tank, recharge shafts & subsurface dykes. Broadly, the area for artificial recharge have to be divided into two categories i.e. overexploited and safe to semi-critical area where long term trends of groundwater level is declining. It is observed that gully plugs and contour bunds may be constructed on the upper reaches of streams. Percolation Tanks can be considered in areas which provide sufficient Spread. In locations where streams are of 5-6 m wide and have sufficient depth, a series of small check dams in the stream course may fulfill the objective of conservation of Groundwater. During rainy season, it should be mandated that the farmers use bunds in the area for storing the water in their fields. In areas where clay beds that prevent percolation of water to the unsaturated zone in the weathered Basalt and Highly Fractured Jointed Basalt, recharge shaft may prove good structures for artificial recharge of groundwater in the alluvial flat terrain areas, due to very poor drainage density the feasibility of percolation tanks is almost remote. In these areas where the phreatic aquifer has gone dried and the clay beds do not allow percolating the water in deeper level, recharge shaft is only means to be adopted to augment the groundwater.

V. REFERENCES

[1]. Udayalaxmi G and Ramadass G, 2009. VES approach for delineating contaminated groundwater zones in Osmania University and Surrounding areas of Greater Hyderabad, A.P., India. Gondwana Geological Magazine, Nagpur. Vol.24 (1), pp.11-18.

[2]. Patangay N.S., Ramaprasada Rao I.B., Venkata Chary M., Ram Raj Mathur and Shiva Keshavulu A., Srinivas S.R.P., 2002.Application of Geophysical techniques to trace groundwater pollution due to industrial effluents in the hard rock terrain.Jour. of Geophysics, Vol. XXIII, No.1, pp.9-12.

[3]. Ebrahim.Am, Hamburger,M.V,Bayless,E.R and Krothe,N.C.1990. A study of acid mine drainage using earth resistivity measurements,Groundwater,Vol.28.No.3.pp 361-368.

[4]. De Lima. O.A.L., Sato, H.K., and Porsani, M.J., 1995. Imaging industrial contaminant plumes with resistivity techniques-jour. App. Geophy. Vol 34, No.2.pp 93-108

[5]. Hansen,B.P.&Lane,J.W 1996. Orientation and characteristics of Fractures in crystalline Bed rock determined by surface and borehole geophysical surveys,Millville and Uxbridge, Masssachusetts SAGEEP1996. Conference Environ, Eng.Geophysic. Soc. Proceedings,927-940

[6]. Skyernaa,L.,& Jorgenson,N.O.1993. Detection of local fracture systems by azimuthal resistivity surveys:examples from south Norway.Memoirs of the 24 th congress of International Association of Hydrolgeologists pp662-671.

[7]. Bayewu,OlatejuO,OloruntolaMoroofO,MosuroGaniyu O,Folorunso, Ismail O & Kolawole,Ajibola,2014. Evaluation of Resistivity Anisotropy of parts of IjeboIgbo,Southwestern,Nigeria Using AaimuthalResistivty Survey (ARS) Method, Journal ogGeogrp and Geology,V0l.6.No.4,ppas 140-150

[8]. Balakrishna S. and Raghava Rao M., 1961.Pink and grey granites Hyderabad, Current Science, Vol.30, pp.264.

[9]. Sitaramayya S., 1968. Structure, Petrology and Geochemistry of Granites of Ghatkesar, A.P., and Ph.D. Thesis (unpublished), OsmaniaUniversity, Hyderabad.

[10]. Sitaramayya S., 1971. The Pyroxene Bearing Granodiorites and Granites of Hyderabad Area, (the Osmania Granites):Quarterly Journal of the Geological, Mining and Metallurgical Society of India, V.43, pp.117-129.

[11]. Murali S and Patangay N.S.1998. Principles and applications of groundwater Geophysics,Publ. by AEG,OU,nHyderabad p 421.

[12]. Niwas S and Singhal DS 1981. Estimation of quifertransmissivity from Dar Zarrouk parameters in porous media,Jour.of Hydrology,Vol.50 pp 393.-399

[13]. Olainka,AI 1996. Non Uniquencess in the interpretation of bedrock resistivity from sounding curves and its hydrological implications.Waterresources.Vol.7.No 1&2 pp 55-60

[14]. Bhattacharya and Patro,H.P.1968. Direct current Geoelectric sounding Methods in Geochemistry and Geophysics,Elsevier,Amsterdam,135p.

[15]. Loke MH 1999. Electrical imaging surveys for environmental and engineering studies.A practical guide to 2 D and 3D surveys.Preconference workshop notes W2..The theory and practice of electrical imaging. EEGS-European section 5 th meeting, DudapetHundgary.

[16]. Worthington P.F 1977. Influence of matrix conduction upon hydro geophysical relationships in arenaceousaquifers,water resourceResearch Vol.13,No.1,pp 87-92.

[17]. Glain D.L. 1979.Use of Longitudinal conductance in vertical electrical soundings induced potential method for solving hydrogeolocial problems, VestrikMoskovskogo Universitta,Geologiya,No.34 pp 74-100

[18]. Zohdy E 1974. Application of surface Geophysicas to groundwater InvestigationsTechniques of water er resources investigations of the UD Geological survey Book.2-pp 5-60

Cite this article as :

N. V. Sharma, I. S. Shaikh, "Geophysical Resistivity Survey (VES) for Selection of Artificial Recharge of Appropriate Artificial recharge for Augmentation of Ground Water Resources In Paithankheda Village, M. S. India", International Journal of Scientific Research in Science and Technology (IJSRST), Online ISSN : 2395-602X, Print ISSN : 2395-6011, Volume 9 Issue 2, pp. 30-34, January-February 2022. Available at doi: https://doi.org/10.32628/IJSRST22917

Journal URL : https://ijsrst.com/IJSRST22917