

## Hydrostratigraphy of Arak aquifer, Iran

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**Abstract:** The study area is located in the North East of Arak city in Central Province and the viewpoint of geological is between structural zones in Central Iran and Sanandaj-Sirjan. This paper has also conducted field survey, geophysical studies and using the results of pumping tests, allocation is studied hydrostratigraphic and lithostratigraphic area. Based on the determination of sediment thickness and sex using resistivity, is obtained permeability and the discharge rate of each layer. The results show that in six of the sediment layers that have the origin of a lake (silt and clay) is low discharge and we can expect made charge and deposits discharge proper.

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**Key words:** Hydrostratigraphy, Quaternary, Geophysic, Arak aquifer.

### Introduction

A Hydrostratigraphic units are includes all or part of a set of lithology that specifications hydrogeologic is separated from the other units (Maxey, 1964). This units are in the alluvium and fractured rocks that formed karstic groundwater resources (Anderson. , et al 2011 and green. , et al 2011). Hydrostratigraphic units are in the perecambrian to Cenozoic formation (Aswasereelert. , et al 2008).

Around two million years ago affected Pasadenian organics phase and performance Talkhab fault Playa Mighan (Arak plain Quaternary sediments) as a closed sedimentary basin was separated from the center of Iran. This loading in the closed sedimentary basin, approximately 639 meters down to the floor of which, are 320 meters lake sediments and 319 meters of alluvial deposits. aquifer characteristic in basin sedimentary is affected the alluvial plain by the layer properties. Result of Geophysical well logs and test results show that the alluvial layers containing large quantities of fine sediments, especially clay is mixed with the coarse sediment layer or a separate form. This causes a discharge from wells is reduced in some areas, on the other hand, if the extent of the clay layer is high, can multi-class aquifer and even pressure (leakage) form. Alluvial plain create from sand grains together with grains of clay caused so grains of clay is much more and clay percent is low then will be greater permeability of alluvium meanwhile the amount of

compression of alluvium is effective in rate of aquifer.

In this paper is trying that to be evaluated the specificities of Arak plain Quaternary hydrostratigraphic sequence (Figure 1) with the field survey, the various tests and identify the relevant characteristics.

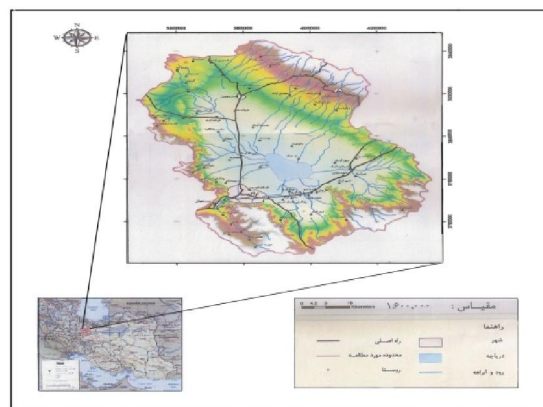


Figure 1 - Geographical location

### Discussion

In order to identify, differentiate and describe the hydrostratigraphic units in sediments of Arak plain Quaternary stratigraphic is used columns of the data set of exploratory wells (underground stratigraphy) that contain wells Ebrahim Abad, Shavsaven , Amman Abad, Mjdabad old, Vlasjrd, Mradabad ( Figure 2) and Geophysical Data from operations.

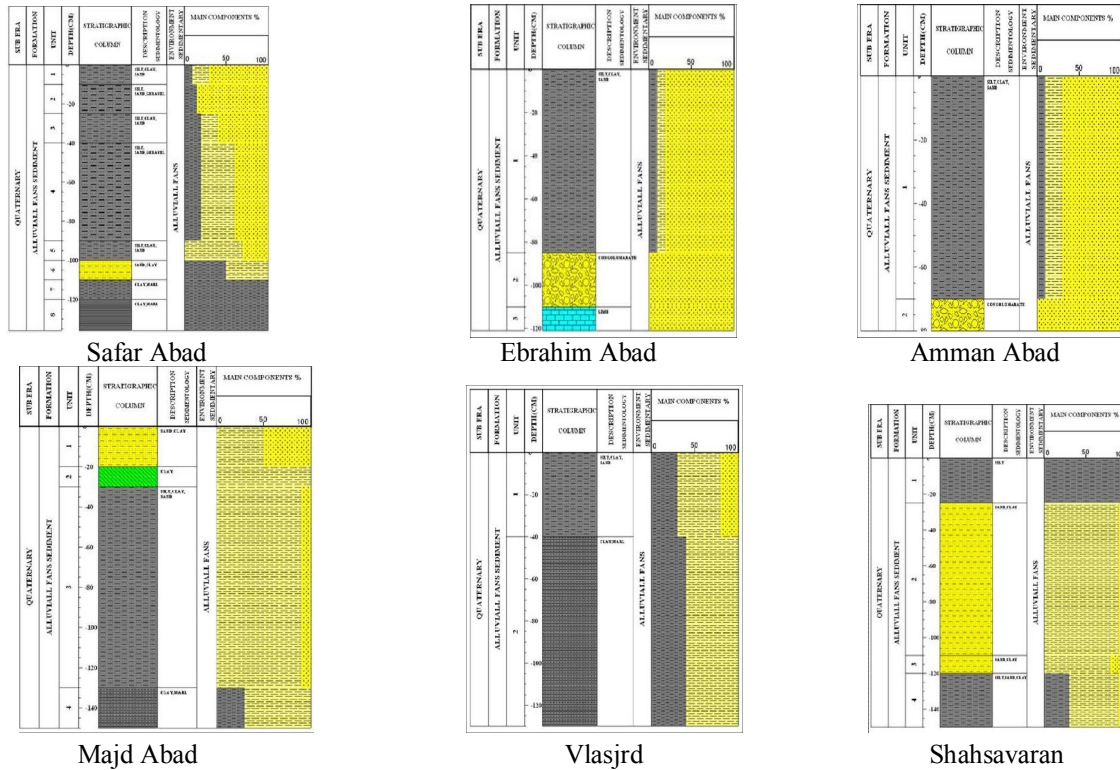


Figure 2 - Underground Stratigraphy of exploration wells

The results of exploratory drilling in the alluvium thickness and sex, Geophysical operations in the plains area of approximately 1600 km<sup>2</sup> to the Arak and 263 sondazh to separate layers deep, and study resources and groundwater reservoirs (aquifers identified) has been done.

Geophysical profiles were examined carefully and show the area between the profiles to D - D (Figure 3) that most of the stratigraphic layers for water studies.

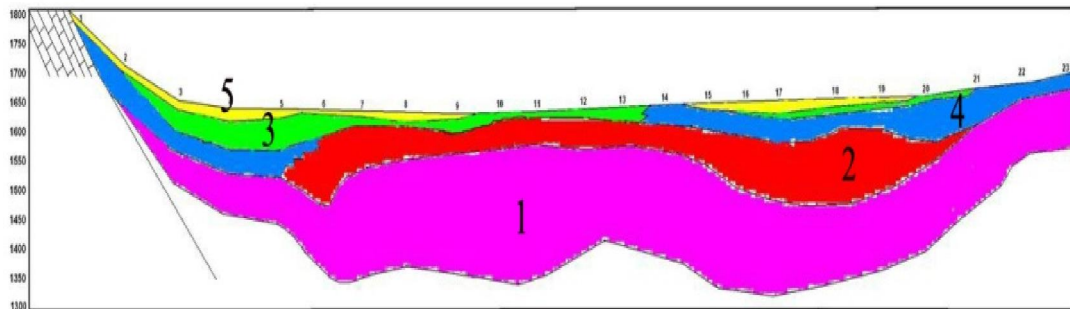


Figure 3 - Profiles of geophysics and the Hydrostragphy layer.

In this shape from the depth to water level is stratigraphic unit 1, with resistivity of 10 Ω and is made of clay silt sediments. Hydrostragphy unit 2, with resistivity of 3 Ω and is made of silt clay sediments. Hydrostragphy unit 3, with resistivity of 20 Ω and then is made of clay sand to clay silt sediments. Hydrostragphy unit 4, with resistivity of 50 Ω and sex of sand (compact) which due to sediment compaction, is formed aquifer with low discharge hydrostragphy unit 5, with resistivity of 30

Ω is made of sex of sand (half - compact) sediments that is formed aquifer with good discharge, and water between these sediments is cause for to be low resistance. Referring to the curves same thickness (b) of Arak plain alluvium and the water conductivity (T) that to be inference from results of exploratory wells pumping we have try to determine the permeability of hydrostragphy units with using the formula  $T = K \cdot b$ :

$$k_s = \frac{T_s}{b} = \frac{1000m^2}{40m} = 25m$$

$$k_4 = \frac{T_4}{b} = \frac{600m^2}{50m} = 12m$$

$$k_3 = \frac{T_3}{b} = \frac{500m^2}{80m} = 6.20m$$

$$k_2 = \frac{T_2}{b} = \frac{100m^2}{80m} = 1.25m$$

$$k_1 = \frac{T_1}{b} = \frac{300m^2}{150m} = 2m$$

According to data from exploratory wells, curve thickness and geophysical data is characterized hydrostratigraphy units 3, 2, 1, have lakes source, so in these units three cannot be expected formed aquifer.

So we get closer of the depth to the surface to reduce the amount of lake sediments and is added alluvial deposits.

In Unit 4, which is belongs to the ancient alluvium is due to the relatively long lifetime and withstand various pressures is made compact and almost to be impenetrable. Accordingly it to be formed aquifer in it with little potential.

Hydrostratigraphy unit 5, sex of sediments are of sand, gravel and little clay is low. These semi-compact deposits are Contents good permeability and aquifer with sufficient potential. Summary is expressed by Table of (1).

Hydrostratigraphy unit	sediments	source	Permeability (Meter Per Day)
Unit 5	sand (half- compact)	alluvium	25
Unit 4	sand (compact)	alluvium	12
Unit 3	clay silt to clay sand	lake	20.6
Unit 2	silty clay	lake	25.1
Unit 1	clay silt	lake	2

Table 1 - separate hydrostratigraphy units in water

### Conclusion

Arak plain sedimentary basin is separated of about two million years ago affected Astadenian orogenic phase from the center of Iran. Thick sediments is in this basin 639 meters (320 meters of lake sediments and 319 meters, alluvial deposits). With older alluvium aquifer and 5 Aqua Stratigraphis seperationality which are 1,2,3, from deep to level presentation ,attention to sex of sedimentary don't charge aqua. In the stratigraphic unit 4 that is contain old alluvium Aqua charge is wake but in Aqua Stratigraphis unit 5 cousin semi-compact sediments (alluvium new) and good permeability of the expected potential.

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