Research Paper Engineering

# A Study of Groundwater Fluctuation in Machchhu-I Command-Morbi, Distirct-Rajkot.


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**ABSTRACT**

The paper present the case of groundwater seasonal and annual fluctuation and rainfall effect on the on groundwater level in semi-arid region Morbi, Rajkot District of Gujarat State.The datahave been collectedare Water-level data ofthe number of wells ofthe last 22 years& rainfall data. TheEstablishing a mutual relationship of groundwater level fluctuation is shown in graph for pre-monsoon and post-monsoon,also graphical representation & discussion of groundwater level v/s year v/s rainfall. The result shows that the groundwater level shows a seasonal pattern of fluctuation. The variation of decadal average water level trend is increasing and average water level with time is decreasing for Rajkot district. When establishing a relationship of average annual water level with average annual rainfall the water level is increasing with rainfall,associate it with good rainfall years, the water level is lowcompared to previous rainfall years[ ].

**KEYWORDS** rainfall, pre-monsoon, post-monsoon, Groundwater Level.

## I. INTRODUCTION

Water resources are becoming scarce, due to growing population and changing lifestyles, increase in demands from industry, contamination of available water resources, resulting from human activities, etc. This thins out the allotment of water available for irrigation.

Dam projects generate a vast array of economic impacts—both in the area where they are located and at inter-regional, national and even global levels. These impacts are evaluated in terms of additional output of agricultural commodities, hydropower, navigation, fishing, tourism, recreation, prevention of droughts and reduced in flood damages, and are referred to as direct impacts. The direct impacts, in turn, create a number of indirect and induced impacts as a consequence of:

• Inter-industry linkage impacts, including both backward and forward linkages, which lead to increase in the demand for and outputs of other sectors.Ingestion-induced impacts arising as a result of increase in incomes and wages generated by the direct outputs of the dam[].

Dams are not just significant in economic growth, but also in overall economical and moral growth.In many developed countries, dams have performed a central function in the evolution of the developing nations.

**Target:**

To study the groundwater seasonal and annual fluctuation and trend of groundwater level and its effect on groundwater level due to rainfall.

## II. STUDY AREA

Location of Machchu-1 dam is on river Machchu near a Jalsika villagein Wakaner of Rajkot District, the distance is 57 km from the source of the river. The Wankanertownlies 22 km down-stream of Machhul dam. The Completion of Machchu-I damwas in the year 1958, the dam site catchment area is up to 735 km$^2$.The projected gross and live storage capacities of the dam are 72.7 Mm$^3$ and 70.8 Mm$^3$ respectively with FRL at 135.35 m.

TheMachchu-I dam has been designed as a reservoir impounding water for the purpose of irrigation.The command area of the task rests on the left bank of River Machhu in Wankaner and Morbi talks of Rajkot district. The cultivable command area is 104.09 Mm$^2$ and the gross command area of this project is 182.18 Mm$^2$.The whole of the catchment area gradually rises towards the source in the north eastern direction, i.e., Mandva hills from where the river holds its source. Away of the 735 km$^2$ of the catchment area at the dam site, 36.3 km2 have already been intercepted by a tank at area, 35.4 km upstream of the dam site.The reservoir is preconceived to provide irrigation water all the year round.Hence, a preparation for the evaporation and absorption losses that take place in the reservoir throughout the year has been caused. The spillway of the damwas designed to pass a flood of 2,595 cumecs with HFL at 137.46 m. In the river portion with water cushion a seller ended the fall weir of 487.68 m has been provided[].

**Fig.1 -Study area map of machchhu1 reservoir**
**Source: GWSSB (irrigation dept.) - Morbi.**

**2.2 Data Collection ofMachchhu1 reservoirs.**
Machchu-I reservoir Basin Map and data of the village were collected from GWSSB-Gandhinagar and GWRDC- Rajkot.

Hydrological data:Average rainfall ofMachchhu-I reservoir.

Geo-hydrological data

- Ground water levels
- Well location (latitude & longitude)

**III. METHODOLOGY**
Pre-monsoon and Post-monsoon water level data of a number of wells have been collected from the GWRDC officefrom the year 1991 to 2012 at an interval of 2-years. The annual rainfall data is collected From the GWSSB - Gandhinagar office. The study and analyses of seasonal groundwater fluctuation are done and established its relationship with rainfall.

- Total annual water level graph of pre-monsoon and post monsoonis found out using ms- excel fora period of 1991 to 2012.
- To study water level for pre-monsoon & post-monsoon the annual water level v/s years v/s annual rainfall graphhas been prepared.
- For testing a water level contour map of the mean annual water level is prepared using Surfer 3-D.

**IV. RESULT AND DISCUSSION**
3-D maps of water surface level and contour map of the average annual water level are prepared using surfer-8 software to study fluctuation in water level for machchu-1 reservoir catchment as shown in fig. 2, fig. 3, fig.4, fig.5.The solution obtained using surfer software shows an increment in ground water level, pre-monsoon and post-monsoon graphs show watertable (movement of Groundwater) Isincreased and decreases with reference of time varies in different area. The graph of Avg. Water level v/s years v/s Avg. Rainfall shows that the water level is increasing with rainfall in the year 1994 and 2003, after that it shows less amount of water available though there is enough (good) rainfall.

Average pre-monsoon and post-monsoon graph in excel sheet shows that 1) From year 2009 post-monsoon water level and pre-monsoon water level moves in parallel paths.2) There is more fluctuation in water level in the post - monsoon period than the pre - monsoon period.3) In year, 2000 there is very poor rain still ground water has some storage and it will increase in year 2003.

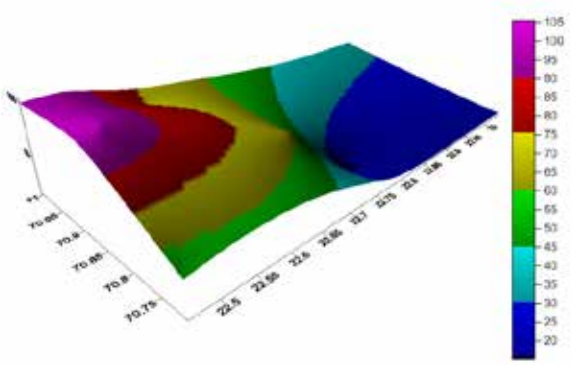

**Fig.2- Avg. Pre-monsoon 3D map (period of 1991 to 2012)**

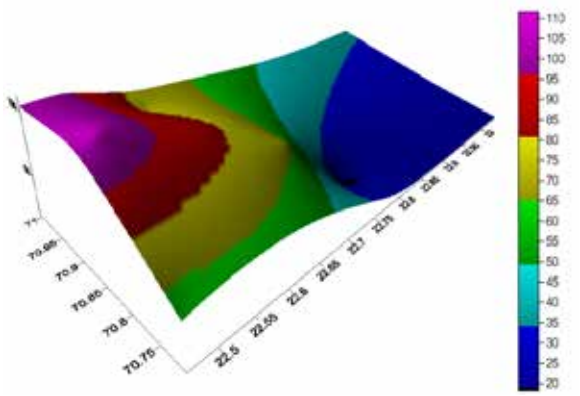

**Fig.3- Avg. Post-monsoon 3D map (period of 1991 to 2012)**

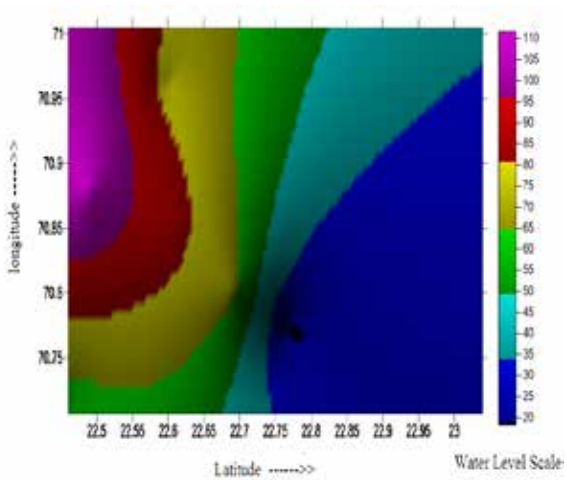


**Fig.4 -Avg. post-monsoon 2D-map (contour)**

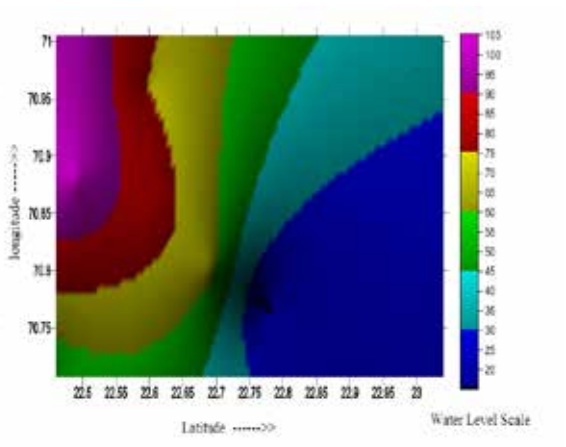


**Fig.5- Average pre-monsoon 2D-map (contour) (period of 1991 to 2012)**

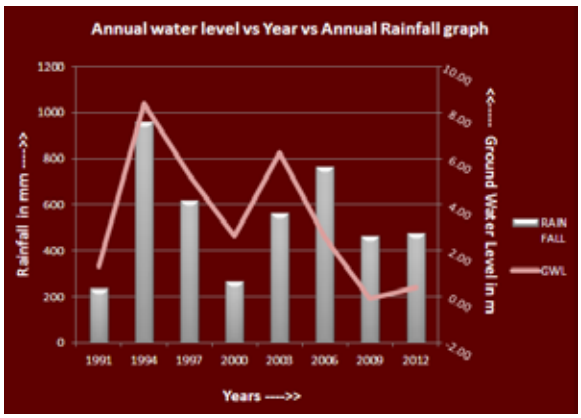


**Fig.6 - Annual Water Level vs Yearsv's Annual Rainfall Graph.**

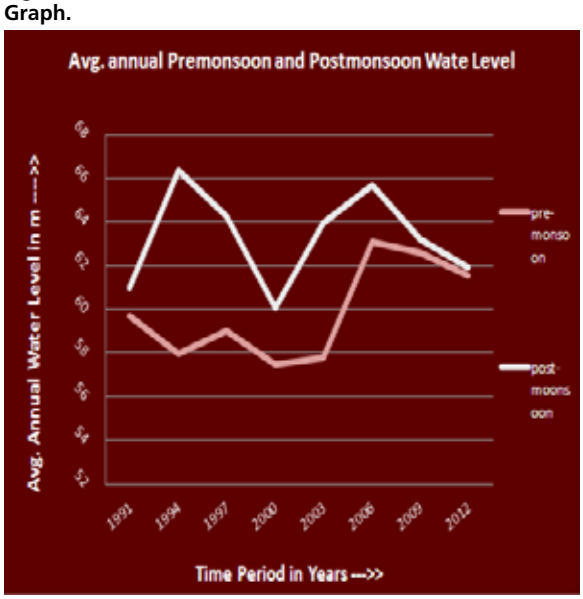


**Fig.7- Yearly Average pre-monsoon & post-monsoon graph**

## V. CONCLUSION

Groundwater table in the study area during post-monsoon follows reverse trend compared to pre-monsoon water level up to 1997, which then after drama seems to follow a similar class.Pre monsoon and Post monsoon groundwater level contours show a standardized dispersion of various contours of average ground water levels with some variance in coverage area.

The groundwater level shows a seasonal pattern of mutation. The variation of decadal average annual water level trend is increasing in year of 1994 and median water level with the reference of time lead to falling in a year of 2000 and again it increased in the year of 2003.When marking up a relationship of average yearly water level with average annual rainfall the water layer is increasing with rainfall, associate it with good rainfall years, the water level is low after year 2003 compared to previous rainfall years[i].

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## REFERENCES

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