Analysis Of Water Level In Multi Aquifers , In Dharoi Command Area, Gujarat, India.

Hema R. Parmar, . Dr. N. D. Shah,.Dr. Pradeep Majumdar

Abstract: Our earlier study carried out in Dharoi command area in Sabarmati River Basin, in India, defined the sensitive parameters to address the problem of water logging and salinity in the shallow aquifer, contribution of multi-aquifer system in making the scenario complex, was thus evident. Therefore, extension of the study by analyzing the piezometric data of complex lithological setup is attempted in this paper. The present paper establishes and discusses the relationships of various depth wise aquifer zones with the help of the seasonal piezometric heads and TDS values, analyzed as tracers.

Index Terms: Aquifer, Aquitard, depth zones , Ground water ,piezometric head, Total dissolved solids,

I. INTRODUCTION

An accurate assessment of water and nutrient balances in large scale wetland systems requires conjunctive modeling of surface water flow in wetlands and groundwater flow in underlying aquifers. Ground water-surface water interface represents the interconnection of ground water and surface water in the hydrologic continuum. . Interactions between these two water masses result in unique gradients and/or transitions of contaminant profiles, biological chemistry, populations, flow, mixing characteristics, redox potential, dissolved oxygen, organic content, and thermal properties. Confronted with the prospect of heightened competition for available water and thepopulations, flow, mixing characteristics, redox potential, dissolved oxygen, organic content, and thermal properties. Confronted with the prospect of heightened competition for available water and the increased difficulty in constructing large-scale water projects, water users must depend on better management of existing projects through integrated, basin wide strategies that include conjunctive use of surface water and ground water resources.Unconfined and perched aquifers in irrigation commands are more prone to water logging and salinity problems. More often mathematical solutions to these complexities involved merely the source/sink terms, because the phenomena was interpreted as caused by excessive irrigation water application .In the present paper, using multiple software GIS to examine these issues.. A simple distributed water balance is presented which simulates the hydrological processes in monthly time step using a geographical information system .Model inputs (precipitation, temperature) and outputs (evapotranspiration, water storage in different conceptual reservoirs, runoff) are given in distributed format in grids with a cell size of 4 square kilometers.

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Generally, extension of distributaries from canals to areas rich in groundwater discourages tube wells and results in water logging. Groundwater recharge refers to the entry of water from the unsaturated zone into the saturated zone below the water table surface, together with the associated flow away from the water table within the saturated zone . Many factors, including topography, lithology, geological structures, porosity, slope, drainage patterns, landform, land use/ land cover, and climate, affect the occurrence and movement of groundwater in a region. Hydro-geological experiments and geophysical surveys help to explain the process of groundwater recharge in the study region. Advective transport of pollutants in a groundwater domain is governed by the flow velocity vectors. The diffusion of pollutants in groundwater is fastest in the most efficient recharge zones.Groundwater is an important source of water for industrial, agricultural, and domestic uses in command area.. Mahesana district occupies 4371 sq. km. area between 23°00' and 24°09' north latitudes and 71°26' and 72°51' east longitudes in the northern part of Gujarat state. It is bounded by Banaskantha and Patan in north, Patan and Surendranagar in west, Ahmedabad and Gandhinagar in south and by Sabarkantha in east. It has nine talukas, having 593 villages. total population of the district as per 2011 census is 20,27,727. Water resources and water demand are unevenly distributed spatially and important issue due to climate change. The government needs to regulate the usage of water resources in order to solve the problem of water shortages and water logging. The continuous development of the economy has led to an increase in water consumption, and has consequently resulted in shortages of surface water Overreliance on groundwater resources lead to the over-drafting of groundwater, and causing ecological problems such as decreased groundwater levels, water exhaustion and deterioration of water quality. Therefore, the reliance on groundwater resources has increased, leading to the over-consumption of groundwater, and causing ecological problems such as decreased groundwater levels, water exhaustion, water pollution, deterioration of water quality. Now groundwater monitoring stations have been established.. The assessment and planning of ground water study uses as the study domain . The groundwater recharge potential zones are assessed for the Sabarmati River basin. The groundwater condition depended on the total recharge, pollution loading, groundwater flow and solute transport within the aquifer. Most severe limitation on the practical application of groundwater contamination problem is the lack of adequate field data. These are project objectives may be seen as technology developed at the end of the research. My basic objective is to define the multi-aquifer system in Dharoi canal command area for setting up correlation-ships between wet lands and depleting water bearing strata to formulate strategies for artificial recharge and conjunctive use of groundwater , and To solve the problem of water logging.

II.METHODOLOGY

For setting out the contour: Surfer and Grapher software will use.

2.1.1 Surfer

Surfer is a full-featured 3D visualization, contour and surface modelling package that runs on Microsoft Windows. Surfers, the volume measurement readings, terrain modeling, depth modeling, landscape visualization ,surface analysis, contour maps, and 3D surface watersheds are used extensively, contour and 3D surface plots that run on many more. Surfer 9 for Microsoft Windows The program window. Surfer 9 to quickly and easily transform data into outstanding contour maps and surface plots. And with all the options available in Surfer 9,you can do exactly what you customize the map in order to produce the desired presentation. To produce publication quality maps of surfers, quickly and easily, and never more dramatically satisfying

2.1.2 Arc Gis:

Easily construct your grid-independent hydro geologic conceptual model in minutes using your existing GIS data sets. Quick and easy data importing of all common file types and formats .Automatic coordinate system and units conversion on import .Automatic data validation and intelligent error checking on import .Define model boundaries, property zones ,boundary conditions and attributes from imported GIS data .Define complex geology and model layers using borehole log data and cross-sections .Interpret GIS data to define hydro geologic properties and boundaries independent of the grid behavior of multi aquifer system, useful for knowledge base.

III.STUDY AREA

3.1 Study Area

The irrigation command area of the right bank canal of Dharoi reservoir on Sabarmati river in Mehsana district in north Gujarat, India is located in Figure 1. Temperature in the region varies between four degree Celsius in winter to 44 degree Celsius in summer. The humidity during monsoon reaches 95% or even more. The geographical area of around 9,027 km2 is rich in agricultural production but is largely dependent on groundwater, both for irrigation and drinking water requirements. Although annual rainfall varies between500 to 1,500 mm, more than 85% of it occurs during the months of July and August. Major rivers flowing through the region are Banas, Saraswati, Rupen and Sabarmati. Many of them remain dry in most parts of a year. Sandy to sandy loam type of soil is deposited in the study area. Some areas also indicate clay loam type of soil due to admixture of argillaceous matrix adequately. Thick pile of recent alluvial formation has deposited in the study area. Alternate layers of sand and clay are laid down to a considerable depth of about 180 to 330 m. Blue clay, boulder formation and basement rock is also met with at certain places in the study area. The thickness of alluvial formation increases from north-east to south-west. The physical observations indicate coarse sandy material laid down in the Eastern areas where as it becomes finer towards west and south-west areas. Ground water occurs under water tables well as in confined condition in the discontinuous beds of varying thickness of sand, kankar and gravel that constitutes the alluvial aquifers in hard rock terrain. Consolidated formations are mainly dominated by basaltic lava flows associated with intertrappean, Infratrappean and archean rock formation represented by phyllites, gneisses, quartzite and granites. Minerals such as Keoline and crude oil are available in the nearby areas. In the adjoining areas of Mehsana and Sabarkantha district the aquifers are highly jointed and fractured or extensively weathered. Wells tapping some thick rock-formations of this type yield as much as 1, 00,000 litres per hour and 40,000 litres per hour are more common. Such aquifer of moderate potential is available within 100–150 m below GL and even as closed as at 30–40 m depth in some of the locations. The phreatic aquifers in the alluvial strata are only suited for shallow wells and low yields tube wells. Bradley and Phadtare(1989) highlighted two distinct aquifer systems, viz. a phreatic aquifer varying in thickness from 9 to 35 m overlying a series of aquifers and aquitards (Figure 1) and isolated perched aquifers within the phreatic aquifer. They found that the total thickness of the aquifer system is around 250 m Both ground water and surface water are being supplied

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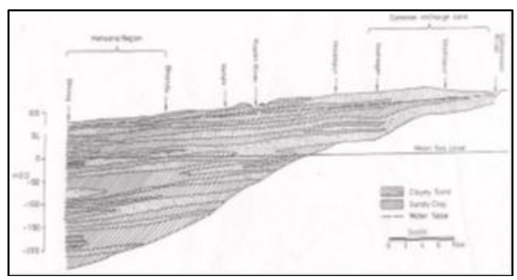

Fig.1 *Multi-aquifer setups in the region*

Both ground water and surface water are being supplied for irrigation in the study area. The deterioration in groundwater quality almost parallels the post 1955 phase, when with the advent of tube wells and electric motors the groundwater extraction went up many folds. Groundwater depletion does not show any specific relation with fluoride concentrations in the unconfined aquifer. whereas on the same locations water levels in various piezo meters are shown in Table 2 for selected years.

Fig. 2 *Piezometer locations in the study area*

Majumdar (2016) used MODFLOW-SWIFT combination for generating improved parameterization to address water logging and salinity in command areas. From this study, carried out in shallow aquifer zone, we believed that the major course of action in spreading the pollution has been the lithological formations of the multi-aquifer system, encouraging water logging. In-situ pollutions such as fluoride in drafted water is due to the excessive pumping power being exerted.Unconfined and perched aquifers in irrigation commands are more prone to water logging and salinity problems. Straight forward adoption of numerical modeling technique was not found suitable for investigation and follow-up recommendations. Therefore, in the present paper, lithological analysis is carried out to understand it's relation with the groundwater hydraulics of the waterlogged region using ROCKWORKS not found suitable for investigation and follow-up recommendations. Therefore, in the present paper, litho logical analysis is carried out to understand it's relation with the groundwater hydraulics of the waterlogged region using ROCKWORKS logical analysis is carried out to understand it's relation with the groundwater hydraulics of the waterlogged region using ROCKWORKS not found suitable for investigation and follow-up recommendations. Therefore, in the present paper, litho logical analysis is carried out to understand it's relation with the groundwater hydraulics of the waterlogged region using ROCKWORKS multi-aquifer system, encouraging water logging. In-situ pollutions such as fluoride in drafted water is due to the excessive pumping power being exerted.Unconfined and perched aquifers in irrigation commands are more prone to water logging and salinity problems. Straight forward adoption of numerical modelling technique was not found suitable for investigation and follow-up recommendations. Therefore, in the present paper, litho logical analysis is carried out to understand it's relation with the groundwater hydraulics of the waterlogged region using ROCKWORKS .

IV. SEASONAL GROUNDWATER LEVEL SCENARIOS:

Generally, extension of distributaries from canals to areas rich in groundwater discourages tube wells and results in water logging The figures,(5a and 5b) difference between 5 years difference (2000-2005), 100metre square area increase , in that area water level was increased. The area nearby Kheralu ,water level is approximately reached 9mt

Table 1 *Water Levels in Different Years*

Well no	T.depth	May 2000	Oct 2000	May 2005	Oct 2005	May 2010	Oct10	May 2013	Oct 2013
MEW-[illegible]	[illegible]							[illegible]	[illegible]
MEW-[illegible]	[illegible]	44.73	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
MEW-[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	27.70	[illegible]	[illegible]	[illegible]	[illegible]
MEW-[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
MEW-[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
MEW-[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
MEW-[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
MEW-[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
MEW-[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
MEW-[illegible]	[illegible]	37.17	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
MEW-[illegible]	[illegible]		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
MEW-[illegible]	[illegible]		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
MEW-[illegible]	[illegible]		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
MEW-[illegible]	[illegible]								
MEW-[illegible]	[illegible]			[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
MEW-[illegible]	[illegible]			[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
MEW-[illegible]	[illegible]			[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
MEW-[illegible]	[illegible]			[illegible]	27.70	[illegible]	[illegible]	[illegible]	[illegible]
MEW-[illegible]	[illegible]			[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
MEW-[illegible]	[illegible]			[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
MEW-[illegible]	[illegible]			[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
MEW-[illegible]	[illegible]								
MEW-[illegible]	[illegible]			[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
MEW-[illegible]	[illegible]			[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
MEW-[illegible]	[illegible]			[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
MEW-[illegible]	[illegible]					[illegible]	[illegible]	[illegible]	[illegible]
MEW-[illegible]	[illegible]			[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
MEW-[illegible]	[illegible]		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
MEW-[illegible]	[illegible]			[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
MEW-[illegible]	[illegible]		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	174.80

from 40 to 49m . The reason is good rain , recharge of wells. After next 5 years, figure (5b and 5c) (2005-2010) (5c and 5d) ,area between Kheralu and Vijapur and some region of Siddhpur, depth of water level goes down by 10 m and area surrounded by MSH 225 , depth of water came up and surrounded area is also larger by recharge. There is mostly same water level between years 2010 to 2013 figure (5d and 5e) , the area uper side of Mehsana district ,Visnagar, Vadnagar ,Kosamba and some region of kheralu ,can see that the water level is improving in these regions. But in Siddhpur area and some part of Vijapur region water level is depleting. And comparing water levels between 2013 to 2015 ,water level increased by approximately 10 m. for the year 2020 ,figure (6a) projected map is there. This projected is done by least square method in GIS Arc. It shows the area near by Ider ,water level will rise and also in Kheralu district, The main reason of rising of water level is canal recharge. and also irrigation by canals. The Narmada canal is passes near by the area. Also next 5 years also can see increasing in water level. If , compare 25 years water level, 72'29" 0 and 72'29"0 E, water level increased by 30 mt in Vadnagar region. But the area of Kheralu and Siddhpur region no change in this areas these will be the scenario till 2025 ,figure (6b) can manage the water for conjunctives use. The rate of recharge is also increase since last 10 years. So can simulate ground water use (to substitute for canal water) to improve soil drainage and Stalinization .Also careful monitoring needed to delete any rising water table when canal water avaibility improved. Largest WT stabilization by reducing irrigation area and growing higher value crops. This way salinity and water logging problem can solve and water management. Also design of ground water recharge method and can solve the water logging problem and salinity. For making these contours and profiles used data of rain fall, recharge, crop data, discharge data from Dharoi dam , Aquifer data etc.
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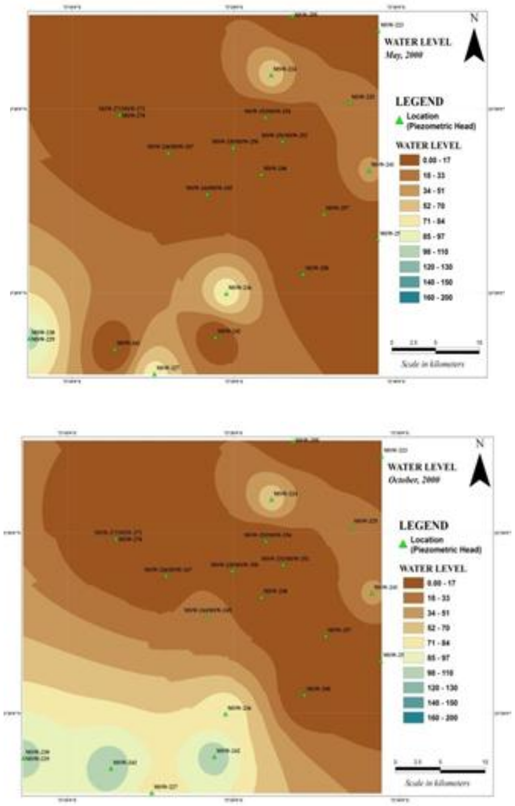


Figure 5a *Pre and Post Monsoon Water Level for 2000*

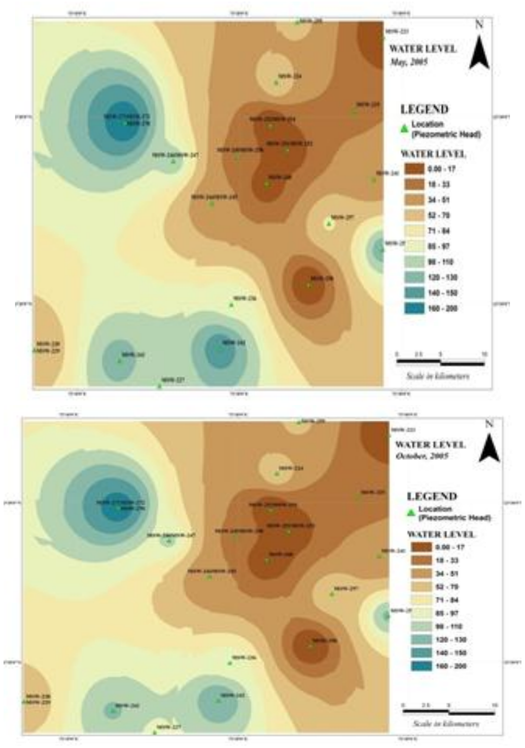


Figure 5b *Pre and Post Monsoon Water Level for 2005*

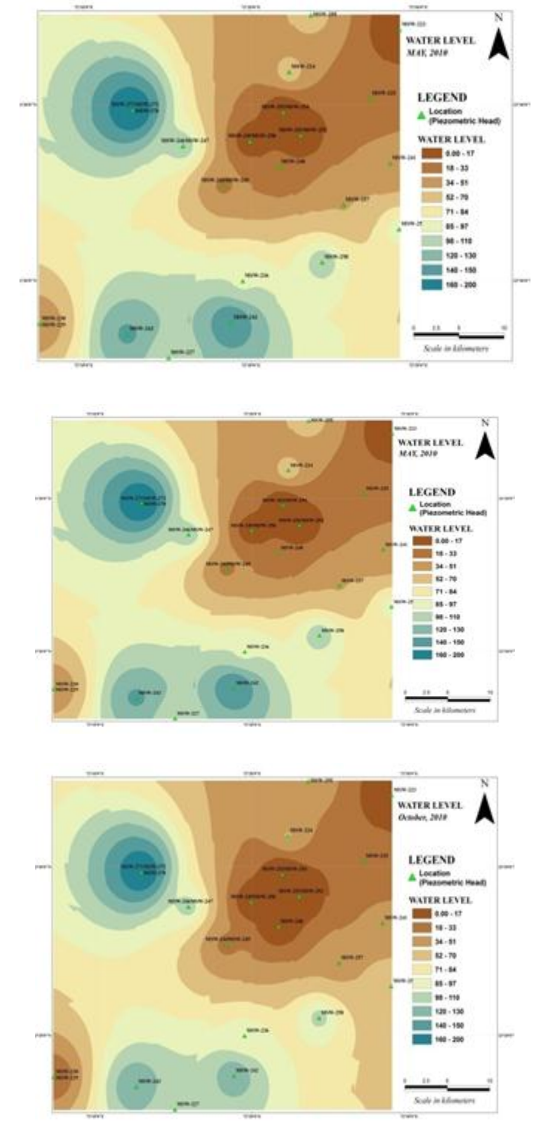
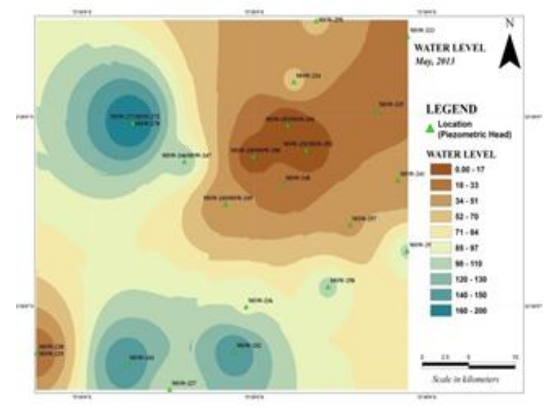


Figure 5c *Pre and Post Monsoon Water Level for 2010*



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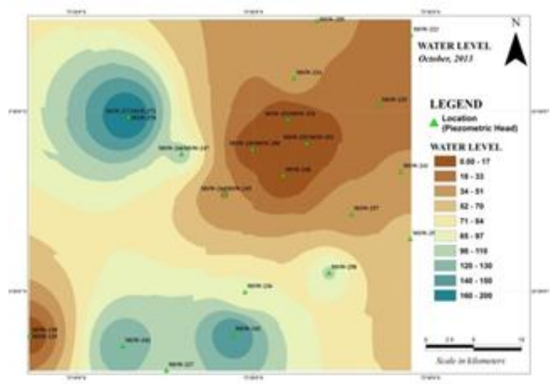


Figure 5d*Pre and Post Monsoon Water Level for 2013*

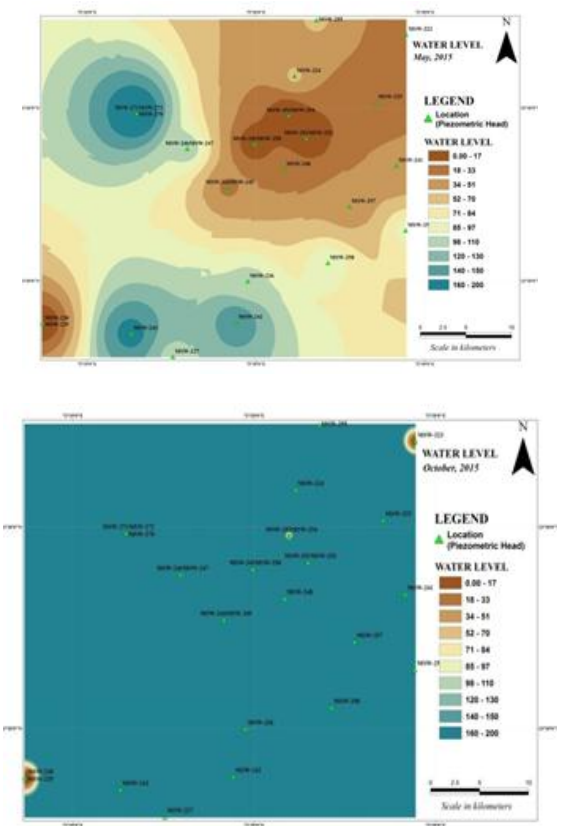
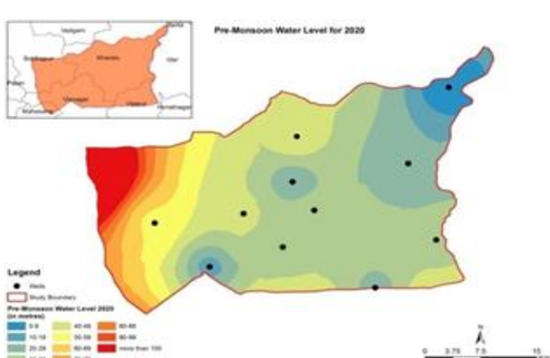


Figure 5e *Pre and Post Monsoon Water Level for 2015*



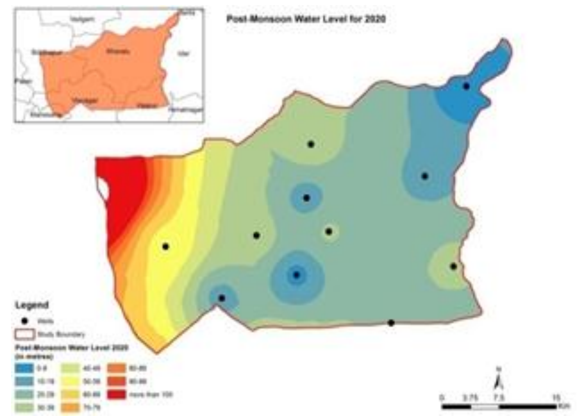


Fig 6a *Pre and Post Monsoon Water Level for 2020 (projected)*

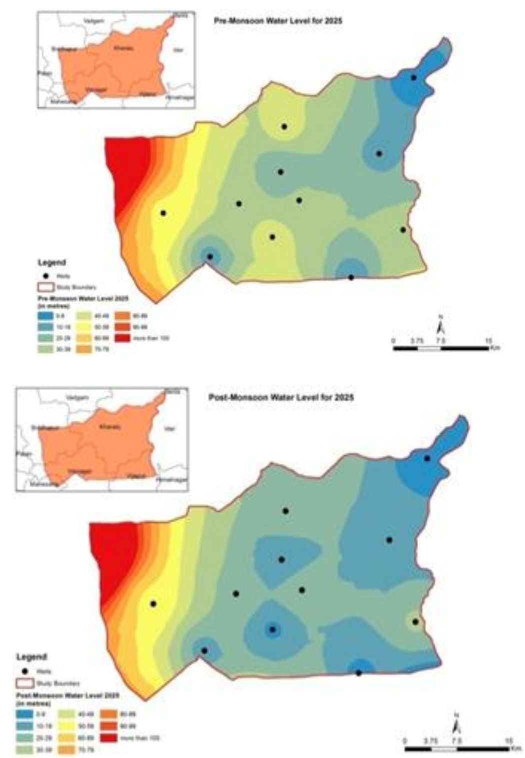


Fig 6b*Pre and Post Monsoon Water Level for 2025*

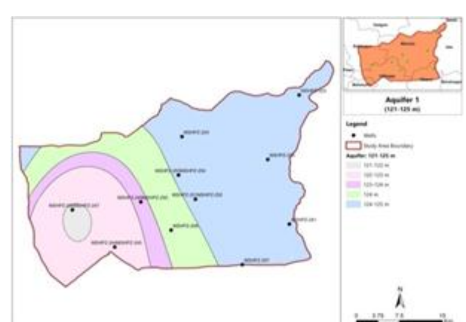


Fig. 7 *Difference in Water level*

Table 3*Emerged Layers of the aquifer-aquitard system from lithological study*

Name	Easting	Northing	Surface Soil	Aquifer-1	Aquitard-1	Aquifer-2	Aquitard-2	Aquifer-3	Aquitard-3	Aquifer-4	Aquitard-4	Aquifer-5
MSW-223	235,708.0	724,815.0	184.8	181.8	172.8	170.8						
MSW-224	235,308.0	723,714.0	165	162	152	152	140	133	121	118	104	99
MSW-225	235,056.0	724,518.0	159.4	156.4	147.4	145.4	132.4	131.4				
MSW-227	232,600.0	722,513.0	87.28	84.28	39.28	36.28	-1.72	-6.72	-27.72			
MSW-230	232,921.0	721,228.0	71.24	68.24	29.24	20.24	-10.76	-20.76	-53.76	-62.76	-82.76	-93.76
MSW-236	233,328.0	723,252.0	107.33	104.33	68.33	63.33	32.33	28.33	0.33	-4.67		
MSW-241	234,443.0	724,720.0	150.5	147.5	115.5	113.5	99.5	97.5				
MSW-242	232,933.0	723,140.0	105.73	102.73	55.73	49.73	13.73	3.73	-22.27	-27.27	-38.27	
MSW-243	232,825.0	722,104.0	83.13	80.13	14.13	11.13	-16.87	-20.87	-36.87	-41.87	-66.87	
MSW-247	234,605.0	722,656.0	128.81	125.81	100.81	92.81	81.81	76.81	38.81	35.81	16.81	
MSW-250	234,651.0	723,322.0	139.18	136.18	118.18	114.18	101.18	94.18	88.18	80.18	60.18	56.18
MSW-252	234,707.0	723,830.0	155.61	152.61	140.61	140.61	121.61	115.61	87.61	85.61	60.61	55.61
MSW-254	234,926.0	723,655.0	149.17	146.17	124.17	120.17	109.17	107.17	95.17	92.17	68.17	52.17
MSW-257	234,049.0	724,255.0	137.64	134.64	88.64	82.64	69.64	60.64	56.64	45.64	16.64	13.64
MSW-258	233,505.0	724,044.0	124.85	121.85	73.85	69.85	46.85	42.85	25.85	19.85	-12.15	-20.15
MSW-272	234,948.0	722,157.0	115.56	112.56	59.56	55.56	30.56	27.56	-2.44	-9.44	-29.44	

4.1 Different Aquifer Sections:

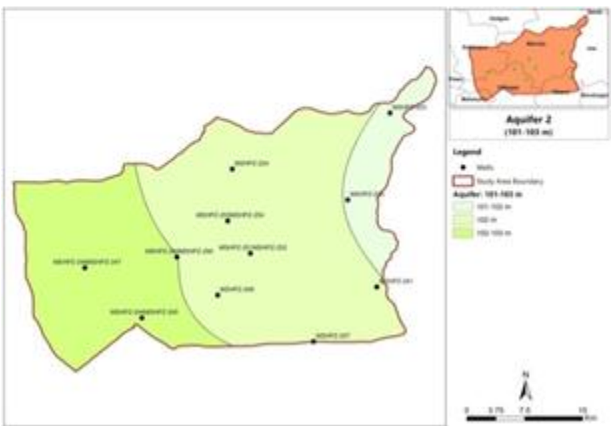


Figure 8a *Aquifer Map 1 (Only Piezometers Drawing Water From This Aquifer To Be Located)*

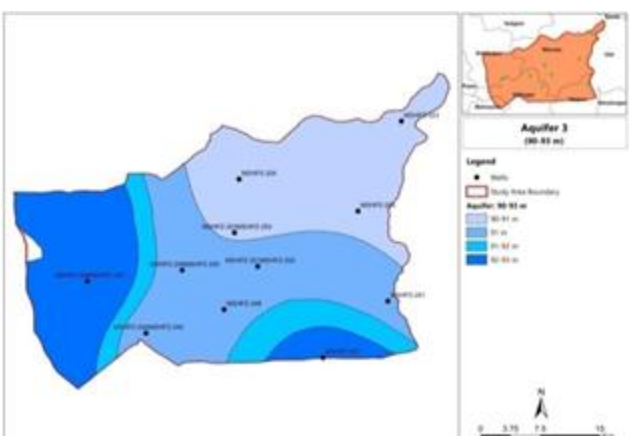


Figure 8b *Aquifer Map 2 (Only Piezometers Drawing Water From This Aquifer To Be Located)*

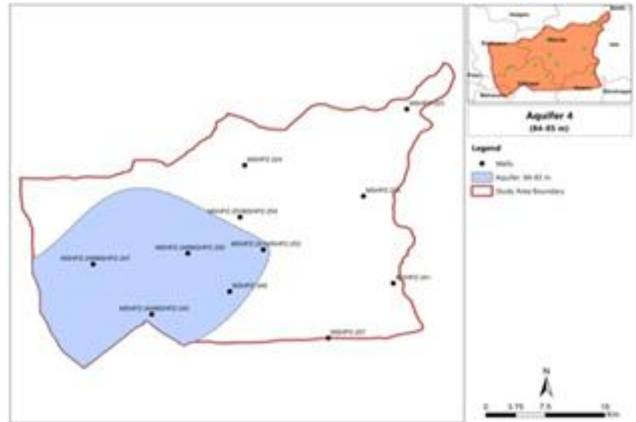


Figure 8c *Aquifer Map 3 (Only Piezometers Drawing Water From This Aquifer To Be Located)*

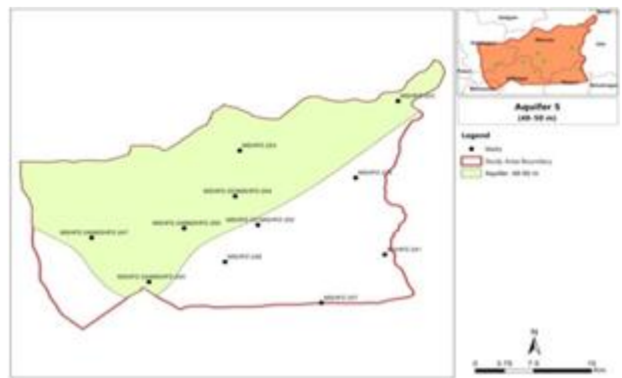


Figure 8d *Aquifer map 4 (Only Piezometers Drawing Water From This Aquifer To Be Located*

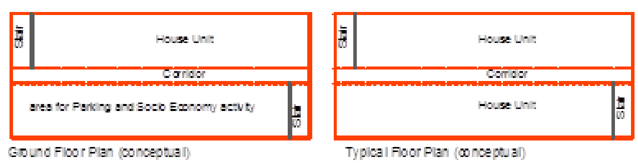


Figure 8e *Aquifer map 5 (Only Piezometers Drawing Water From This Aquifer To Be Located)*

4. 2 Multi-aquifer water Conditions:

With surface level gridding generated as in Figure 7, and five aquifer bottom layer grids available as in Figure 8a to 8b, five layered three-dimensional groundwater flow model can be further developed to examine the areas of water logging and salinity. However, we kept it out of the scope of this paper, and would be carried out to draw management strategies in future as and when required. To deal with the use of lithological study in searching for reasons behind water logging and salinity, the holistic sense of the layering pattern that could be visible in Figure 8a to 8e is sufficient to draw the conclusions. Topography visible in Figure 7, 8a and 8c are prone to create obstruction in regional water flow on the surface and subsurface respectively. In Figure 8d and 8e perched aquifer formations are evident. These undulations could uphold the water locally for longer durations. Because of high vertical flows in the aquifers, more irrigation water application may be a necessity in the region and being followed, causing deep percolation with nutrients.

V.RESULT AND DISCUSSION:

This study shows that the lower part of Siddhpur to whole Dharoi command area that includes Kheralu , Visnagar ,Vadnagar and Vijapur have aquitard by lithological study. This study prove that most of the part of this region have perched aquifer ,but some part of siddhpur region found an aquifer . In this region ,approximately 25km^2 area of study region West side, have very deep water level .I have also include the study of water levels in different years by GIS arc. By this I found that water level is increased in last 5 years (In figs 19 to 22) and Fig 23 and 24 with the projection map of quifers and water level maps of year 2020 and year 2025 , water level are increasing by at least 10 to 20m , because of irrigation of canals and by canal irrigation. Rate of recharge is also increased, seepage is also the reason for rising of water. Conjunctive use practices have been a regular remedy proposed for water logging problems. The operations executed on the model were first, injecting various proportions of surface water for irrigation. The Figs(20a to 20g) is showing the scenario of water condition in this area. So from these figures ,The rate of recharge is also increase since last 10 years. So can simulate ground water use (to substitute for canal water) to improve soil drainage and Stalinization .Also careful monitoring needed to delete any rising water table when canal water avaibility improved. Largest WT stabilization by reducing irrigation area and growing higher value crops. This way salinity and water logging problem can solve and water management. Also design of ground water recharge method and can solve the water logging problem and salinity. Conjunctive use can also include augmentation tube wells supplementing the low canal surface flow stable in this region In year 2000 to 2005, if we compare the post monsoon map (fig 20a and 20 b)there is not markable change in water levels in this region. But Between year 2005 to year 2010 (fig 20b,20c) water level come up in Kheralu and Visnagar region, and in Sidhdhpur area water level is depleting.Atleast 10m rise of water level in this region in last 5 years, Now next comparison for year 2013 to year 2015.(fig 20d ,20f) the area ,north side of Mehsana Visnagar, Kosamba, and centre part of Kheralu Talukas ,Water level is increasing by 10m. but the Siddhpur area and Vijapur region has the water level is deplecting .Actually this area is dry area with very low rainfall., Before canal irrigation and seepage of canals, ground water level is severely going down but how lithology is one of the important factors that affect the recharging of ground water aquifer of this area. Agriculture of study area is totally dependent on surface irrigation and ground water irrigation both. Because of perched aquifer or thicker layer of clay impede recharge of ground water table. Due to thick layer of clay land subsidence risk is law, but it acts as aquitard with impede ground water recharging. The increasing of groundwater table can reduce the concentration of dissolved salt and fluoride. I have checked these for small scale area (75×75)km^2 but big scale can be designed and constructed and large scale system where scale effects are usually very significant. By this work, I can realize that water level is uplifting in this area. The water bearing strata is depleting in whole region. This can be concluded from the work of rockworks. The perched aquifer is spreadeding whole area of Mahesana, Visnagar, Kheralu and Vijapur. But some region of Kheralu and Siddhpur have very deep water level. Conjunctive use practices have been a regular remedy proposed for water logging problems. The operations executed on the model were first, injecting various proportions of surface water for irrigation. The Figs(5a to 7) is showing the scenario of water condition in this area . So from these figures ,The rate of recharge is also increase since last 10 years. So can simulate ground water use (to substitute for canal water) to improve soil drainage and Stalinization .Also careful monitoring needed to delete any rising water table when canal water avaibility improved. Largest WT stabilization by reducing irrigation area and growing higher value crops. This way salinity and water logging problem can solve and water management. Also design of ground water recharge method and can solve the water logging problem and salinity. Conjunctive use can also include augmentation tube wells supplementing the low canal surface flows. The promotion of more planned and integrated conjunctive use has to overcome significant socioeconomic impediments through institutional reforms, public investments, and practical measures, including (a) the introduction of a new overarching state government apex agency for water resources, because existing agencies tended to rigidly follow historical sectoral boundaries and thus tend to perpetuate separation rather than the integration needed for conjunctive use; (b) gradual institutional reform learning from carefully monitored pilot projects; and (c) a long-term campaign to educate farmers through water user associations on the benefits of conjunctive use of both canal water and groundwater, crop diversification, and land micro-management according to prevailing hydro geologic condition.

VI.CONCLUSION AND FUTURE SCOPE:

Significant conceptual improvement is aimed in the research and could be more fruitful, if carried out at the planning stages of the command area development. Such studies could ensure better preservation of irrigation command areas in future. This research has examined and developed an altered realization that, water-logging could be defined as regional groundwater flow approaching a well storage condition locally with clogging of pores due to abrupt velocity reductions governed by a topography, exhibiting a steeper slope followed by a flatter one, all of a sudden .Hence present study was carried out, using multiple software application for groundwater study. Parameters such as; aquifer and well skin hydraulic conductivities, topography, lithologs and solubility have been introduced for the first time in a groundwater study of a waterlogged region Analysis of piezometric data, is carried out to understand the pressure and concentration behaviour in the parts of multi-aquifer of Sabarmati river basin in North Gujarat in India. Existence of semi-confined aquifers are concluded based upon the head fluctuations and concentration variations. In respect of the head fluctuation two sensitive zones are found, although relation with TDS variation is evaluated as identical in both the zones. Such information is useful while setting up the lithology correlations and carrying out groundwater modelling exercises.

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