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Resolving Seepage Problem and Ground Water Management at Kanshiram Multispeciality Hospital

Mirat Ahmad[1], Dr. Gauhar Mehmood[2]

[1]Masters in Environmental Sci. & Engg. , Jamia Millia Islamia New Delhi 110025 India

[2]Professor, JamiaMillia Islamia New Delhi 110025 India

Abstract: ***The availability of groundwater is neither unlimited nor protected from deterioration, in most of the instances the extraction of excessive quantities of ground water has resulted in drying up of wells, damaged ecosystem, land subsidence, saltwater intrusion and depletion of resources. This paper deals with the problem that was prevailing in Kanshiram hospital due to shallow ground water level. Depth of the water table in the area is about 3.1m pre-monsoon and it is papered at a depth 2.8m post monsoon. The Basement of hospital which was at a depth of 9880mm was submerged in water. There was a seepage problem from walls also which could not be rectified even after injection grouting. Water proofing which was done at site also got failed. Therefore, this paper highlights the rectification of the seepage problem and proper groundwater management in terms of qualitative and quantitative potential of Kanshiram Multispecialty hospital and nearby area by using Hydro Abstraction wells.***

Keywords: Seepage Problem**,** Groundwater, Gr. Noida, Quantity, Quantity, Management

1. Introduction

Groundwater is the water located beneath the earth's surface in soil pore spaces and in the fractures of rock formations. A unit of rock or an unconsolidated deposit is called an aquifer when it can yield a usable quantity of water. Ground water abstraction is the process of taking water from any source, either temporarily or permanently. This water can be used for irrigation, recreation, flood control or treatment to produce drinking water.

Depending on the environmental legislation in the relevant country, controls may be placed on abstraction to limit the amount of water that can be removed. Over abstraction can have many dire consequences such as drying up rivers or the level of groundwater aquifer reducing unacceptably.

The science of hydrology is used to assess safe abstraction levels. Hydro Abstraction well is different from tube well because it does not create the cavities in the Sub-Surface strata and so the settlement of the building is avoidable unlike tube wells.

1.1 Study Area

The government hospital, titled, 'Kanshi Ram Multispecialty Hospital,' which is being considered a world class hospital, designed to deliver the facilities of all sorts to its patient. The hospital is also claimed to be the 'best government hospital' of its own kind which will give the facilities better than that of the private hospitals. The colossal set up is established over the area of around 48850 square metres.

Kanshi Ram Multispecialty Hospital is located in Greater Noida with its Co-ordinate **28°26'0"N 77°31'58"E**.It is built by Greater Noida Industrial Development Authority (GNIDA) with double basement up to a depth of 10m to provide the parking facility.

Depth of the water table in the area is about 3.1m pre-monsoon and it is reported at a depth 2.8m post monsoon. Dewatering of groundwater is done excessively at site which has reduced the level of groundwater to a great extent. Therefore, it is required to maintain the water table at a suggestible depth of 9.9m. Otherwise it would be a major disaster for the building. This building has been suggested with raft foundation.

The major problem of this area is that dewatering is completely ban for throwing of water in drain. Nearby area comes under water lodged condition. However, surrounding area like Gautam Budh University and green spaces needs a lot of water for which water supply is a major problem for Greater Noida Jal Authority. Interestingly on one hand the surrounding area needs a lot of water for maintenance for Landscape, Horticulture, Artificial Lake, and fountains on the other hand the Kanshi Ram Multispecialty Hospital has got a major threat due to shallow water level condition.

2. Aims and Objectives

1) To resolve the problem of seepage in and around the KanshiramMultispecialty hospital.
2) Assessment of Groundwater qualitative potential.
3) Assessment of Groundwater quantitative potential.
4) Feasibility of Hydro Abstraction well for water management of the area.

3. Methodology

1) Assessment of water quality based on IS 10500 with analysis of Physical, Chemical and Biological properties of groundwater sample collected from Kanshi Ram Multispecialty Hospital and surrounding areas.
2) Assessment of water requirement based on IS 1172 and Local norms of Horticulture.
3) Presentation of Test result and interpretation of the test result.

4) Solution for seepage problem and water management plan.

4. Ground Water Quality

S. No.	*Parameters*	*Unit*	*Result*	*Protocol Followed IS:10500*
PHYSICAL PARAMETERS				
1	Colour	Hazen Unit	<5.0	5
2	Odour	Un-objectionable	Un objectionable	Unobjectionable
3	pH	Mg/l	7.18	6.5-8.5
4	Turbidity	N.T.U.	<1.0	5.0 max
5	Taste	--		Unobjectionable
CHEMICAL PARAMETERS				
1	Total Hardness	Mg/l	232	300-600
2	Ca-Hardness	Mg/l	190	
3	Mg-Hardness	Mg/l	42	
4	Alkalinity	Mg/l	65	600
5	Chloride	Mg/l	278	250-1000
6	T.D.S.	Mg/l	350	500-2000
7	TSS	Mg/l	NIL	
8	BOD	Mg/l	5	30
9	DO	Mg/l	8	
BIOLOGICAL PARAMETERS				
1	Coli form	MPN/100 ml	<1.1	<2.0

5. Ground Water Quantity

As per Groundwater Estimation Committee – 2003
When Draw Down is 5.05 m. for -1 below ground level by Abstraction by a well.

Natural Availability = A * WLF * Sp. Yield
Q1 = 48850sq m x 1.95 m x 20 %
Yearly = 19051.5 m3/ yr.
Daily = 52.19 m3/d.

For 30 Wells 52.19 x 30 = 1565.7 m3/d
When Draw Down is 10 m. below ground level by Abstraction

Q2 = 48850 sq m. x 6.9 m x 20 %
Yearly = 67413 m3/yr.
Daily = 184.69 m3/d

6. Interpretation of Test Results

On the basis of sample collected from the site and test result the water that is being extracted, is fit for drinking. But the ground water estimation done is not accurate as it is theoretical calculation. The discharge from Hydro abstraction wells is not uniform therefore the exact amount of water and water level situation is measured at site and tabulated in table 2.

7. Seepage Control of Hospital

To control the seepage problem of hospital and nearby area, 30 Hydro abstraction wells are drilled and A comprehensive water management scheme is prepared to retain the water level at a depth of 9880mm at kanshi Ram Multispecialty hospital with compliance of water management for the surrounding area which includes GautamBudh University etc. 30 Hydro Abstraction wells are drilled along the periphery of the hospital at distance of 20m away from each other. It is designed in a way that it extracts water from the bottom as well as from sub-surface strata which helps in suction of water sideways. Slotted pipes are provided in the zones where sand is encountered and blank pipe is provided at the places where clayey zone is found. As the wells are switched on, the potentiometric level falls down and vice versa. A monitoring detail of wells is obtained and month wise working of pumps is plotted.

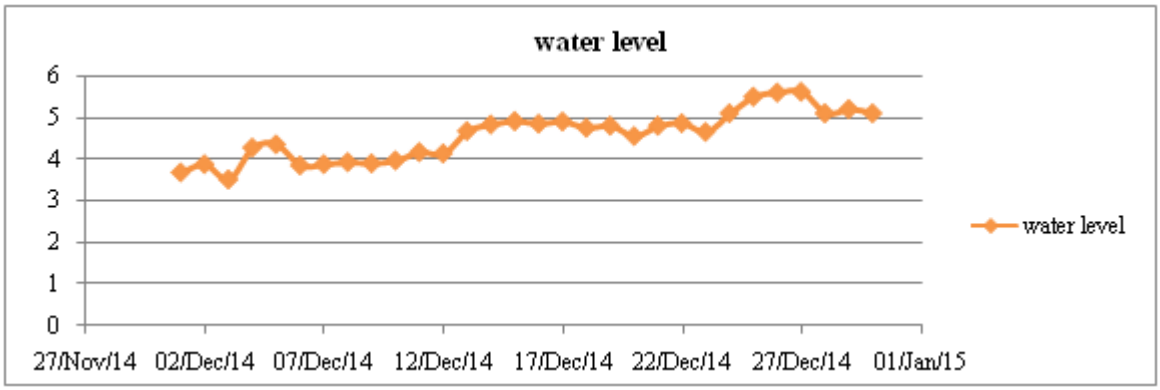

Figure 1: Water Level vs. Time graphs
Note: Number of pumps working 17-26

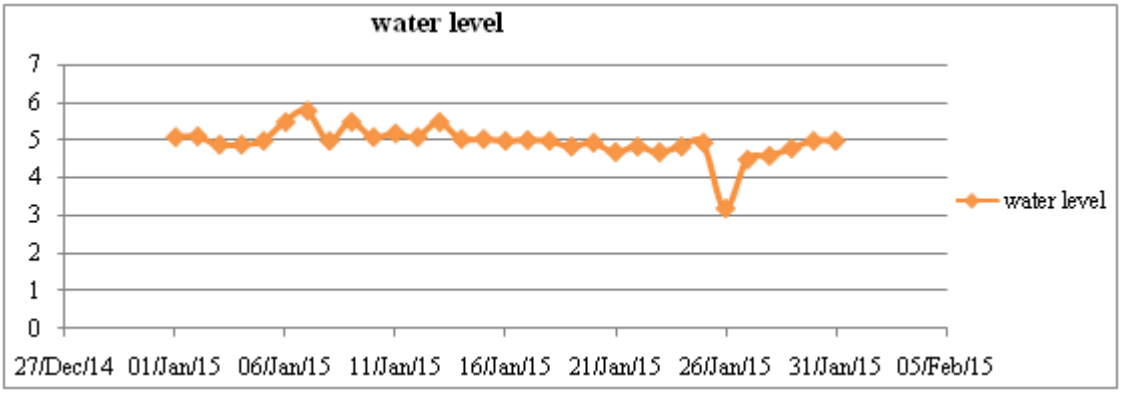

Figure 1: Water Level vs. Time graphs
Note: Number of pumps working 17-22

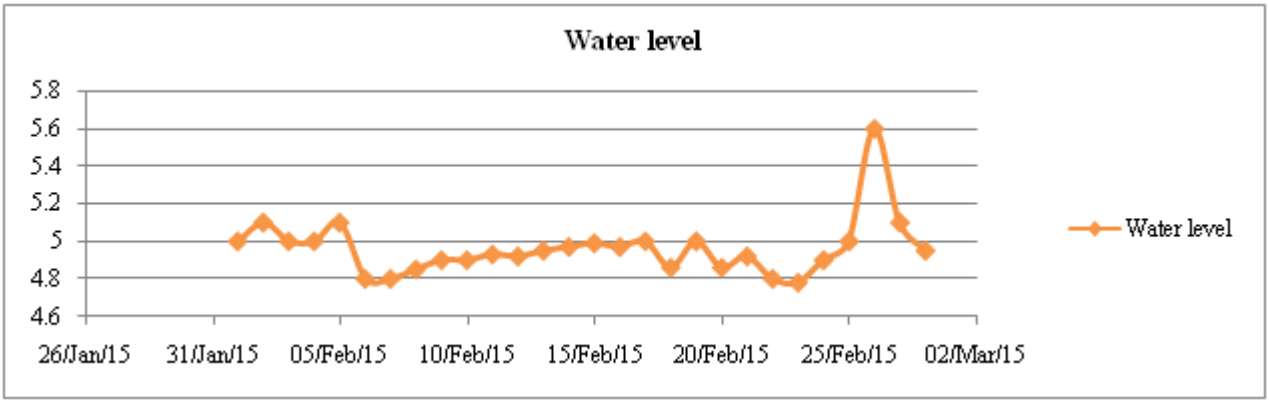

Figure 1: Water Level vs. Time graphs
Note: Number of pumps working 20-22

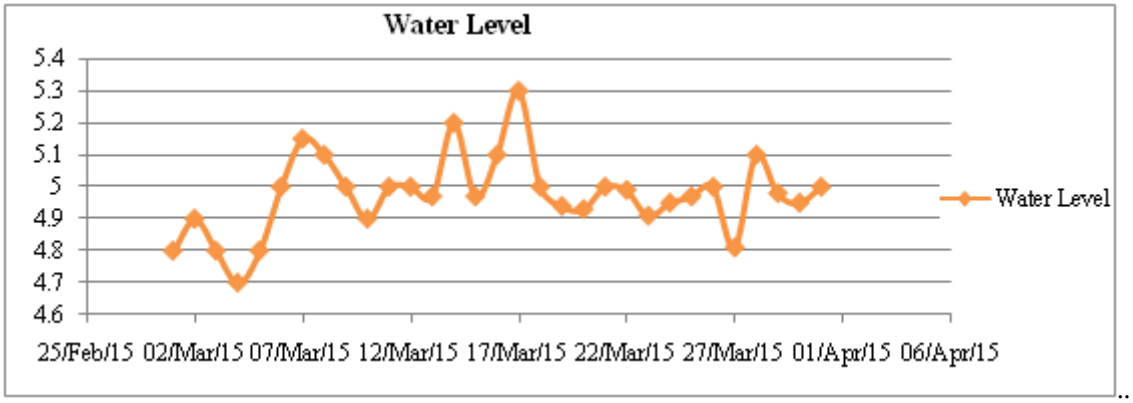

Figure 1: Water Level vs. Time graphs
Note: Number of pumps working 19-24

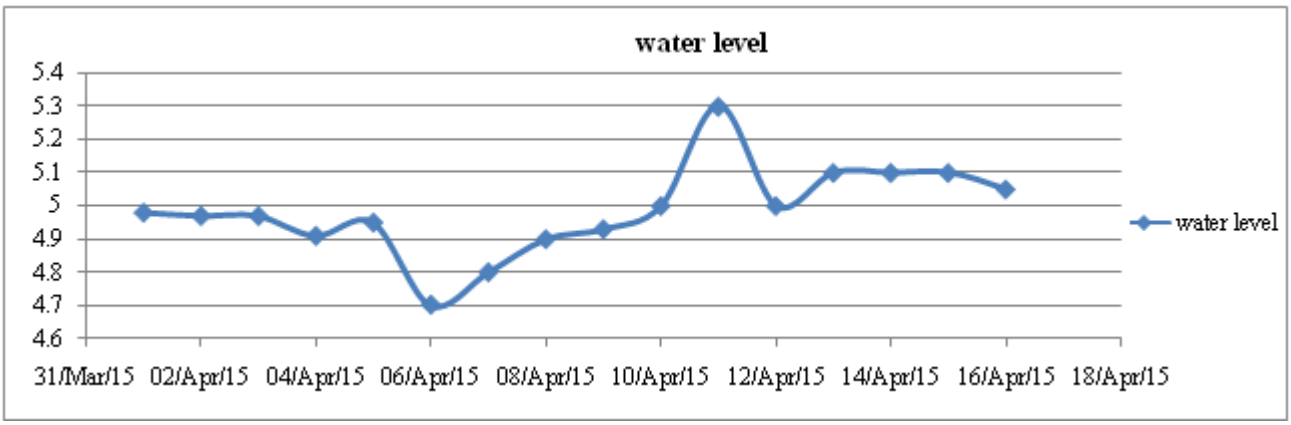

Figure 1: Water Level vs. Time graphs
Note: Number of pumps working 18-24

8. Water Management Plan

A water management plan is prepared for sustainable ground water management. The water from hydro abstraction well installed at Kanshi Ram Hospital is supplied to following locations.

Table 2: Ground Water Management at Kanshiram

Availability	Requirement
1.Ground water (1566m^3/d)	1.Hospital (225m^3 /d)
	2.Horticulture (74m^3/d)
	3.Reuse (180 m^3 /d)
	4.Recycle (90 m^3 /d)
	5.Supply to GBTU (200 m^3 /d)
	6.Supply to GNJB (797 m^3/d)

9. Conclusion and Recommendations

The following recommendations have been made for the control of water level in Manywar kashiram hospital greater Noida

(1) At present there are only three water level monitoring bore-hole have been installed without proper distance. Monitoring through these will not be appropriate because it is possible to make the ground basement are dry by abstraction activity. But what exactly the water level below the peripheral foundation is not clear through these monitoring system

(2) In order to achieve the result it is recommended that at least 15 monitoring wells @ at least one monitoring well in between 2 hydro-abstraction well may be install in order to monitor the water level throughout surrounding of the hospital in a proper manner.

(3) At present the manual monitoring is going on which is not a correct procedure and there are chances of over pumping, due to over pumping the chances may be formation of fissures, cavities and cracks by virtue of which the chance of settlement is possible. **Therefore it is strongly recommended that the monitoring should be done through SCADA action with proper online monitoring**

(4) During the rainy season and post monsoon season the number of abstraction well will be more and if the abstraction wells run more than required time than there may be settlement problem due to rapid hydro tangent activity. **Therefore SCADA monitoring system is strongly recommended**

(5) Periodic water quality monitoring through its physical, chemical and biological parameter is also recommended in order to analyse the hydro-abstraction well on the basis of geophysical and geochemical parameters to avoid regional cavity formation.

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Author Profile

Mirat Ahmad did his bachelor of engineering in Civil Engineering from Amity University, Noida and doing his Master of Engineering in Environmental Science and Engineering from Jamia Millai Islamia, New Delhi. The research interest includes the resolution of seepage problem.