CENTRAL GROUND WATER BOARD
MINISTRY OF WATER RESOURCES
GOVERNMENT OF INDIA

RISING WATER LEVEL PROBLEM IN JODHPUR CITY AREA RAJASTHAN

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Executive Summary

Jodhpur is the second largest city of Rajasthan founded by Rao Jodhaji in 1459 A.D. It has a standard urban area of 208.31 Km^2 and population of about 8,56,034 (Census 2001). Jodhpur town has peculiar geomorphologic setting. Old walled city part is located on hill slope area and in the base of the fort hill ridge. The sloping land gradually turns to plain alluvial terrain towards south, east and south west. Streams and drains originating from the city area join Jojari river which is ephemeral.

The area has arid type of climate characterized by low and erratic rainfall and extremes of temperatures. Mean annual rainfall in the area is 391.3 mm. Jodhpur city has limited ground water resources and it has depended mainly on surface water sources for domestic needs. With time, the population of the town increased and various water supply schemes were implemented to meet the increased demand of water supply. Apart from the local sources, during State times, supply to city was maintained from Jawai reservoir located in Pali district, through Jawai canal. Later potential ground water areas near Jodhpur were developed to augment the city water supply. The areas were Rampura-Mathania, Borunda-Ransigaon and Doli-Pal. But the supply was far less than the need. Presently water supply to the city is mainly met from IGNP lift canal and partly from ground water sources (Rampura-Balarwa-Manai & Doli-Pal area). It is expected that the city will receive entire water supply from IGNP canal after the year 2005.

The Jodhpur city area comprises sequences of sandstone and shales belonging to Jodhpur Group of Marwar Super Group resting unconformably

over a moderately rugged basement of proterozoic Malani volcanics and covered with thin blanket of alluvial or aeolian sediments.Hydrogeologically the area comprises Malani rhyolites, Jodhpur sandstone and alluvium. Except in thin upper weathered and fractured zone the rhyolites are impervious, poorly jointed, massive and form very poor aquifer zones. Sandstone also do not form potential aquifer zones and its yield varies widely depending upon texture, extent of weathering and fracturing. The yield of the wells in sandstone generally varies from 10 to 50 m^3/day whereas in alluvium it varies from 50 to 120 m^3/day.Depth to water level varies from 1 m. to 50m bgl. Shallow water levels (< 5m.) occur in the old walled city area. Deeper water levels occur in southwestern part of the area. Elevation of the water table ranges from about 283 m to less than 195 m above mean sea level. It is observed that the flow of the ground water from city area is towards southward direction. Chemical quality of ground water varies from fresh to saline and salinity is also associated with higher concentration of nitrates and hardness. In most parts of the city area the quality of ground water is brackish or saline.

Water levels in the city area have started rising since early eighties. However, these have significantly risen in most of the area after 1997. This has caused serious problem of appearance of water in the basements of buildings and dampening of walls in some parts of the city. Weakening of foundation of houses and decrease in life of buildings cannot be ruled out.

CAUSES OF WATER LEVEL RISE

Studies conducted during 1977-78 revealed that the draft from the area was less compared to the recharge as a result of which water table in and around the city area was seen rising gradually. During year 1990 the area received the highest rainfall of last three decades which caused flooding in the

area. This caused significant rise in water levels in the area. Thereafter since 1994,water levels are seen to rise.

Input of water to the area is from the following:

- Rainfall in the area and in upper catchment.
- Water brought from outside area for water supply to the city.
- Seepage from the water bodies located on upper levels.

Output from the area is in the form of following:

- Ground water draft
- Subsurface outflow
- Outflow through Sewerage and drains.
- Evaporation and human consumption.

Based on the studies carried out, the main causes of water level rise in the Jodhpur City area are as below.

- Drainage and Sewerage system in the walled city area is quite old. The seepage from these open drains and sewerage lines is a process, which continue throughout the year. The flow becomes sluggish due to frequent choking of drains due to polythene etc. Also there is frequent leakage of water from waste water pipes. The seepage directly joins the ground water in shallow water table area and causes rise.
- The water supply to the city was 183.46 lac gallons per day in 1994,which has been almost doubled to 377.54 lac gallons per day presently. This has resulted in increase seepage to ground water causing rise of water table.

- Many open water bodies located in and around the city remain unutilized. These were in use earlier for water supply. Presently these remain filled up with water throughout the year. The water bodies located on higher elevations cause continuous seepage.
- Due to plentiful availability of fresh surface water, utilization of existing ground water structures in the city area has been stopped by the Government and private users, which has caused rise in water levels.
- Rhyolite forms the basement rock, this formation is massive from shallow depth and is devoid of deep fractures. Thus the seepage water does not percolate to deep levels.
- Presence of intermittent shale layers in sandstone also hinders percolation of seepage water to deep levels.

Seepage to the city area directly from Kaylana Takhat Sagar reservoir through inferred lineaments is given as main reason for the observed water level rise in Jodhpur city area by some agencies which is unlikely. The water table contours indicate that the ground water movement is towards southward direction. Two massive water divides roughly trending north south comprising rhyolite hills occur between Kaylana Takhatsagar reservoir and the affected old city area, which lies to the east of the reservoir. Dau ki Dhani-Pratapnagar-Kamla Nehru Nagar area lies in the intervening valley area. The ground water flow in this valley area is southward. From both the slopes of the valley (eastern as well western) the flow of ground water is towards the center. Ground water flow pattern in this valley area, indicates that sub surface flow from Kaylana - Takhatsagar reservoir to the city area is unlikely. Thus, there appears no direct seepage from kaylana lake to the old city area through long conduit fractures. This is also supported by the study of chemical quality data, which indicates large difference in chemical quality regarding the chemical parameters between

the reservoir water and ground water/seepage water of the affected area. There is also large difference in chemical quality regarding the chemical parameters between the reservoir water and ground water of the intervening valley area.

From the above it is quite evident that the water balance of the city area is greatly disturbed due to heavy input of water from outside sources and low output of water from the area causing rise in water level resulting in increased seepage in basements of the buildings.

RECOMMENDED REMEDIAL MEASURES

The following remedial measures are recommended to counter the problem of water table rise in the problematic areas of the city.

- Drainage from the city area must be improved to minimize the seepage losses to ground water. For efficient water, management of any area there is prime requirement of efficient drainage system.
- Heavy pumpage must be done from the unutilized water bodies Fatehsagar,Gulabsagar,Gorinda Baori,Ranisar and Padamsar etc. This water together with ground water pumpage from shallow water potential areas of the city, may be taken away from the area to nearby rural areas along Jojari river for irrigation purpose. Sufficient gradient exists for supply through gravity. This will lead to increase in agriculture production and lowering of water table in the city area.
- Pumpage from the ground water structures must be restored on a large scale. Dual water supply system based on available ground water and surface water may be introduced in city area.

There is an urgent need to implement the suggested remedial measures to avoid damage to civil structures and environment.

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