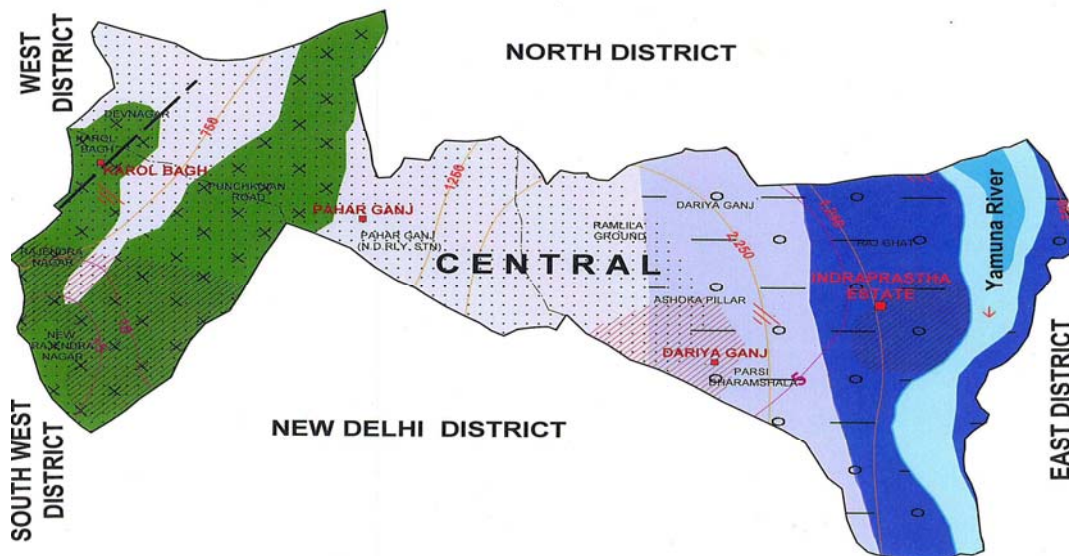




## GROUND WATER INFORMATION BOOKLET OF CENTRAL DISTRICT, NCT, DELHI



**CENTRAL GROUND WATER BOARD  
MINISTRY OF WATER RESOURCES  
STATE UNIT OFFICE  
NEW DELHI**

**DISTRICT BROCHURE OF  
CENTRAL DISTRICT, NCT DELHI**

**CONTENTS**

<b>Chapter</b>	<b>Title</b>	<b>Page No.</b>
	DISTRICT AT A GLANCE	.....i
1.0	INTRODUCTION	.....1
2.0	RAINFALL & CLIMATE	.....1
3.0	GEOMORPHOLOGY & SOIL TYPES	.....2
4.0	GROUND WATER SCENARIO	.....2
5.0	GROUND WATER MANAGEMENT STRATEGY	.....4
6.0	GROUND WATER RELATED ISSUES AND PROBLEMS	.....5
7.0	AREA NOTIFIED	.....5
8.0	RECOMMENDATIONS	.....5
<b>PLATES:</b>		
1	Hydrogeological Map	.....6
2	Subsurface disposition of aquifers in and around Central District	.....8

**DISTRICT AT A GLANCE**

<b>S.No.</b>	<b>ITEMS</b>	<b>STATISTICS</b>
<b>1.</b>	<b>GENERAL INFORMATION</b>	
	i. Geographical Area (Sq. Km.)	25
	ii. Administrative Divisions (as on 31.03.2011)	
	a) Number of Tehsils	3
	b) Number of Villages	0
	c) Number of Towns	4
	iii. Population (as on 2011 Census)	
	a) Total Population	5,78,671
	b) Population Density (persons/sq. km)	23,147
	iv. Average Annual Rainfall (mm)	647 (Delhi Sadar)
<b>2.</b>	<b>GEOMORPHOLOGY</b>	
	Major Physiographic Units	Yamuna Flood Plain Delhi Quartzite Alluvial Plain
	Major Drainage	Yamuna River
<b>3.</b>	<b>LAND USE (Sq. Km.)</b>	
	a) Forest area	5.05
	b) Water bodies	0.05
<b>4.</b>	<b>MAJOR SOIL TYPES</b>	Sand and clay
<b>5.</b>	<b>NUMBER OF GROUND WATER MONITORING WELLS OF CGWB (As on 31.3.2013)</b>	
	a) Number of Dugwells	0
	b) Number of Piezometers	1

6.	<b>NUMBER OF GROUND WATER EXTRACTION STRUCTURES</b>  a) Dugwells  b) Handpumps  c) Tubewells/borewells	96  1331  2837
7.	<b>PREDOMINANT GEOLOGICAL FORMATIONS</b>	Quaternary Alluvium consisting mainly fine sand, silt, clay with kankar
8.	<b>HYDROGEOLOGY &amp; AQUIFER GROUP</b>  Major water bearing formation  Pre-monsoon Depth to water level during May'2012  Post-monsoon Depth to water level during Nov'2012  Long term water level trend in 10 years (2003-2012) in m/yr	Alluvium and Quartzite  Sand and Kankar  2.08 mbgl  1.88 mbgl  Pre monsoon : Fall 0.83  Post monsoon : Fall 0.94
9.	<b>GROUND WATER QUALITY</b>  Presence of Chemical constituents more than permissible limit (e.g. EC, F, Fe)  Type of water  Fresh/Saline Interface	EC :3745 $\mu$ S/cm at 25°C  Iron :1.53 mg/l  Mixed Type  30 m
10.	<b>DYNAMIC GROUND WATER RESOURCES (2011)- in MCM</b>  Annual Replenishable Ground Water Resources  Gross Annual Ground Water Draft  Stage of Ground Water Development  No. of OE tehsils  No. of safe tehsils	3.84  2.92  84.45%  2  1
11.	<b>GROUND WATER CONTROL AND REGULATION</b>	The entire district has been notified by Delhi Government

12.	<b>GROUND WATER EXPLORATION BY CGWB (AS ON 31.3.2011)</b>  No. of wells drilled (EW, OW, PZ, SH, Total)	NIL
13.	<b>MAJOR GROUND WATER PROBLEMS AND ISSUES</b>	The ground water below 30 m is saline. Depletion of ground water levels is attributed to over exploitation of ground water

# **DISTRICT BROCHURE OF CENTRAL DISTRICT, NCT DELHI**

## **1.0 INTRODUCTION**

### **1.1 ADMINISTRATIVE DETAILS**

The Central district is bounded by Yamuna River and East district on the east, North district on the north, New Delhi district on the south and West district on the west. The Central district is the smallest district covering an area of 25 sq. km. with very high density of population and the entire district is urbanized. For administrative convenience, the district is divided into three tehsils namely Darya Ganj, Karol Bagh and Pahar Ganj. The district has 4 towns.

According to 2011 census, the total population of the district is 5,78,671 and average population density is 23,147 persons per sq km.

### **1.2 BASIN/SUB-BASIN:**

The district falls in Yamuna sub-basin and forms part of the Ganga basin. The entire district is covered by Yamuna River watershed.

### **1.3 DRAINAGE:**

The river Yamuna flowing in North-South direction and bordering eastern part of the district controls the entire drainage system. The river has meandering courses with abandoned channels in the form of stagnant water bodies along the course.

### **1.4 LAND USE:**

As the district falls in urban area, there is no agricultural land. Small forested area of 5.05 sq km occurs towards western and eastern sides of the Central district. The district has approximately 0.05 sq km of area under water bodies.

### **1.5 STUDIES/ACTIVITIES OF CGWB:**

Central Ground Water Board had covered the entire district under Systematic Hydrogeological Surveys. Based on the Re-appraisal Hydrogeological survey carried out in 1983-84, CGWB, NWR had brought out a consolidated report on Hydrogeological condition and Ground Water Development Potential of Union Territory of Delhi in 1989. In 1996 and 2009, reports highlighting development and augmentation of Ground Water Resources of the State were published by CGWB. The Dynamic Ground Resources of the district have been estimated in 2011 for understanding of ground water scenario. CGWB, SUO Delhi is also monitoring water level and quality regularly from the existing National Hydrograph Network Stations.

## **2.0 RAINFALL & CLIMATE**

### **2.1 RAINFALL:**

The average annual rainfall of the district is 647 mm. About 81% of the annual rainfall is received during the monsoon months July, August and September. The rest of the rainfall is received as winter rain and as thunderstorm rain in the pre and post monsoon months. The variation of rainfall from year to year is large.

On an average, rainfall of 2.5 mm or more falls on 27 days in a year, of which, 19 days are during the monsoon months. Two to three days in June are rainy. In other months, except in November and in first half of December when it is practically rainless, rain falls on a day or two only in each month.

## **2.2 CLIMATE:**

The climate of district is mainly influenced by its inland position and prevalence of air of the continental type during major part of the year. Extreme dryness with intensely hot summer and cold winter are characteristics of the climate. The cold season starts towards the latter half of November when both day and night temperatures drop rapidly with the advance of the season. January is the coldest month with the mean daily maximum temperature at 21.3°C and the mean daily minimum temperature at 7.3°C. May and June are the hottest months. In May and June, maximum temperature may sometimes reach 46 or 47°C.

## **3.0 GEOMORPHOLOGY & SOIL TYPES**

### **3.1 GEOMORPHOLOGY:**

Geomorphologically, Central district is located on the ridge formed by Delhi quartzites and towards the eastern part lies the flood plain of river Yamuna, which is sub divided into Active Flood Plain and Older Flood Plain.

### **3.2 SOIL TYPES:**

Soils in the district are sandy loam to clayey loam in area underlain by quartzites while alluvial area has silt to sandy loam soils. The soil is mostly calcareous in nature.

## **4.0 GROUND WATER SCENARIO**

### **4.1 GEOLOGY:**

Central district of NCT Delhi is located in hard rock terrain of quartzites at one end while alluvium underlain by Delhi quartzite at another end. The quartzites are of Proterozoic to Cenozoic Age. The other parts of the area are occupied by unconsolidated Quaternary alluvium underlain by Precambrian Meta sediments of Delhi system.

### **4.2 HYDROGEOLOGY:**

#### **Water Bearing Formation:**

Hydrogeological map of Central district is presented in Plate 1. The sub surface geology comprises of top soil which is silty clay with sand, sand which is medium grained, sub-angular to sub rounded, grey in colour, composed of quartz grains and mica flakes which occur as massive as well as fractured, admixed with calcareous matter and mica schist, alternate bands of light grayish to whitish in colour (Plate 2). The aquifer system consists of sand which is fine to medium grained, yellowish in colour with kankars medium to high grade.

**Depth to water level:**

To monitor the nature of water level and its behavior, ground water observation wells established in the district are being monitored four times in a year. Pre-monsoon and post-monsoon water level data are collected during May and November months respectively. Depth to water level varies from 1.88 to 2.08 m bgl.

**Seasonal Water level fluctuation:**

Seasonal water level fluctuation has been computed from the water level data obtained from the ground water observation wells monitored in the area during pre-monsoon and post-monsoon period. Fluctuation in water level is outcome of mainly the amount of rainfall received by the area and ground water withdrawal. Analysis of water level data of pre and post monsoon season has shown rise of 0.20 m.

**Long Term Water level trend:**

Long term water level trend of last ten years (2003-2012) shows a decline in water levels at the rate of 0.83 m/yr during pre monsoon period and 0.94 m/yr during post monsoon period.

**4.3 GROUND WATER RESOURCES:**

Tehsil wise ground water resources as estimated using GEC, 1997 methodology by CGWB as on 31.03.2011 are given in Table 1. Total annually replenishable ground water resources of the district have been assessed as 384.14 ham, out of which net annual ground water availability has been assessed as 345.726 ham. Total annual ground water draft for all uses has been estimated to be 291.97 ham with overall stage of ground water development at 84.45%. Out of 3 tehsils, 1 tehsil is falling under safe category whereas 2 fall under over exploited category.

Table 1: Tehsil wise ground water resources of Central District (As on 2011)

Sl. No.	Tehsil	Annual ground water recharge (ham)	Net annual ground water availability (ham)	Existing annual gross ground water draft for irrigation (ham)	Existing annual gross ground water draft for domestic and industrial uses (ham)	Existing annual gross ground water draft for all uses (ham)	Stage of ground water development (%)	Category
1.	Darya Ganj	259.77	233.793	40.70	98.13	138.83	59.38	Safe
2.	Karol Bagh	44.57	40.113	10.42	44.64	55.06	137.26	Over-exploited
3.	Pahar Ganj	79.8	71.82	0	98.08	98.08	136.56	Over-exploited
	Total	384.14	345.726	51.12	240.85	291.97	84.45	Semi Critical



#### 4.4 GROUND WATER QUALITY:

The ground water is fresh at all depths in the areas around the ridge falling in Central district. The chemical constituents more than permissible limit are EC upto 3745  $\mu\text{S}/\text{cm}$  at 25°C and Iron is reported to be 1.53 mg/l. Fluoride concentration is within the maximum permissible limit of 1.5 mg/l. The general values of various important chemical constituents in the ground water samples are given in Table 2.

Table 2: General values of various chemical constituents in ground water

Chemical Constituents	Values
pH	8.37
EC ( $\mu\text{S}/\text{cm}$ at 25°C)	3745
Bicarbonate (mg/l)	98.21
Chloride (mg/l)	629.49
Nitrate (mg/l)	394
Sulphate (mg/l)	545
Fluoride (mg/l)	0.54
Calcium (mg/l)	185.8
Magnesium (mg/l)	233.67
Total Hardness as $\text{CaCO}_3$ (mg/l)	1439
Sodium (mg/l)	486.4
Potassium (mg/l)	59
Iron (mg/l)	1.53

#### 4.5 STATUS OF GROUND WATER DEVELOPMENT

The present level of ground water development is maximum (137.26%) in Karol Bagh whereas minimum (59.38%) development has been recorded in Darya Ganj as indicated in Table 1 above. The district as a whole is categorized as semi critical with 84.45% stage of ground water development.

#### 5.0 GROUND WATER MANAGEMENT STRATEGY

##### 5.1 GROUND WATER DEVELOPMENT:

As stated above, the district as a whole is categorized as semi-critical with stage of ground water development at 84.45%. This indicates the reality that the ground water resources of the district are stressed. In view of increasing extraction of ground water and consequent adverse environmental impacts, sustainable management of this precious natural resource is extremely important.

##### 5.2 WATER CONSERVATION AND ARTIFICIAL RECHARGE:

As the district receives 647 mm of annual rainfall there is ample scope of rain water harvesting. As water level is shallow, rain water can be conserved through construction of storage tanks.

## **6.0 GROUND WATER RELATED ISSUES AND PROBLEMS**

### **6.1 WATER LOGGING:**

A considerable part of the district faces problem of water logging or is prone to water logging conditions as depth to water level rests within 3 m bgl during pre and post monsoon period. Such areas generally fall in the vicinity of river Yamuna, indicating excessive seepage from the river.

### **6.2 DEPLETING GROUND WATER LEVEL & QUALITY:**

The wells located in this district show declining trends during pre and post monsoon period. Analysis of seasonal and long term water level data indicates a very moderate and gradual declining of water levels.

The ground water is saline below 30 m depth.

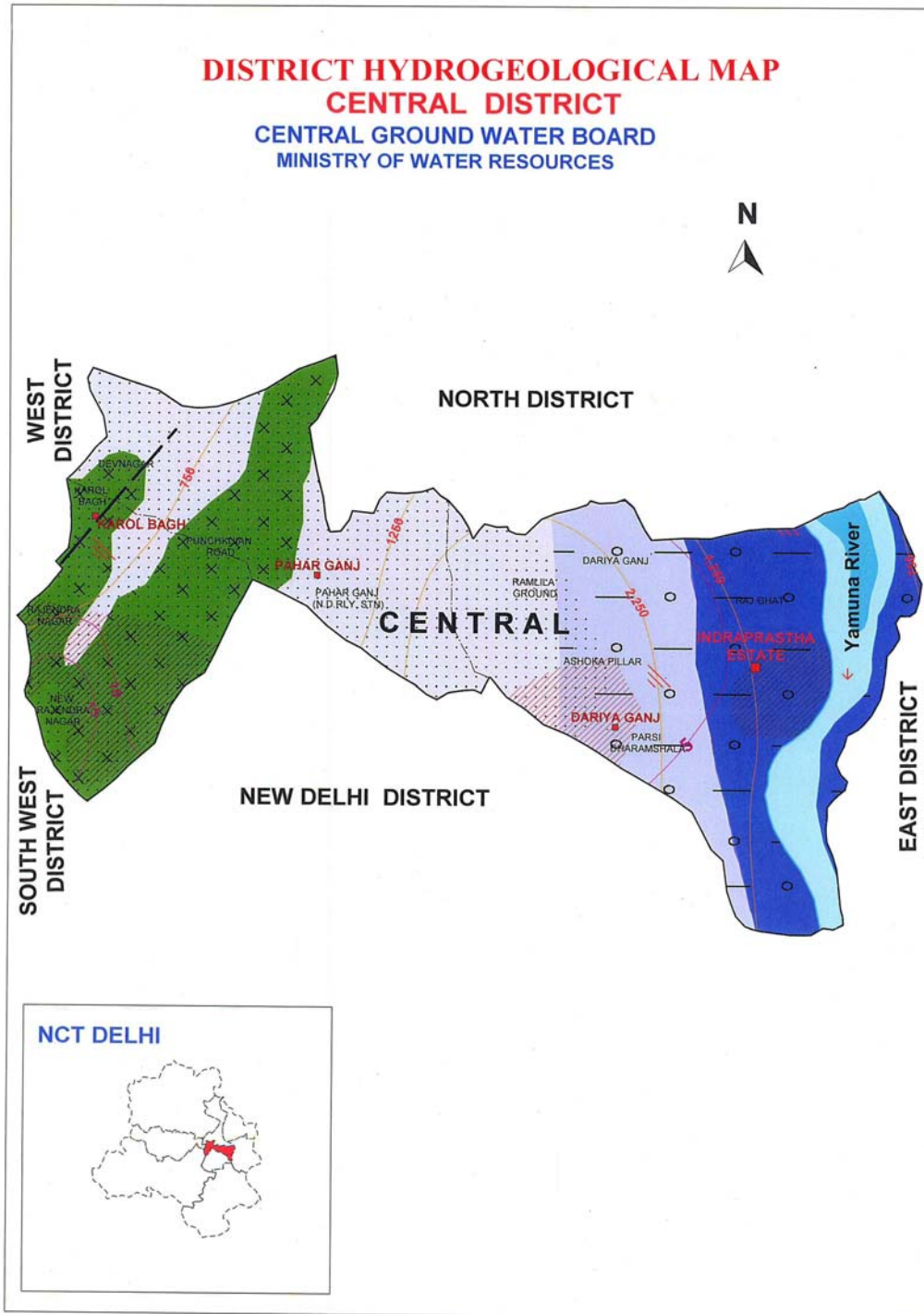
## **7.0 AREA NOTIFIED**

The entire district has been notified by the Government of Delhi for regulation of ground water development.

## **8.0 RECOMMENDATIONS**




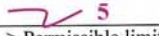

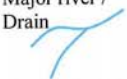
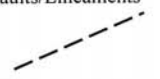










1. Efforts should be made to arrest the declining ground water levels by preventing indiscriminate withdrawal of ground water and adopting roof top rain water harvesting and artificial recharge.
2. Regular monitoring of water levels and chemical quality is essential.
3. Areas receiving drinking water supply from ground water sources should be monitored rigorously for quality consideration. The contaminants, if in the manageable range, should be removed by various techniques.
4. In areas prone to water logging, development of ground water should be encouraged.

Plate 1: Hydrogeological Map



## CENTRAL DISTRICT

### LEGEND

	Wells feasible	Rigs suitable	Depth of Well (m)	Discharge (lpm)	Suitable Artificial Recharge Structures **
 Soft Rock Aquifer	Tube Wells	Reverse / Direct Rotary	30-60 *	300-450	Not Feasible
 Soft Rock Aquifer	Tube Wells	Reverse / Direct Rotary	30-80*	240-360	Shaft/Trench with recharge well, Recharge Pit with/without bore
 Hard Rock Aquifer	Tube Wells	DTH/ Rotary cum DTH	60-90*	90-180	Shaft/Trench with recharge well, Recharge Pit with/without bore, Check Dams/Bunds
Depth to Water level in m. (Pre-monsoon decadal mean, 2003-2012 )		Electrical Conductivity (Micro mhos/cm at 25° C)		Major river / Drain	Faults/Lineaments
					
Fluoride > Permissible limit (1.5 ppm) 	Nitrate > Permissible limit (100 ppm) 	Iron > Permissible limit (1.0 ppm) / * Fe 			
State boundary 	District boundary 	Tehsil boundary 			
Tehsil head quarter 	Over exploited block 	Area feasible for Artificial Recharge structures 			
District head quarter 					

\* Depth of the well is restricted to the availability of fresh water. \*\* Feasible in areas where depth to water level is more than 8 m below ground level. In soft rock formation recharge well may be constructed where water level is more than 15 m. bgl (meter below ground level).

### OTHER INFORMATION

Name of State	Delhi
Name of District	Central
Geographical Area	25 Sq.Km.
Major Geological Formation	Soft Rock - Younger/Older alluvium Hard Rock - Quartzite
Major Drainage System	Yamuna
Population (as on 2011)	5.79 lakhs
No of Tehsils	3, Karol Bagh, Paharganj and Daryaganj
Replenishable Ground Water Resources (MCM)/ Draft (MCM)/ Stage of Ground Water Development	Daryaganj-2.60/1.79/76 Karol Bagh-0.45/0.73/183 Paharganj-0.80/1.24/172
Average Annual Rainfall	Delhi Sadar - 647 mm
Range of Mean Daily Temperature	18-31°C
Tehsil Showing Intensive Ground Water Development	Karol Bagh and Paharganj

**Plate 2: Sub-surface disposition of aquifers in and around Central District**

