

जल वर्ष
2007



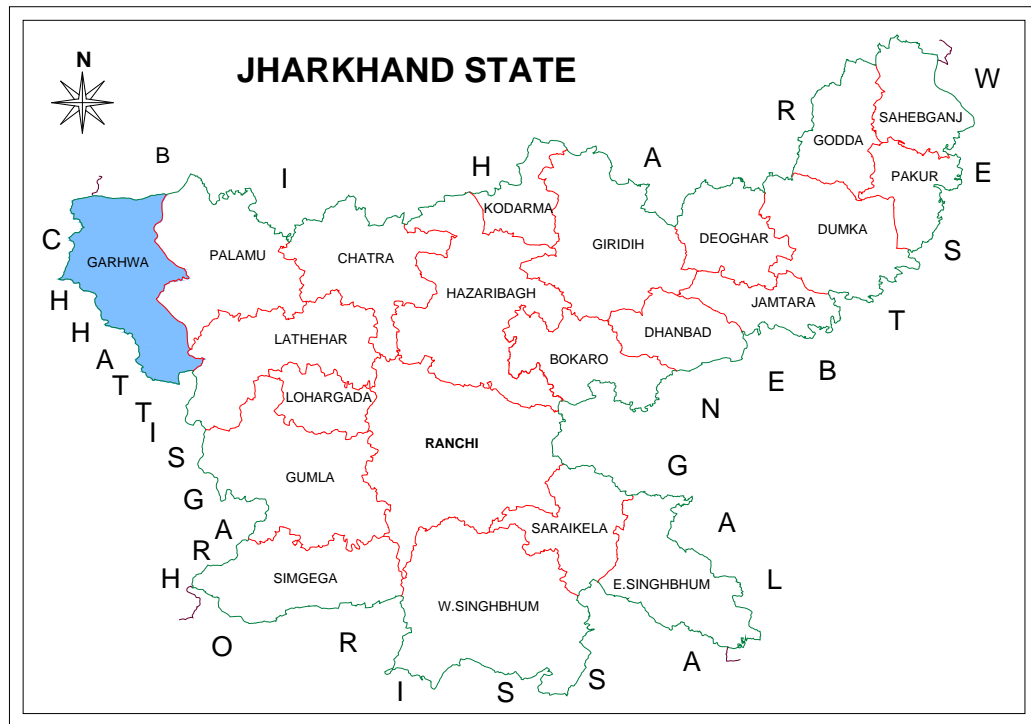
Water Year
2007

स्वच्छ सुरक्षित जल – सुन्दर खुशहाल कल

CONSERVE WATER - SAVE LIFE



“Ground Water Information Booklet” Garhwa District, Jharkhand State



Central Ground Water Board

**Ministry of Water Resources
(Govt. of India)
Mid-Eastern Region PATNA**

October, 2009

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UNDER SUPERVISION OF - **Shri S. N. Sinha, Sc. 'D'**

DISTRICT AT A GALANCE

(GARHWA DISTRICT)

SI No.	ITEMS	Statistics	
1.	GENERAL INFORMATION		
	i) Geographical Area (Sq km.)	4044.10 Sq. km.	
	Administrative Divisions (As on 2001)		
	Number of Block	8	
	Number of Panchyat / Villages	156/914	
	(ii) Population (As on 2001 Census)- in lakhs	10, 35, 464	
	(iii) Average Annual Rainfall (mm)	1193 mm	
2.	GEOMORPHOLOGY		
	Major Physiographic units	Hilly and undulating	
	Major Drainages	North Koel, Banki, Son and Dhorara	
3.	LAND USE (Sq Km.)		
	a) Forest area:	1911.5	
	b) Net area sown:	647.7	
	c) Cultivable area:	893.1	
4.	MAJOR SOIL TYPES	Alfisols (Red sandy soils) ultisols (red and yellow soils)Light textured Acidic to Neutral Very poor fertility	
5.	AREA UNDER PRINCIPAL CROPS	Pulses – 167.0 Oilseed – 85.05 Paddy – 188.74	
6.	IRRIGATION BY DIFFERENT SOURCES (Areas and Number of Structures)	Area (ha)	No. of structures
	Dugwell	19594	18902
	Tube wells /Bore wells	-	-
	Tanks / Ponds	392	42
	Canals	72	13
	Other Sources	11404	2327
	Net irrigated area	-	-
	Gross irrigated area	31462	21284
7.	NUMBERS OF GROUND WATER MONITORING WELLS OF CGWB (As on 31-03-07)		
	No of Dugwell	06	
	No. of Piezometers	-	
8.	PREDOMINANT GEOLOGICAL FORMATIONS	CGG, Limestone, Shale Gondwana SST, Shale, Alluvium.	
9.	HYDROGEOLOGY		
	➤ Major Water bearing formation	CGG and SST	
	➤ (Pre-monsoon Depth to water level during 2005)	7.00 – 8.78 m bgl	
	➤ Post-monsoon Depth to water level during 2005)	4.93 – 6.71m bgl	
	➤ Long term water level trend in 10 yrs (1997-2005) in m / yr.	Rise: .011 - .224 m Fall: 0.033 m at NagarUtari.	

10.	GROUND WATER EXPLORATION BY CGWB (As on 31-03-07)	
	No. of wells drilled (EW, OW, PZ, SH, Total)	EW – 7, OW – 4 Total: 11
	Depth Range (m)	114 – 206 m bgl
	Discharge (litres per hr.)	8 – 20 l/hr.
	Storativity (S)	1.7×10^{-4}
	Transmissivity (m^2/day)	7.16
11.	GROUND WATER QUALITY	Potable
	Presence of Chemical constituents more than permissible limit (e.g. EC, F, As, Fe)	EC 450 to 1000 micro mhos/cm at 25 ^o C.
	Type of Water	Slightly Alkaline
12.	DYNAMIC GROUND WATER RESOURCES (2004) in mcm.	196 mcm / year
	Annual Replenishable Ground Water Resources	27411 mcm / year
	Net Annual Ground Water Draft	7264 mcm / year
	Projected Demand for Domestic and Industrial uses up to 2005	2510 mcm / year
	Stage of Ground Water Development	29.42 %
13.	AWARENESS AND TRAINING ACTIVITY	
	Mass Awareness Programmes Organized Date Place No. of Participants	29.01.2004 Town hall, Garhwa 150
	Water Management Training Programmes Organized Date Place No. of Participants	NIL – – –
14.	EFFORTS OF ARTIFICIAL RECHARGE & RAINWATER HARVESTING	NIL
	Projects completed by CGWB (No & Amount spent)	NIL
	Projects under technical guidance of CGWB (Numbers)	NIL
15.	GROUND WATER CONTROL AND REGULATION	NIL
	Number Of OE Blocks	NIL
	No. of Critical Block	NIL
	No. of Blocks notified	NIL
16.	MAJOR GROUND WATER PROBLEMS AND ISSUES	Fluoride

**GROUND WATER INFORMATION BOOKLET OF GARHWA DISTRICT,
JHARKHAND STATE**

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Ground Water Information Booklet of GARHWA DISTRICT,

Jharkhand

1.0 INTRODUCTION :- Garhwa district occupies the North – West Part of Jharkhand with a geographical area of 4044.10 Sq. Km. It is an under developed and drought prone district having diverse terrain. It lies between the North Latitude 23°34'50" to 24°30'00" and East Longitude 83°37'25" to 84°04'00". It falls in the Survey of India Topsheet No. 63P/07, 63P/08, 63P/11, 63P/12, 63P/15, 63P/16, 64M/09, 64M/13 and 64M/14.

1.1 Administration :- It has eight administrative blocks namely Garhwa, Meral, Majhiaon, Bhawnathpur, Nagar Utari, Dhurki, Ranka and Bhandaria. According to the census 2001, the total population of Garhwa district is 10,35,464 which is 3.84% of the total population of Jharkhand state. The rural and urban population of the district are 992,825 and 42,639 respectively. The rural population constitutes 95.88% of the total population of the district. The district headquarter is Garhwa. Administrative divisions/maps have been shown in Table – 1/Fig1.

1.2 Basin/Sub basin :- The district comes under the Ganga basin and Son Sub basin.

1.3 Drainage :- The general slope of drainage is from South to North towards the Sone. It also forms part of northern boundary of the district. The main river is Koel and its tributaries. There are a lot of small streams, most of which are flowing over hilly terrains. The upper reaches of Koel river is characterized by high banks. The bed of the Koel is rocky for small length from the north of its confluence with Anurag river, and then it is sandy. The Koel flows for a total distance of about 255 Km from its source to the confluence of the Sone. It is generally dry in the summer. Drainage map of the district is shown in fig- 2.

1.4 Land Use :- There is a heterogeneity in the soils of the area. The soils of the district is light grey with fine texture in nature. The Cultivated area of 1.80 lacs hectares forms about 42% of the geographical area and about 12% of the area is irrigated by different sources. The forest cover constitutes over 44% of the area. The surface water irrigation system has been developed to a very small scale and only 2325 Ha of land had been put under canal irrigation system. Irrigation from groundwater resources is very low and is about 25% of total irrigation in the district.

1.5 Studies / Activities carried out by Central Ground Water Board :- Central Ground Water Board has established a Network Hydrograph Stations for monitoring of groundwater level behavior and quality of groundwater of the district. The

Board has also carried out exploratory drilling to identify the potential fractures in the district and also to know sub surface geology, depth and thickness of water bearing formation with their yield and to determine the different aquifer parameters. The exploratory wells have been constructed at Meral, Dhurki, Sonpurna, Garhwa, Ranka and Ramna.

2.0 RAINFALL AND CLIMATE

2.1 Climate :- The climate of the district is humid and sub tropical. The winter season starts from November and lasts till February. It is followed by summer, which continues up to May or early June. The monsoon season begins from June and continues up to September. The October is the transitional month between Monsoon and Winter Season. In winter the temperature goes down to 3^oC.

2.2 Rainfall :- The monsoon sets in the middle of June and continues till the September. The maximum precipitation occurs during July month. The average rainfall of the district as a whole is 1193 mm. The maximum rainfall takes place from June to September.

3.0 GEOMORPHOLOGY AND SOIL TYPES

3.1. Geomorphology:- Garhwa district is characterized by highly rugged terrain with thick green forest all over the area. The hills are widely scattered and rise up to 1164 m above MSL in the southern part of the district. Average height of the hills varies from 700 – 900mts. The elevation of plain varies from 250 – 500 mtr. The slope of the district is towards north.

3.2 Soil Types:- There is a soil variation in the district. The soils of the district can broadly be grouped into three classes :-

- a) Heavy Clays :** This soil is locally known as ‘Kewal’ Soil. This soil becomes hard when dry and sticky when wet. This soil can hold moisture for a longer period and as a result considered to be favourable for Rabi crops.
- b) Sandy Soil :** This soil is locally known as ‘Balsundar’ and consists of coarse sand to a large extent and facilitates production of Paddy, Fruits and vegetables.
- c) Loamy Soil :** This soil is locally named ‘Dorasa’ and consists of sand and clay. This soil is suitable for growing sugarcane.

4.0 Ground Water Scenario:

4.1.0 Hydrogeology :- The district is underlain by hard rock belonging to the Precambrian period and recent alluvium along river courses. The geology and structure of underlying basement controls the occurrence and movement of groundwater. The groundwater occurs in secondary porosities like joints, fractures and their inter connected extensions.

Groundwater occurs in the district within weathered mantle of hard rocks. The limited volume of groundwater in alluvial deposits occurs along the Sone and North Koel rivers. The thickness of weathered mantle varies from 5 to 16 mbgl in general. The source of groundwater recharge is entirely by rainfall. As the rivers of the district are effluent which do not contain appreciable amount of water during lean period to recharge groundwater at lower reaches. The rainfall over the area is fairly high but because of its topography major part of the rainwater goes as run off. The Hydrogeology of the district is shown in Fig – 3.

4.1.1 Exploratory Wells :- 7 Nos. of exploratory wells were drilled in the district of Garhwa (Table -2). The available data reveals that 1 – 6 nos of fracture zones up to the depth of 206.00 mbgl were deciphered. The static water level of the bore wells varies from 3.75 to 10.6 mbgl. The minimum and maximum discharge of

exploratory wells are 1.5 l/hr. at Ranka and 20.4 l/hr. at Ramna respectively.

4.1.2 Depth of Water Level:- Central Ground Water Board has established a network of observation wells for monitoring of groundwater level to know the behavior of groundwater regime in the district. There are six nos. of NHNS, which are monitored every year in January, May, August and November. It has been shown in Table -3.

During Pre-monsoon season the minimum and maximum water level observed were 7.00 m bgl at Bhawnathpur and 8.70 m bgl at Ranka (fig-4) The water level during the post monsoon season of the district varies from 4.93 m bgl to 6.71 m bgl (fig-5). The water level in the southern part of the district is within 4 m bgl and it is more than 6 m bgl in the northern part.

4.1.3 Water Level Trend :- There are six nos. of Observation wells in the district. The water level of the majority wells show the rising trend in the district, which are localized patches of the area. The Observation well in Nagar Utari is the only well showing falling trend of 0.033 m/Yr. The maximum and minimum rises of water level of the observation wells are 0.224 m/Yr. (Majhiaon) and 0.011 m/Yr. (Garhwa) respectively. The rising and falling trend of water level has been tabulated in the Table -4.

4.2 Ground Water Resources :- Groundwater resources assessment has been carried out based on the recommendations of Central Water Estimation Committee Report 1997 (GEC, 1997). Block wise groundwater resource gross draft and stage of groundwater development have been worked out for the year 2004 and presented in Table-5. The net groundwater availability has been assessed to be 25727.75 ham. The existing groundwater draft for all uses has been assessed as 7263.77 ham. The net groundwater availability for future irrigation has been assessed as 17561.65 ham. The stage of groundwater development in Garhwa district is found to be very low. It ranges from 12.43 % (Bhadaria) to 60.17% in Garhwa Block.

4.3 Ground Water Quality :- Chemical quality of water is very important from the agriculture and public health point of view. The chemical constituents of water should be within the prescribed limits to avoid any harmful effect on crops and general health of local population.

The available chemical analysis data reveals that groundwater of the district is mainly alkaline in character (pH – 8.3). The chemical constituents are within the tolerance limit as per the drinking water norms. Presence of chemical constituents more than permissible limit are EC, Fe and F.

4.4 Status of Ground Water Development :- There is sufficient scope for shallow as well as deep bore wells. State Government agency has been drilled a no. of bore wells to minimize the drinking water problems in the district. Central Ground Water Board has also drilled 7 no. of bore wells in the district. The depth of bore well ranges between 114.07 and 206 mbgl. The discharge of bore wells ranges from 1.5 l/hr. to 20.4 l/hr. The maximum draw down of the bore well is 30m. The transmissivity and storativity of the bore well at Meral is $16\text{m}^2/\text{day}$ and 1.7×10^{-4} respectively.

5.0 Ground Water Management Study

5.1 Ground Water Development :- There is sufficient scope of groundwater for drinking and irrigation purpose in the district. The shallow and medium dug wells are suitable extraction structures in the area to meet the increasing demand of domestic water supply and groundwater irrigation. The net annual groundwater draft in the district is 7264mcm/yr. The stage of groundwater development in the district is 29.42%.

Construction of dug cum bore well structure is also suitable for enhancing the yield of dug wells. The groundwater resources of the district can be developed, as substantial groundwater resources are available. Local bodies with the help of skilled persons in each block will do maintenance of dug cum

borewell and shallow tubewells. The potential available for the groundwater development considering the groundwater draft has been worked out as per norms of Ground Water Estimation Committee 1997. The groundwater recharge net annual draft, net groundwater balance and stage of groundwater development have been evaluated.

5.2 Water Conservation and Artificial Recharge :- Water conservation is the activity of collection of rainwater for augmenting the resource. Thus the rainwater can be stored and made to recharge the groundwater aquifer. The conservation of rainwater aims at optimum utilization of the natural resources. From hydrogeological point of view, rainwater conservation is needed to arrest decline in groundwater level and to improve groundwater quality by dilution. Very high percentage of surface run off goes to river. There should be proper planning to arrest the decline of groundwater and ensure sustainable and economic utilization of groundwater resources in the district. The district has undulating topographic features, so rain water harvesting structure like check dam, gully plug structure, percolation tank, contour bunding and trenching may be constructed.

6.0 Ground Water Related Issues And Problems :

During summer season the dug well generally dry up. The deepest groundwater level has been observed at Ranka in

Garhwa district (Jharkhand). Fluoride contamination has also been recorded in the district.

7.0 Awareness and Training activity :-

7.1 Mass Awareness Programme(MAP) & Water Management Training(WMTP) by CGWB

Central Ground Water Board has organized one mass awareness program in Town hall, Garhwa on 29.01.2004. The topic of mass awareness was “Rain Water Harvesting & Artificial Recharge”. About 150 people from different organizations participated in the programme including representatives of NGO’s. In addition to technical lectures, interaction and discussion session was also included with participants in the programme.

7.2 Participation in exhibition, mela, fair :- NIL

7.3 Presentation & Lectures delivered in Public Forum / Radio / T.V. / Institution of Repute / Grassroots Associations / NGO / Academic Institutions etc :- NIL

8.0 Areas Notified by Central Ground Water Board / Central Ground Water Authority :- As per the groundwater resource assessment all blocks of the district fall under the safe category. Thus, the authority has not notified any blocks.

9.0 Recommendations :-

1. The exploration data is indicating the poor percentage of successful bore wells in the district. So, geophysical survey is needed for selection of suitable sites for groundwater exploration.
2. In order to conserve runoff water during monsoon, it is suggested to construct the Water conservation structures at suitable places in the district.
3. In certain places, the dug wells go dry during the summer. In such places the wells should be constructed deeper so that it can tap the entire saturated thickness of weathered residuum.
4. Rainwater harvesting and artificial recharge to groundwater schemes may be adopted in all block head quarters in the district. The artificial recharge structures like percolation tank, gully plugging, sub surface dykes can be constructed to maintain the groundwater sustainability.
5. In hilly area, contour bund can be constructed to avoid uncertainty of the surface water run off in the district.
6. The river water can be lifted for irrigation as well as drinking purposes.

TABLE-1: Administrative Division of Garhwa District

Block	Area (Sq. km)	Rural Population	Urban Population	Total Population
Garhwa	305.39	131640	36686	168326
Bhawnathpur	440.93	101914	5953	107867
Manjhian	239.17	85378	-	85378
Nagarutari	197.96	80796	-	80796
Dhurki	311.29	66307	-	66307
Meral	263.87	100292	-	100292
Ranka	427.43	72763	-	72763
Bhandariya	661.19	51488	-	51488

TABLE-2: Exploratory Wells of Garhwa district

Location	Depth	SWL (m bgl)	Fracture (m bgl)	Discharge (l/hr)
Meral	180m	-	-	15.6
Dhurki	206m	4.15	154.00 – 155.00	2.7
Sonpurwa	198m	3.75	87.60 – 88.60	1.8
Garhwa	151.76m	10.60	93 – 94 106 – 107.90 114 – 115 133 – 134 137 – 138	8.3
Ranka P.S.	197.96m	-	-	1.44
Ranka Block	198.48m	-	20 – 21 44.50 – 45 76.60 – 77.60 96.80 – 98.40 102 – 103	1.5
Ramna, Ranka	114.07m	5.04	9.00 – 15.90 21.99 – 23.61 38.85 – 46.40 54.09 – 60.00 64.50 – 82.50 110.70 – 114.50	20.4

TABLE-3
Pre and Post Monsoon Water Level Data of Garhwa district

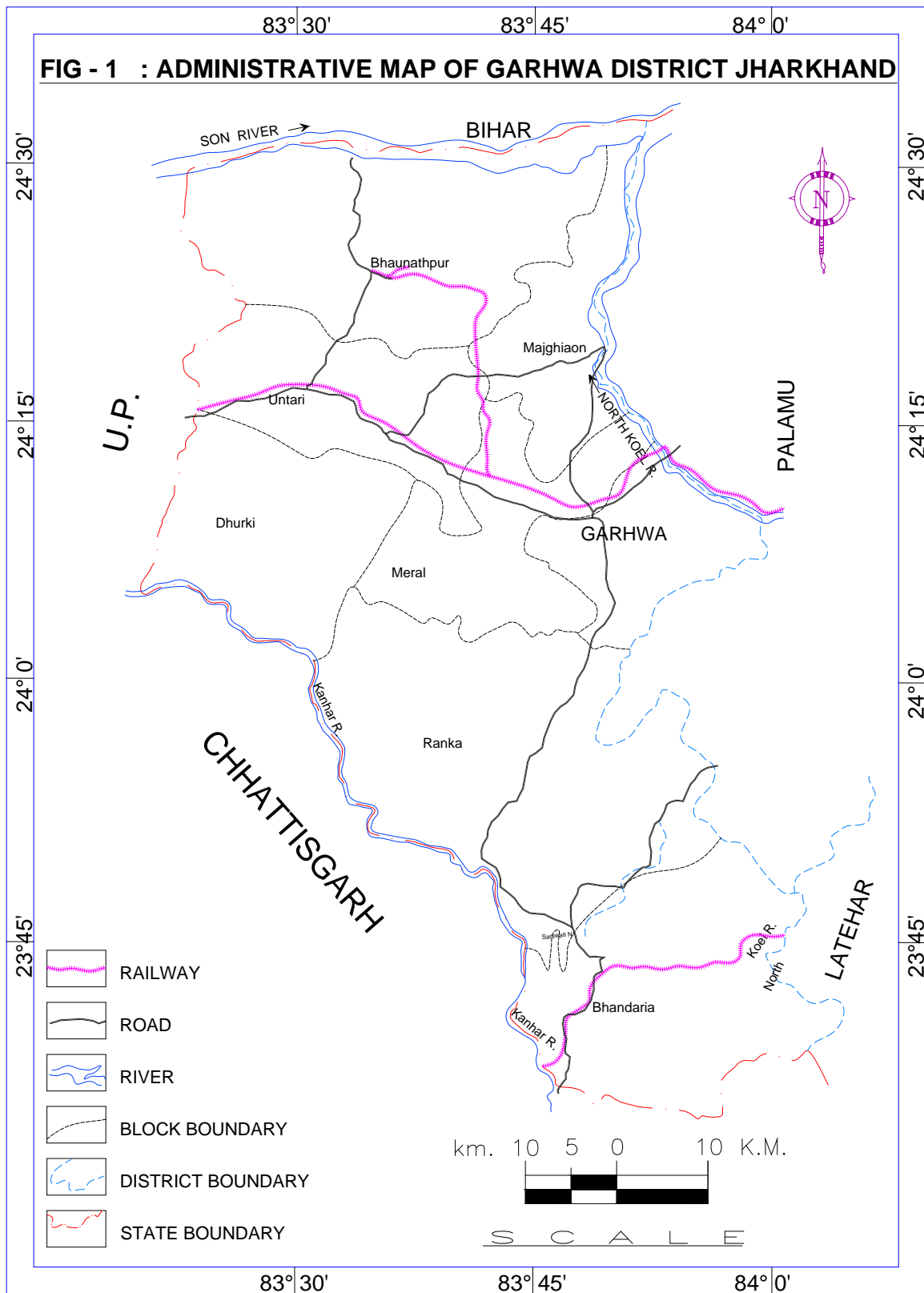
Location of NHNS	Pre Monsoon (in mbgl)	Post Monsoon (in mbgl)	Difference (in mbgl)
Garhwa	8.28	6.71	1.57
Bhawnathpur	-	-	-
Ranka	8.78	4.93	3.85
Nagar Utari	7.00	5.95	2.05
Majhiaon	-	-	-
Godarmana	8.24	6.38	1.86

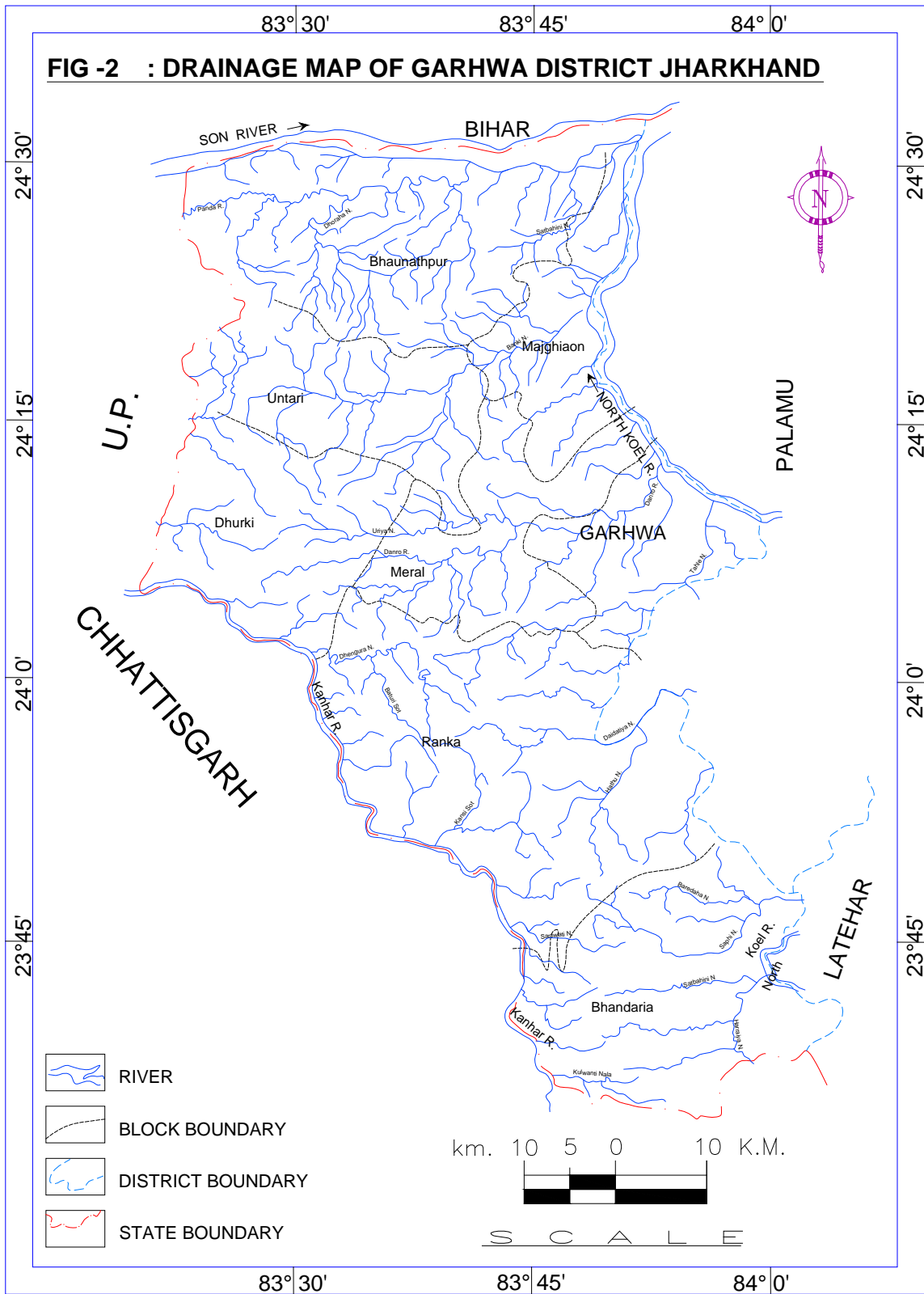
TABLE-4
Trend of Ground Water Level in Garhwa District
Period 01 – Jan. 95 to 01 – Jan. 05

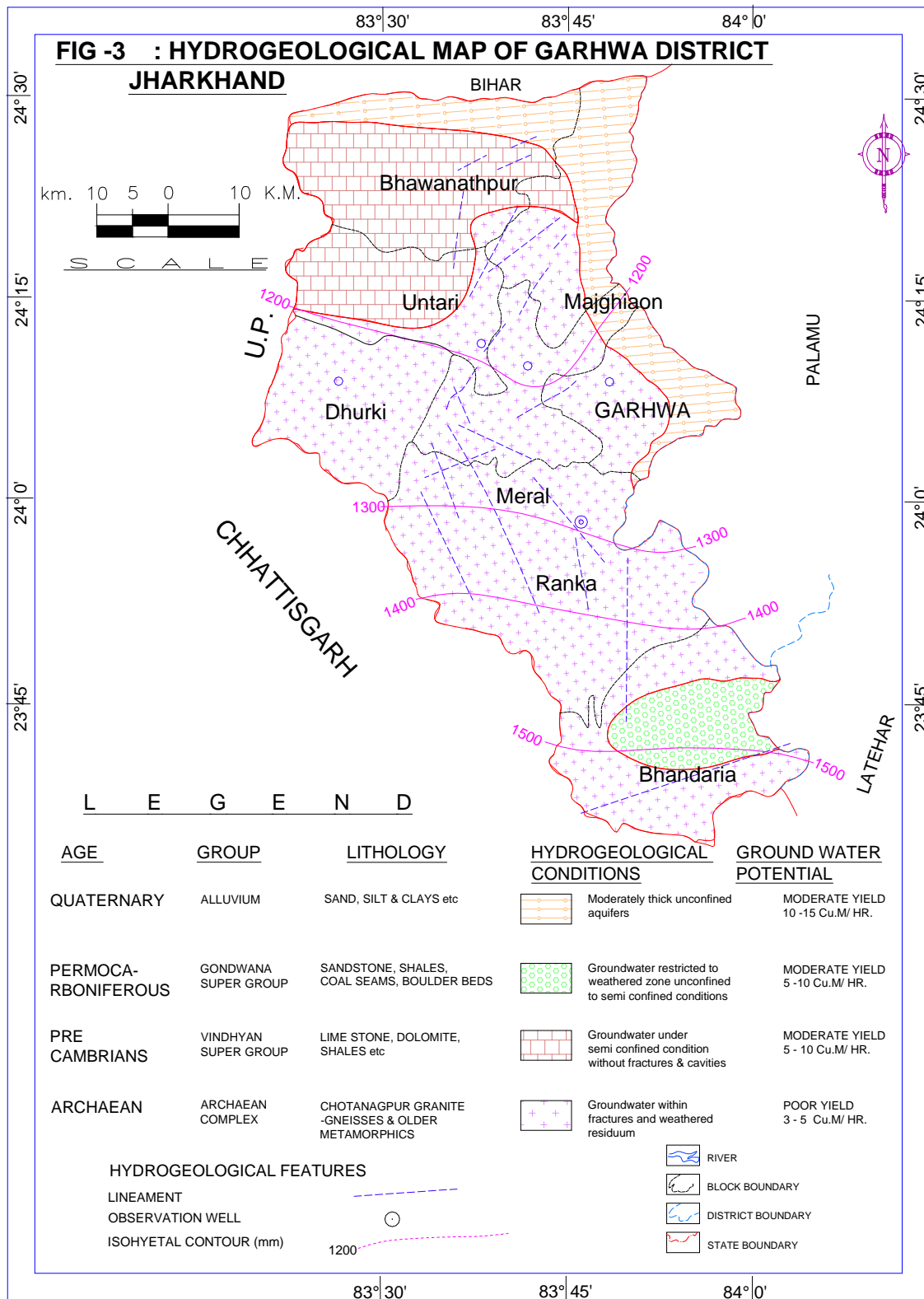
Location	No. of Data	Rise (Meter / Yr.)	Fall (Meter/Yr.)
Bhawnathpur	20	0.068	-
Garhwa	24	0.011	-
Godarmana	15	0.056	-
Manjhian	13	0.224	-
Nagarutari	25	-	0.033
Ranka	21	0.071	-

TABLE-5:**Block wise Ground Water Resources of Garhwa District as on 31st March 2004**

S.N.	Assessment Unit (ha)	Command/ Non-Command area Total (ha)	Recharge from Rainfall during Monsoon season (ham)	Recharge from Other sources during Monsoon season (ham)	Recharge from Rainfall during Non Monsoon Season (ham)	Recharge from Other sources during Non - Monsoon Season	Total Ground Water Recharge (4+5+6+7) (ham)	Natural Discharge during Non Monsoon Season (ham)	Net Ground Water Availability (ham)
1	2	3	4	5	6	7	8	9	10
1.	Bhawnathpur	46300.00	2988.80	93.15	495.47	79.11	3656.53	182.83	3473.70
2.	Majhian	26500.00	1908.63	142.28	314.94	292.82	2658.67	265.87	2392.80
3.	Nagaruntari	17300.00	1123.80	180.25	179.23	113.14	1596.42	79.82	1516.60
4.	Dhurki	23600.00	1486.60	55.57	244.50	83.30	1869.97	93.50	1776.47
5.	Meral	28200.00	2022.40	66.73	323.23	103.06	2515.42	125.77	2389.65
6.	Garhwa	25000.00	1491.12	584.06	246.05	297.22	2618.48	261.85	2356.63
7.	Ranka	35000.00	2290.50	7.41	362.60	105.14	2765.65	138.28	2627.36
8.	Bhandaria	49000.00	3269.10	9.65	522.14	98.55	3899.45	194.97	3704.48

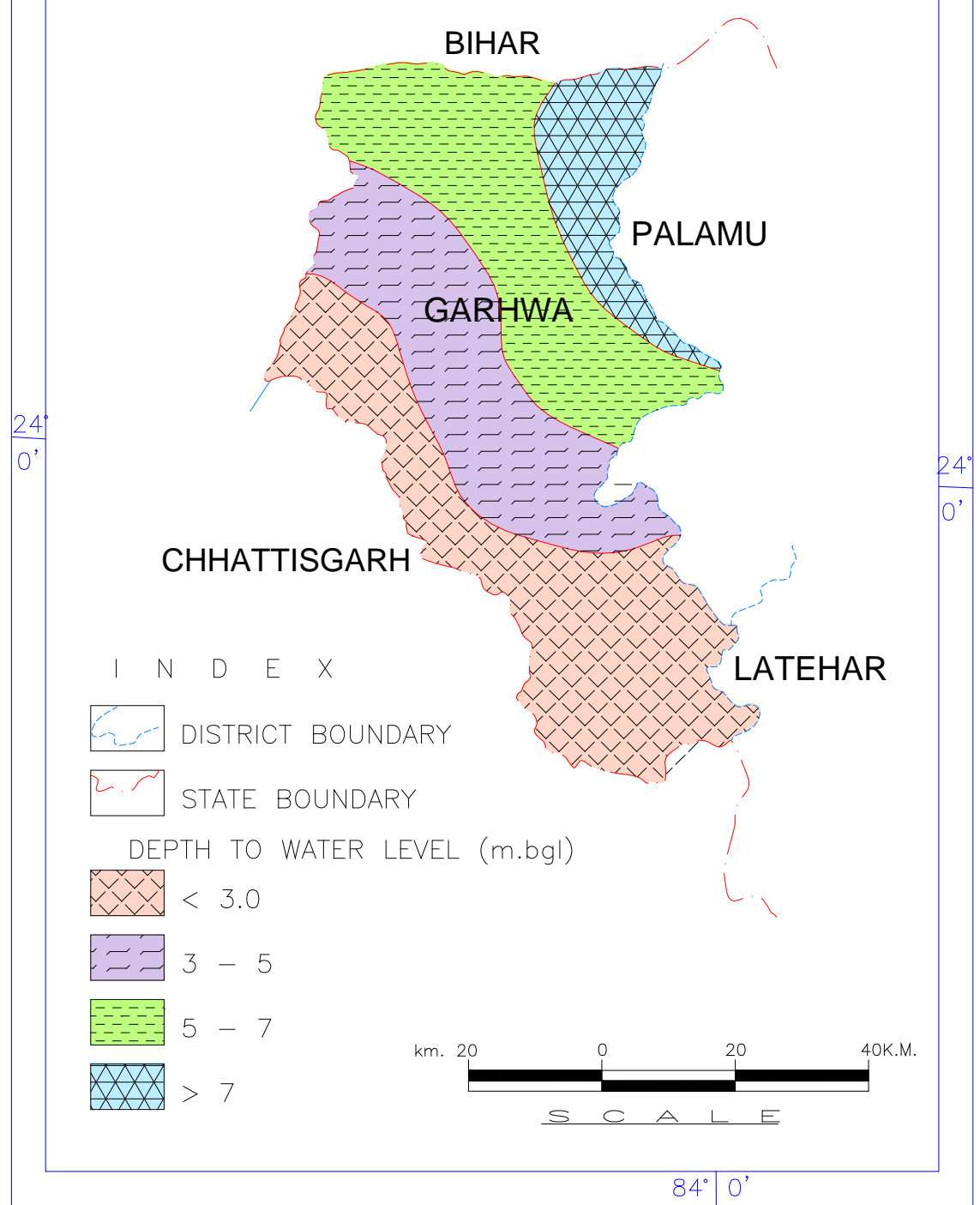






84° 0'

**FIG - 5 :POST MONSOON (NOV 2005) DEPTH TO WATER LEVEL
MAP OF GARHWA DISTRICT**



24° 0'

24° 0'

84° 0'