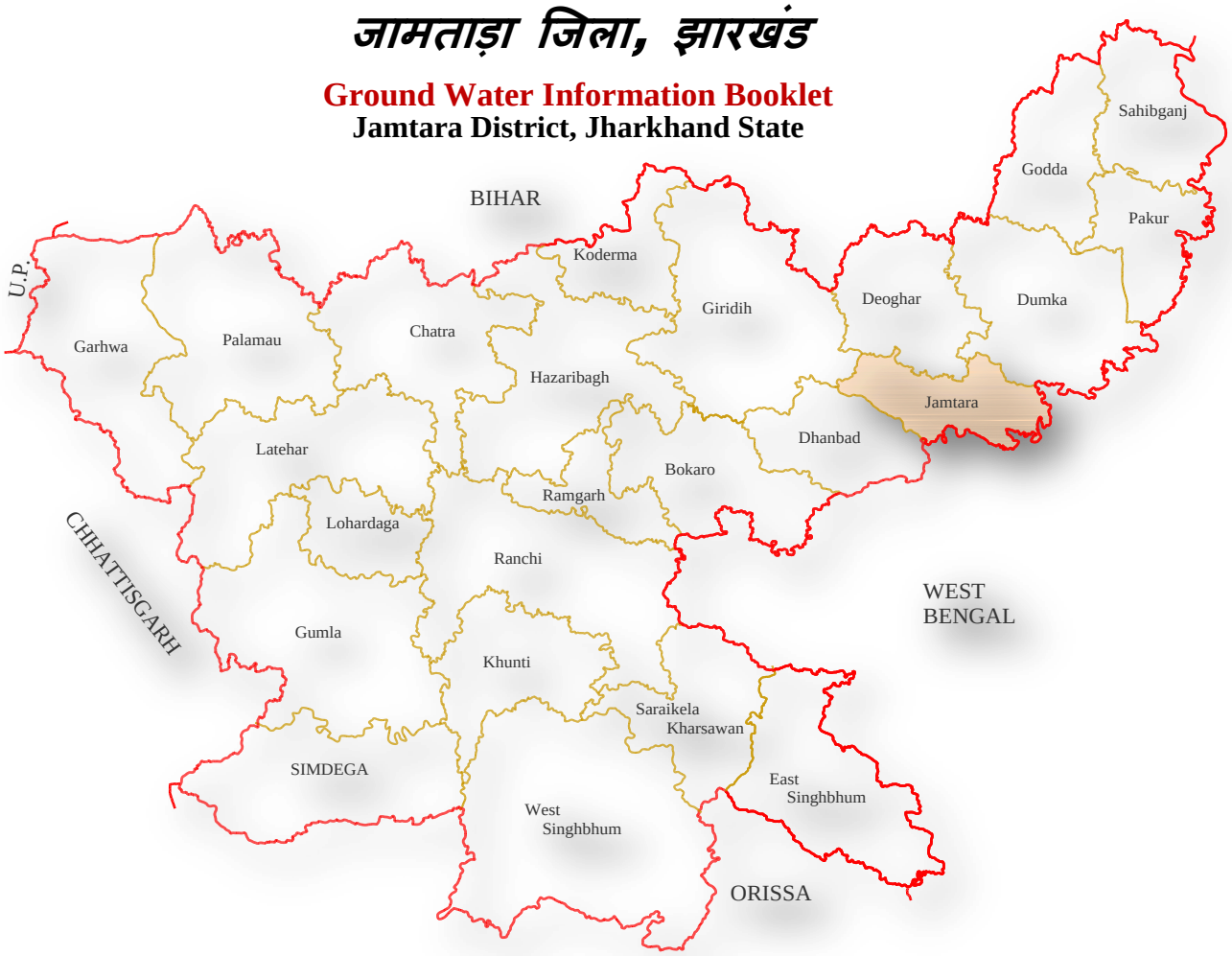
भूजल सूचना पुस्तिका

जामताड़ा जिला, झारखंड

Ground Water Information Booklet
Jamtara District, Jharkhand State



केन्द्रीय भूमिजल बोर्ड
जल संसाधन मंत्रालय
(भारत सरकार)
राज्य एकक कार्यालय, राँची
मध्य-पूर्वी क्षेत्र
पटना

Central Ground water Board
Ministry of Water Resources
(Govt. of India)
State Unit Office,Ranchi
Mid-Eastern Region
Patna

सितंबर 2013
September 2013

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मध्य-पूर्वी क्षेत्र,पटना

State Unit Office, Ranchi
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JAMTARA DISTRICT AT A GLANCE

Sl. No.	ITEMS		Statistics	
1.	GENERAL INFORMATION			
	i)	Geographical area (SqKm)	1791.7	
	Administrative Division (As on 2011)			
	i)	Number of Tehsil / Block	7	
	ii)	Number of Panchayat/Villages	99 /1175	
	iii)	Population (As on 2011 Census)	15,82,084	
	iv)	Average Annual Rainfall (mm)	1293.7	
2.	GEOMORPHOLOGY			
	Major physiographic unit:		Hills, Rolling valleys, Pediplains	
	Major Drainages:		Brahmani, Mayurakshi, Ajoy and their tributaries	
3.	LAND USE (SqKm)			
	a)	Forest area:	302	
	b)	Net area sown:	553.4	
	c)	Cultivable area:	591.6	
4.	MAJOR SOIL TYPE		Alfisols/Ultisols	
5.	AREA UNDER PRINCIPAL CROPS			
6.	IRRIGATION BY DIFFERENT SOURCES (Areas in Ha and Number of Structures)		Number of structures	Area (ha)
	Dug well		8156	3651
	Tube well/Bore well		-	-
	Tank/ponds		422	389
	Canals		17	26
	Other sources		8156	3651
	Net irrigated area			
	Gross irrigated area			
7.	NUMBER OF GROUND WATER MONITORING WELLS OF CGWB (As on 31-3-2012)		04	
	No of Dug wells		04	
	No of Piezometers		Nil	
9.	HYDROGEOLOGY			
	Major Water bearing formation		Precambrian Chottanagpur Granite Gneiss, Schists, Gondwana SST & Shale.	
	(Pre-monsoon Depth to water level during 2012) m bgl.		6.70-11.80	
	(Post-monsoon Depth to water level during 2012) m bgl.		2.63-5.93	
	Long term water level trend in 10 yrs (2002-2011) in m/yr		Rise range 0.00-0.93 Fall range 0.038-0.167	

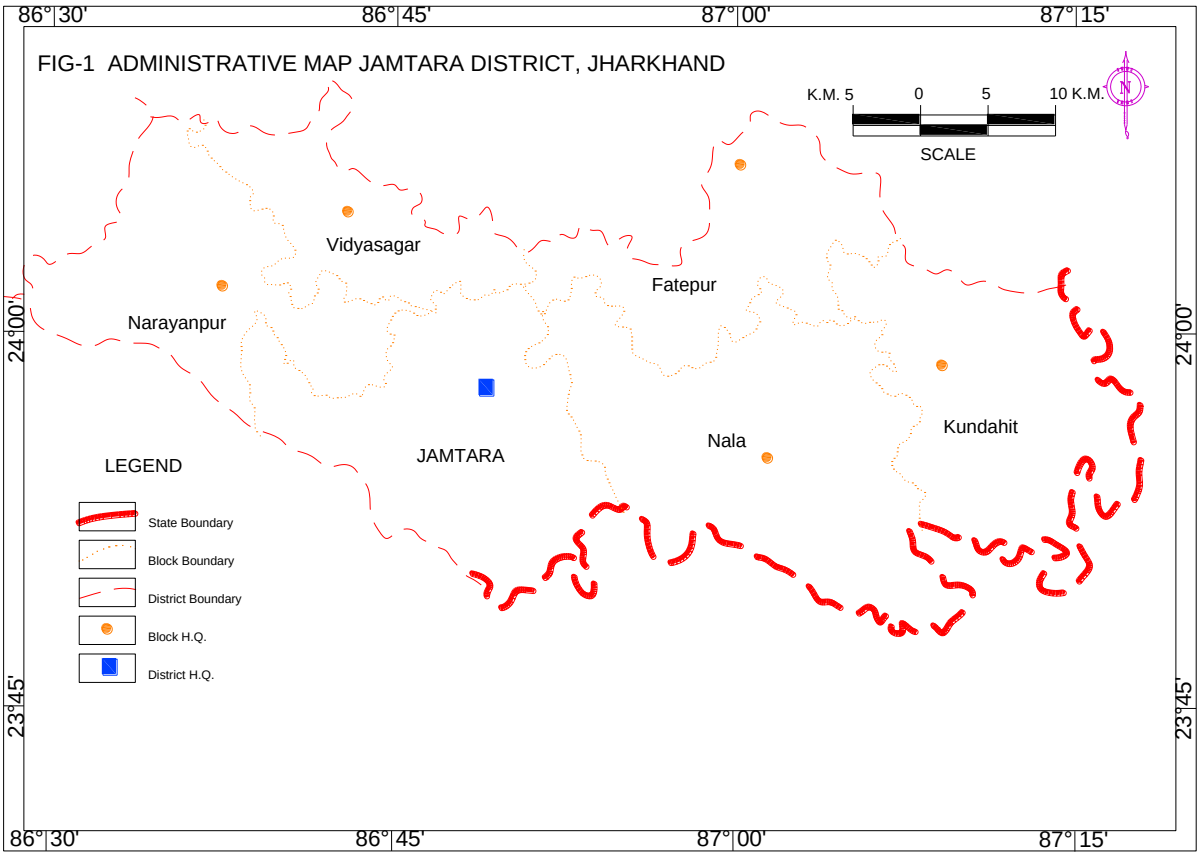
10.	GROUND WATER EXPLORATION BY CGWB (As on 31-07-2007)	
	No of wells drilled (EW, OW, PZ, SH, Total)	2(EW), 1 (OW)
	Depth range (m)	12-198
	Storability (S)	
	Transmissivity (m^2/day)	
11.	GROUND WATER QUALITY	
	Presence of Chemical constituents more than permissible limit (e.g EC, F, As, Fe)	Nil
	Type of water	Potable
12.	DYNAMIC GROUND WATER RESOURCES(2009)- in mcm	
	Annual Replenishable Ground water Resources	144.01
	Net Annual Ground Water Draft	21.40
	Projected Demand for Domestic and industrial Uses up to 2025	12.92
	Stage of Ground Water Development	26.77%
13.	AWARENESS AND TRAINING ACTIVITY	-
	Mass Awareness Programmes organized	-
	Date:	-
	Place:	-
	No of participant :	-
	Water Management Training Programmes organized	-
	Date	-
	Place	-
	No of participant	-
14.	EFFORT OF RTIFICIAL RECHARGE & RAIN WATER HARVESTING	-
	Project completed by CGWB(No & Amount spent)	-
	Project under technical guidance of CGWB (Numbers)	-
15.	GROUND WATER CONTROL AND REGULATION	-
	Number of OE Blocks	Nil
	Number of Critical Blocks	Nil
	Number of Blocks notified	Nil
18	MAJOR GROUND WATER PROBLEMS AND ISSUES	

JAMTARA DISTRICT INFORMATION BOOKLET

1.0 INTRODUCTION

1.1 **Administrative Details**

Jamtara district is located in the north-eastern portion of Jharkhand state. It has a total geographical area of 1791.70sq.kms, which is 2.22 % of the geographical area of Jharkhand state. It lies between 23010' and $24^0$05' North Latitude and 86030' and $87^0$15' E. Longitude. The district is bounded by Giridih and Dhanbad districts in the west, Dumka district in the north, West Bengal State boundary in the south and east. The head quarter of the district is located in Jamtara town. The district has only one sub-division-Jamtara, consisting of four blocks namely Narayanpur, Jamtara, Nala and Kundahit. There are 2 municipal/N.A towns namely Jamtara and Mihijam. Chitaranjan, Vidyasagar and Jamtara are the three railway stations (on main line Delhi to Howrah) situated in the district.



1.2 Drainage

The district is mainly drained by the rivers Brahmani, Mayurakshi, Ajoy and their tributaries.

1.3 Studies/Activities carried out by CGWB

Central Ground Water Board has carried out hydrogeological surveys and ground water exploration in the district. Ground water regime monitoring is carried out 4 times annually from 4 HNS wells in the district. Water samples are collected during the month of May to study the changes in water quality along with monitoring of pre-monsoon water level.

2.0 HYDROMETEROLOGY

The climate of Jamtara district can be divided into three distinct seasons in a year, viz. winter, summer and monsoon seasons. Winter commences from late November and continues till the end of February. January is the coldest month of the year. Winter is characterized by heavy dew, thick fog and associated cold wave when mercury drops down to as low as 3^0C to 4^0C. May is the hottest month of the year. The rainy season commences from the middle of June and continues till the end of September. The beginning of monsoon is marked by dust storms, thunder and lightning.

The district receives a larger share of the annual rainfall mainly by the south west monsoon during the rainy season and from the retreating monsoon during the inter monsoon period which originates in the Bay of Bengal. The district receives most of the annual rainfall during the monsoon period.

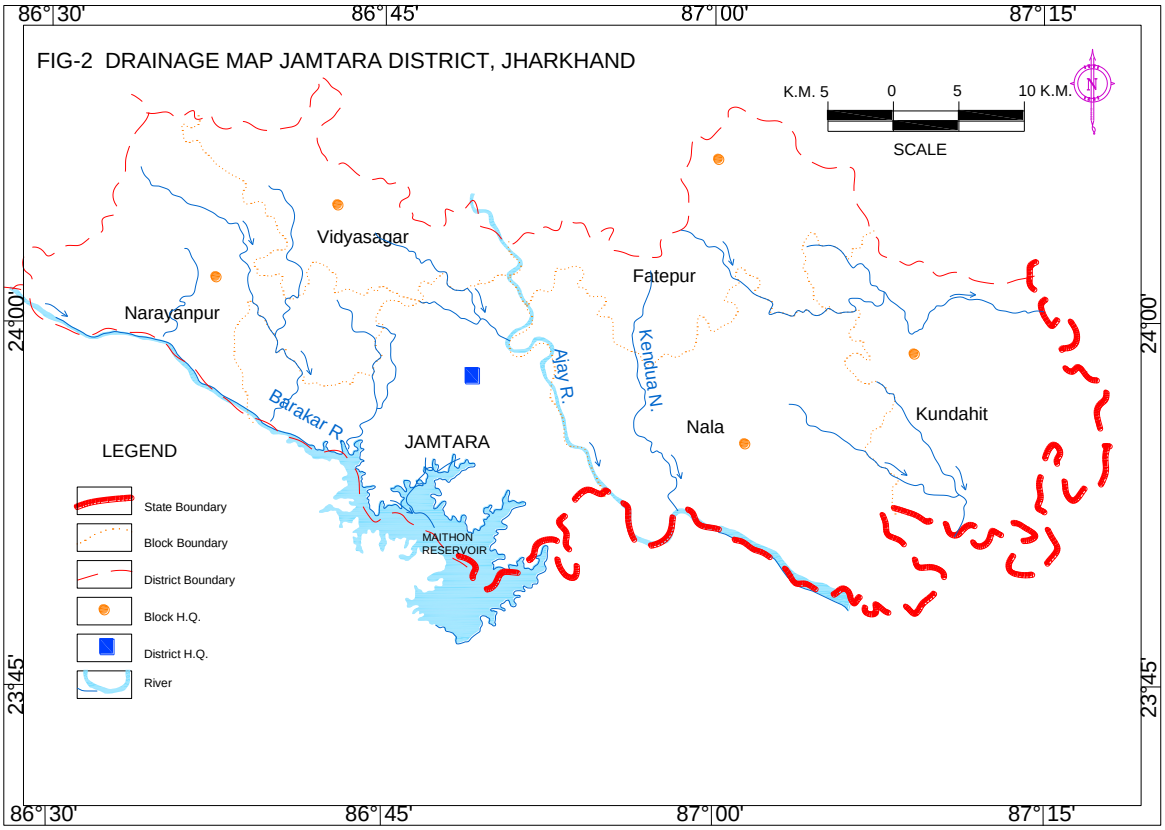
Relative humidity is the lowest during the summer months when it can be as low as 30% in the afternoon. In the night humidity is relatively high.

Light north westerly prevails during the winter and summer months. Towards the end of the summer season wind begins to blow more and more from directions between north-east and south-east. These wind strengthen and predominately during monsoon. Dust storms occur occasionally in April and May.

3.0 GEOMORPHOLOGY AND SOIL TYPES

Geomorphologically, the district can broadly be divided into three well defined physiographic units (a) Hilly area (b) Rolling Valleys and (c) Pedi plain flat country. The general elevation of the area ranges between 150 m – 640 m above MSL. The general slope of the district is from North to South East.

Major soil types are Alfisols amongst which Red sandy soils are common and Ultisols of which red and yellow soils are common.



4.0 GROUND WATER SCENARIO

4.1 Hydrogeology

The district is underlain by the Precambrian crystalline metamorphic rocks, intrusive, Gondwana sedimentaries and Recent to sub-Recent alluvium occurring as thin and discontinuous patches on a limited scale along prominent drainage channels.

The hard crystallines of the Precambrian age occupy 90% of the total geographical area of the district. The semi-consolidated rocks of the Gondwana formation occur in pockets.

The Precambrians are hard and compact and do not possess primary porosity, though secondary porosity is produced in these rocks due to weathering, jointing, fracturing etc. Ground water, occurrence and movement in these rocks are manifested through the secondary porosity and permeability introduced in them due to their weathering and fracturing.

Ground water occurs under unconfined conditions in the weathered mantle and under semi-confined to confined conditions in the fractured rocks below.

The major hydrogeologic units in the district can be subdivided into two broad groups.

i) Areas underlain by fractured, fissured and consolidated formations

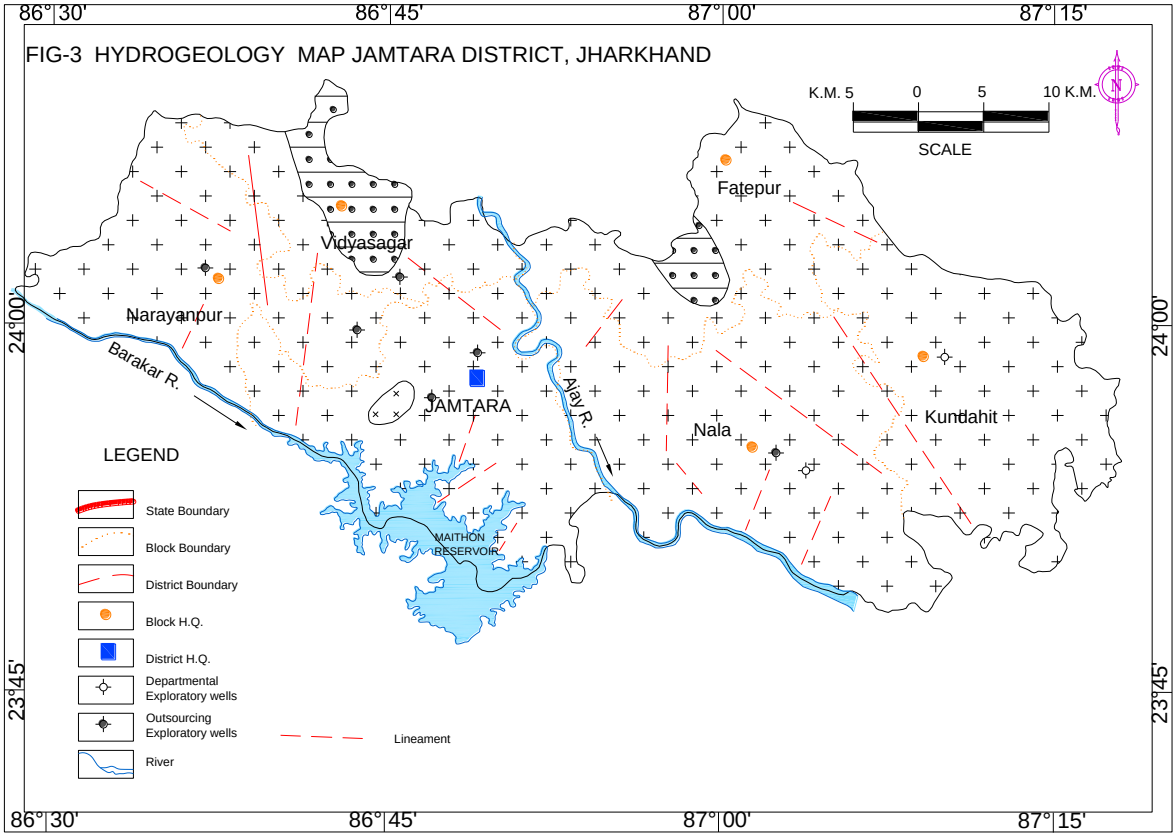
ii) Areas underlain by the semi-consolidated (Gondwana) formation.

4.1.1 Consolidated Formation

Granites and Gneisses are the most predominant rock types among all other rocks falling under the consolidated unit. Weathering in granitic rocks is pronounced and fissures and joints etc are also well developed. These rocks are traversed by numerous veins of quartz and pegmatite. Weathered zones of granites and gneisses are the most productive zone for ground water development. The depth of weathering varies from place to place, which influences the aquifer characteristics. The drinking water and sanitation department has drilled a number of tube wells in Jamtara district having a yield of approximately 80 liter per minute. The dug wells in this formation has a depth to water range from 4 m to 9 m bgl and the wells can sustain 2 hours of pumping with a yield range of 4000 to 8000 liters per hour. These aquifers are mainly unconfined to semi-confined in nature. Dug wells within the hard, fractured granites cannot sustain long durations of pumping. Fracture porosity plays an important role but with varying degree, in different parts of the area depending upon the pattern and intensity of joints and fractures. The potentiality and yielding property of these aquifers vary considerably. Bore wells can be constructed tapping the deep-seated fractures and joints.

4.1.2 Semi-Consolidated Formation

The areas underlain by the semi-consolidated (Gondwana) formation occur in isolated pockets in the northern part of the district. The rocks are mainly sandstones and shales belonging to the Barakar and Talchir formation. Barakar sandstones are coarse to medium grained, weathered in nature and may be a productive zone for ground water development. Exploration work has to be taken up for knowing detail aquifer characteristic of Gondwana formation. The yield of wells in this formation is less than 10 m^3/hr. Wells constructed in sandstone yield better than those in shale. Depth of open wells in this formation ranges from 5 to 12 m bgl. Dug wells can sustain pumping of 1 m^3 of water per hour with a moderate recuperation rate.



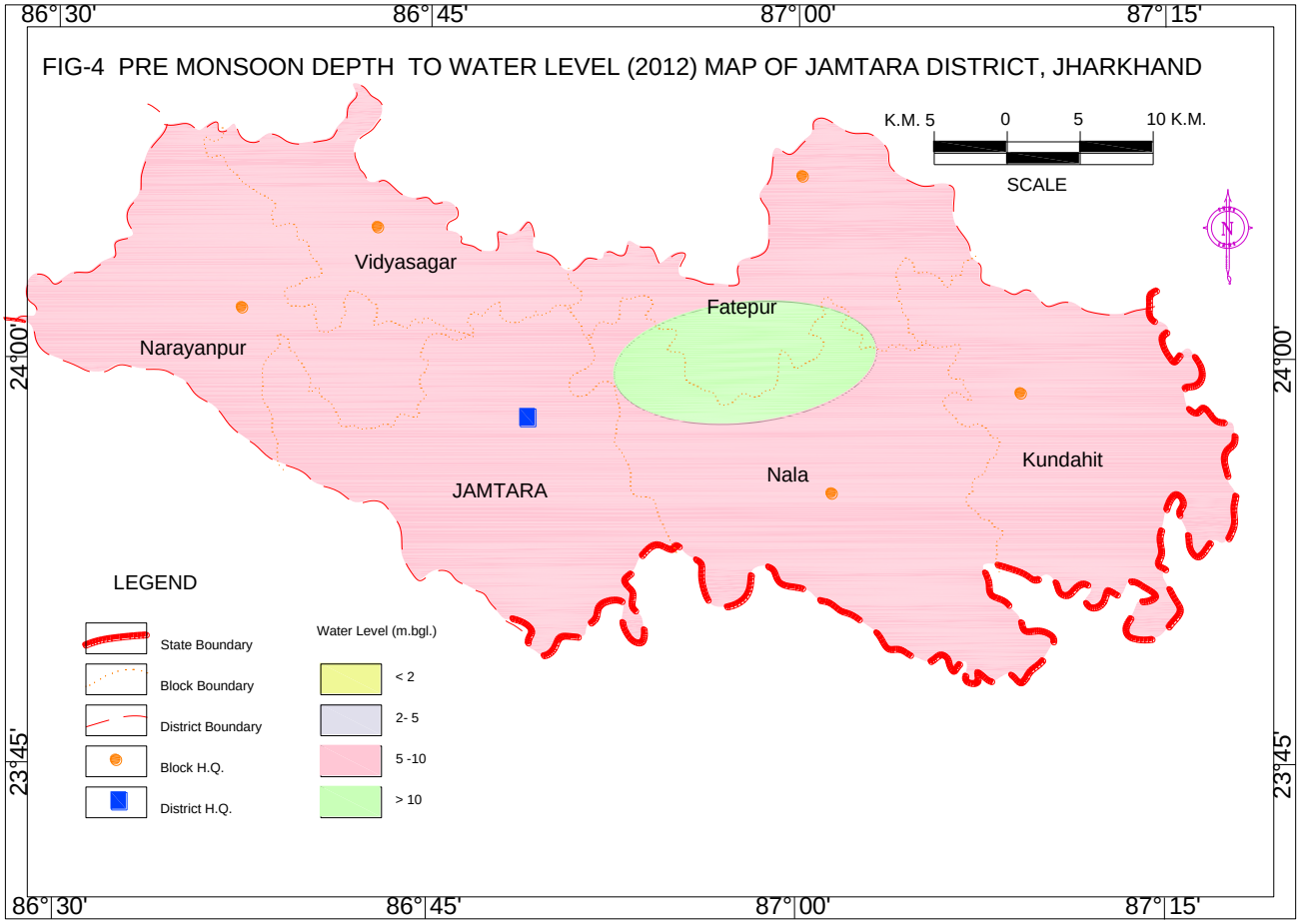
AGE GROUP	LITHOLOGY	HYDROGEOLOGICAL CONDITION	SYMBOL	GROUND WATER POTENTIAL
Upper carboniferous to Upper Triassic (Gondwana)	Sandstone and Shale	Groundwater restricted to weathered zone and fractured zone. Groundwater occurs under water table and semicofined condition mostly occurs as dykes.		Limited yield prospect below 10m^3/ hr.
Archaean	Amphibolite and Metabasics	Groundwater restricted to fracutres, joints and fissures. roundwater occurs under water table and semi confined to confined conditions		Limited yield prospect below 10m^3/ hr.
Archaean	Granite and Gneisses	Groundwater restricted to weathered zones and inter connected fractures zones having secondary porosity. Groundwater occurs under water table and semi confined to confined state of disposition.		Moderate to good yield prospect 10-50 m^3/hr.

4.1.3 Depth to Water level

During May 2012, the depth to water levels in HNS wells tapping shallow aquifer ranged from 6.70 to 11.80m.bgl. Depth to ground water levels during the post monsoon (November 2012) varied between 3.31 and 5.93 m bgl. Categorization of depth to water level of pre-monsoon period (May 2012) for HNS in Jamtara district is presented below in table 1

Table-1 Categorization of depth to water level of pre-monsoon period (May 2012)

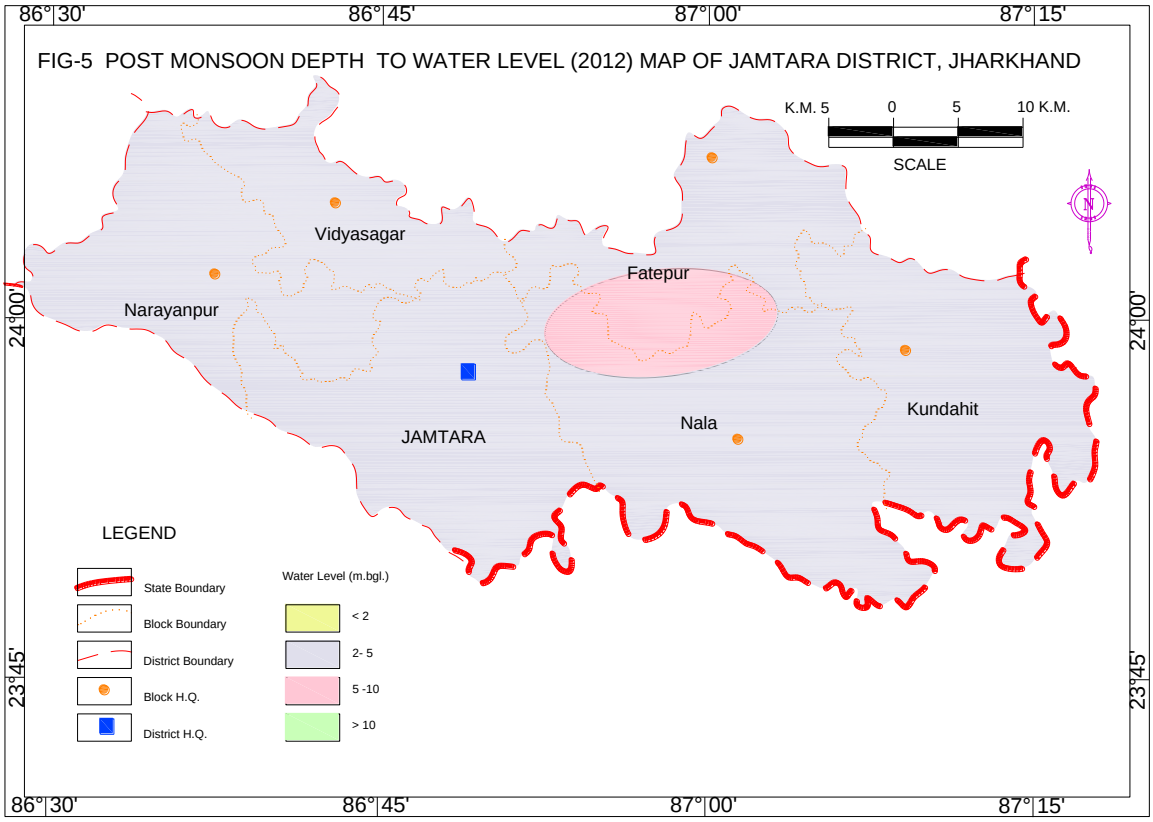
No. of wells measured	**Depth to water level (m bgl)**		0-2 (m)		2-5 (m)		5-10 (m)		10-20(m)	
	Min	**Max**	No.	%	No.	%	No.	%	No.	%
4	6.70	11.80	0	0	0	0	3	75	1	25



Categorization of depth to water level of post-monsoon period (November 2012) for HNS in Jamtara district is presented below table-2

Table-2 Categorization of depth to water level of post-monsoon period (November 2012)

No. of wells measured	**Depth to water level (m bgl)**		0-2 (m)		2-5 (m)		5-10 (m)		10-20(m)	
	Min	**Max**	No.	%	No.	%	No.	%	No.	%
4	2.63	5.93	0	0	3	75	1	25	0	0



4.1.4 Aquifer Parameters

A total of 02 exploratory wells and 01 observation well have been drilled down to depth of 198.46 m in hard rock formation to decipher the potential fracture zones. The exploratory data reveals presence of maximum of 6 sets of potential fractures between 12m and 136 m. depth. The yield of the wells has been found between 0.9 and 26.1 m^3/hr. The summarised hydrogeolgical data of exploratory wells has been presented in table-3.

Table-3 Summarised hydrogeological data of exploratory drilling in Jamtara District.

Rock Type	No.of fractures tapped	Depth zone within which fractures confined	Water level (m bgl)	Yield (m^3/hr)
Granite gneiss	1-6	12-135.58	6.89-8.16	0.9-26.1

4.2 Ground Water Quality

Ground water in the phreatic aquifers in Jamtara district has been found to be colourless, odourless and slightly alkaline in nature. The specific electrical conductance of ground water in phreatic zone during May 2011 was 200 µS/cm at 25ºC. The suitability of ground water for drinking purpose has been evaluated on the basis of pH, Total hardness (T.H), Ca, Cl, F and NO_3. The $_{chemical}$ concentration of these constituents, when compared with the drinking water specification recommended by IS: 10500, 1991 as presented in table-4, indicates that none of the samples exceed the permissible limit set for drinking use.

Table-4 Number of samples exceeding permissible limit in the district.

Quality	IS:10500, 1991		No. of samples in the district exceeding permissible limit
	Desirable limit	Permissible limit	
pH	7.42	No relaxation	0
T.H	75	600	0
Ca	16	200	0
Cl	18	1000	0
F	-	1.5	0
NO_3	-	100	0

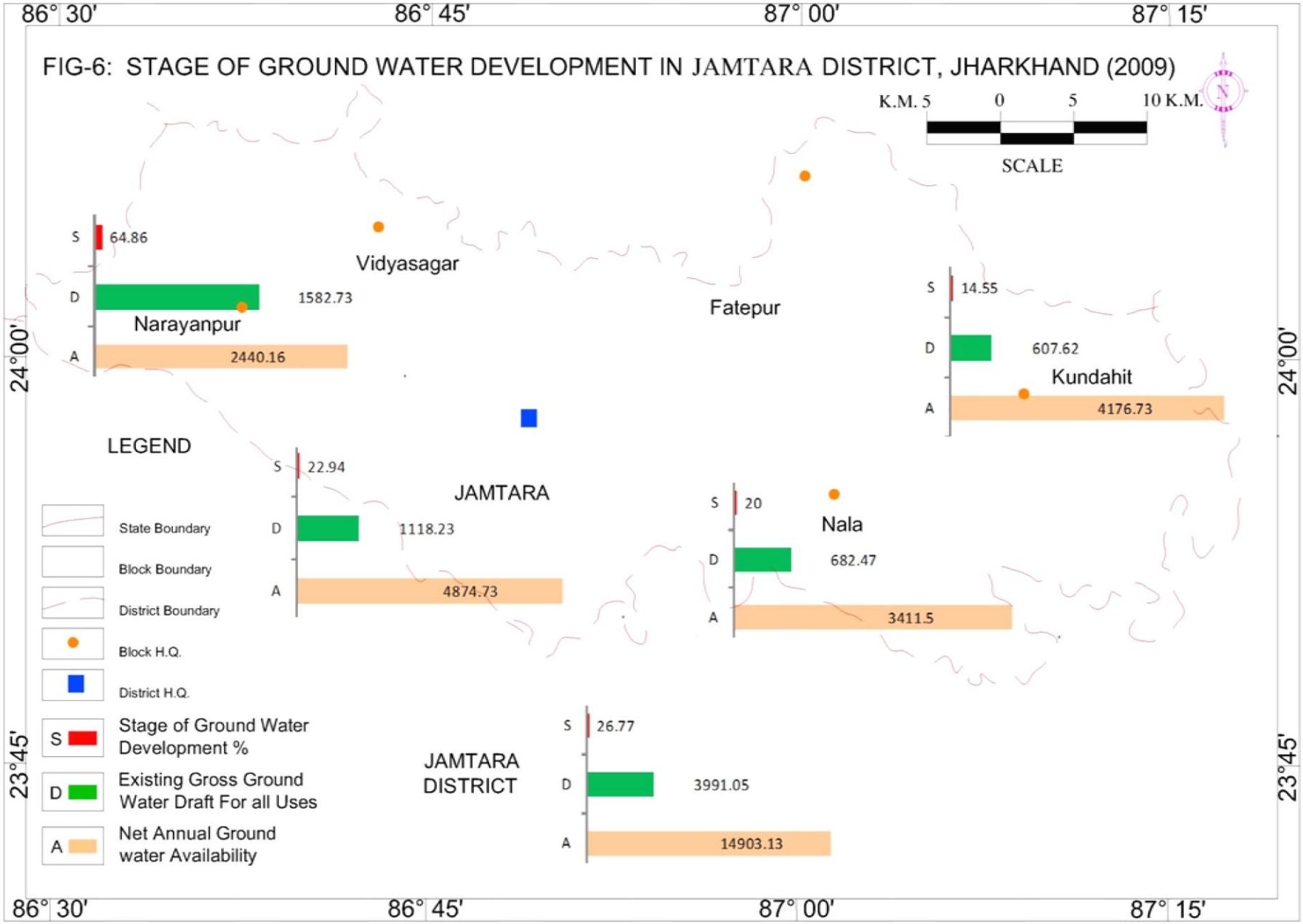


FIG-6: STAGE OF GROUND WATER DEVELOPMENT IN JAMTARA DISTRICT, JHARKHAND (2009)
86° 30'
86° 45'
87° 00'
87° 15'
24°00'
23°45'
K.M. 5 0 5 10 K.M.
SCALE
N
Vidyasagar
Narayanpur
S 64.86
D 1582.73
A 2440.16
Fatepur
Kundahit
S 14.55
D 607.62
A 4176.73
JAMTARA
S 22.94
D 1118.23
A 4874.73
Nala
S 20
D 682.47
A 3411.5
LEGEND
State Boundary
Block Boundary
District Boundary
Block H.Q.
District H.Q.
S Stage of Ground Water Development %
D Existing Gross Ground Water Draft For all Uses
A Net Annual Ground water Availability
JAMTARA DISTRICT
S 26.77
D 3991.05
A 14903.13

4.2.1 Status of Ground Water Development

In the rural areas the entire water supply is dependent on ground water. Ground water development is mainly carried out in the district through dug wells and Hand pumps. Dug wells are in general of 2 m diameter and between 8 to 15 m depth, depending on the thickness of the weathered zone, tapping the shallow ground water in the weathered zone and uppermost slice of the basement. Large number of dug wells used for drinking water is under private ownership for which there is no reliable data. Over the years Mark II/ Mark III hand pumps are being drilled in large numbers for ground water development. These hand pumps have the following two major advantages i) are less susceptible to contamination from surface sources and ii) they tap fractures between 20-60m depth which have been found to be less affected by seasonal water level fluctuation and thus have lesser chances of failure even during extreme summer. In rural areas of Jamtara district the number of hand pumps drilled by PHED is 9561 of which 6815 are under working condition.

In the urban areas ground water plays a supplementary role in water supply, the major supply being made through dams, reservoirs or weirs across rivers or streams. No authentic data is available on the number of ground water structures catering the urban water supply. For Jamtara urban area the dependence on ground water has been considered as 15% .

As per the latest resource estimation carried out following GEC 97 methodology, the overall stage of ground water development in Jamtara district is 22.94 % indicating sufficient scope of development. The ground water resource of Jamtara district is shown in the table-5 below.

4.2 Ground water Resources—

Ground water Resources of the district have been evaluated based on the recommendation of the GEC-1997. Resources are carried out on the block wise basis for the year 2009. Total dynamic Resources of the district come out to be 149.03 mcm. Total ground water drafts for all uses are 39.9105 mcm. Stage of ground water development is 27%. As per the future ground water development point of view, all blocks of the district come under the safe category.

TABLE 4 - BLOCK WISE GROUND WATER RESOURCES OF JAMTARA DISTRICT (AS ON 2009)

Sl No	Assessment unit	Net Ground Water Availability (Ha-m)	Existing Ground Water Draft For Irrigation (Ha-m)	Existing Ground Water Draft For Domestic And Industrial Water Supply (Ha-m)	Existing Ground Water Draft For All Uses (Ha-m)	Allocation For Domestic And Industrial Requirement Supply (Ha-m)	Net Ground Water Availability For Future Irrigation (Ha-m)	Stage Of Ground Water Development (%)	Categorisation of blocks
1	JAMTARA	4874.73	778.48	339.76	1118.23	416.45	3679.80	22.94	**SAFE**
2	Kundhit	4176.73	417.25	190.37	607.62	233.34	3526.14	14.55	**SAFE**
3	Nala	3411.50	423.17	259.30	682.47	317.84	2670.50	20.00	**SAFE**
4	Narayanpurn	2440.16	1317.53	265.20	1582.73	325.07	797.57	64.86	**SAFE**
	Total	14903.13	2936.42	1054.63	3991.05	1292.69	10674.01	26.77	**SAFE**

5.0 GROUND WATER RELATED ISSUES & PROBLEMS

Some of key ground water related issues are

a) Low stage of Ground Water development

b) Locating suitable sites for bore wells

c) Suitable design of dug wells and hand pumps

d) Optimal development of irrigation intensity by developing ground water available for future uses:

e) Creating public awareness for conserving ground water through awareness camps, NGO's and mass media.

6.0 Awareness & Training activity

6.1 Mass Awareness Campaign (MAP) & Water Management Training

6.2 Programme (WMTP) by CGWB:- NIL

7.0 AREA NOTIFIED BY CGWB/SGWA

None

8.0 RECOMMENDATIONS

Ground water development in the district should be stepped up to give boost to agricultural sector. The present acreage under irrigation which is just over 9% of total cultivable area can be increased by development of ground water through dug wells and bore wells.

In the hard rock areas, pin pointing suitable sites for bore wells is always a challenge. Considering the anisotropy in distribution of fractures at deeper level, suitable sites may be selected using remote sensing techniques in association with geophysical and hydro-geological investigations.

For deriving optimal benefit from aquifers in areas under fissured formation the dug wells should be so designed that it penetrates the weathered zone as well as top part (1-2 m) of the underlying bed rock so as to derive the benefit of the shallow aquifer. For hand pumps and shallow tube wells the casing provided against the weathered zone should be slotted at the bottom so that the well can extract shallow ground water also. In urban areas use of shallow aquifers should be encouraged.

The surface run off in urban areas and its peripheral parts should be harnessed to augment the ground water resource through appropriate techniques. For urban areas roof top rain water harvesting and artificial recharge is most suitable. Location and design of the structures should be guided by hydro-geophysical surveys. Sites for artificial recharge should be taken up if fractures are available and the depth of the recharge well should be governed by the depth of occurrence of the fractures.