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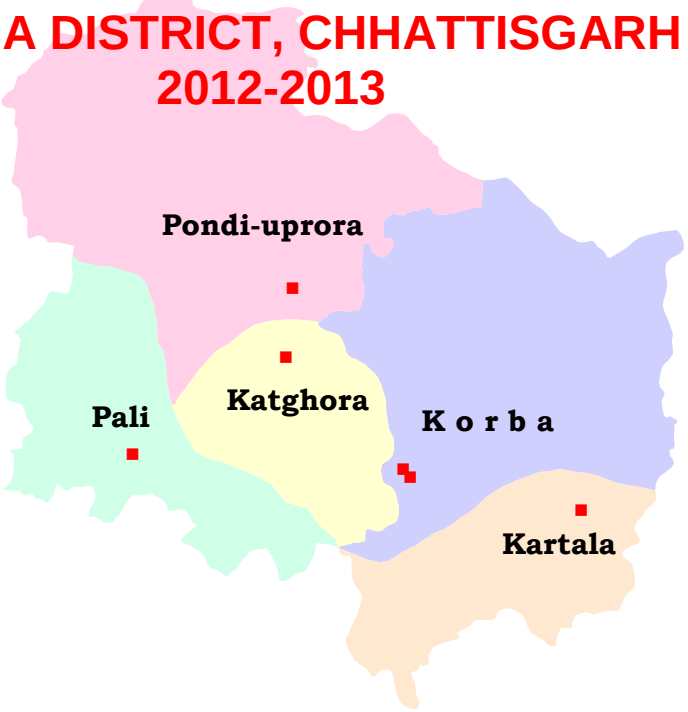
MINISTY OF WATER RESOURCES

CENTRAL GROUND WATER BOARD

GROUND WATER BROCHURE OF KORBA DISTRICT, CHHATTISGARH 2012-2013



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A. K. PATRE
Scientist 'C'

GROUND WATER BROCHURE OF KORBA DISTRICT

DISTRICT AT A GLANCE

I.	**General**			
	1.	Geographical area	:	7145.44 sq.km
	2.	Villages	:	717
	3.	Development blocks	:	5 nos
	4.	Population (2011)	:	1206563
	5.	Average annual rainfall	:	1329 mm
	6.	Major Physiographic unit	:	Northern Hilly and part of Chhattisharh Plain
	7.	Major Drainage	:	Hasdo, Teti, Son and Mand rivers
	8.	Forest area	:	1866.07 sq. km
II.	**Major Soil**			
	1)	Alfisols	:	Red gravelly, red sandy and red loamy
	2)	Ultisols	:	Lateritic soil, Red and yellow soil
	3)	Vertisols	:	Medium grey black soil
III.	**Principal crops**			
	1) Paddy		:	109207 ha.
	2) Wheat		:	670 ha.
	3) Pulses		:	9556 ha.
IV.	**Irrigation**			
	1) Net area sown		:	1314.68 sq. km
	2) Gross Sown area		:	1421.32 sq. km
	3) Gross irrigated area		:	8325 hectares
		a) By dug wells	:	827 ha
		b By tube wells	:	305 ha
		c) By tank/Ponds	:	489 ha
		d) By canals	:	4579 ha
		e) By other sources	:	2125 ha
V.	**Monitoring wells (by CGWB)**			
	1) Dug wells		:	48 no
	2) Piezometers		:	35 no
VI.	**Geology**		:	Chhota Nagpur Gneissic Complex (Granitic and Metamorphic rocks), arenaceous and argillaceous rocks of Gondwana Super Group and Chhattisgarh Super Group

VII. Hydrogeology

1) Water bearing formation	:	Weathered & fractured granite Porous Sandstones and Fractured shales, Cavernous Limestone
2) Water level		
a) Pre monsoon water level depth (May- 07)	:	3.18 m to 22.23 m bgl
b) Post monsoon water level depth (Nov-07)	:	0.81m to 13.72 m bgl
c) Water level trend (2001 - 2011)	:	0.3 m/Fall in Korba and Salihabhata area

VIII. Ground water exploration

1) Wells drilled	:	83 no
a) Exploration	:	42 no
b) Observation	:	06 no
c) Piezometer	:	35 no
2) Depth range		45 to 341 mbgl
3) Discharge	:	0.2 to 7.1 lps
4) Transmissivity	:	0.87 to 56 m^2/day (For Granites) 1.8 to 142.75 m2/day (For Sandstone)

IX. Ground water quality : Useful for all purposes.

X. Ground water resources (2009)

1) Annual available resource	:	42483 ha.m
2) Ground water draft	:	6364.92 ha.m
3) Stage of ground water development	:	14.98 %

XI. Awareness and training activity : Mass Awareness Training Programme at Korba (2005-06, 09-10,12-13) On Roof Top rainwater Harvesting and Artificial

XII. Artificial recharge and rain water harvesting

1) Projects by CGWB	:	Nil
2) Projects under technical guidance of CGWB	:	Nil

XIII. Ground water control and regulation : Nil (No over exploited, Critical, notified areas)

XIV. Major ground water problems and issues : Nil

GROUND WATER BROCHURE OF KORBA DISTRICT, CHHATTISGARH

By

A. K. Patre, Scientist 'C'

1. General

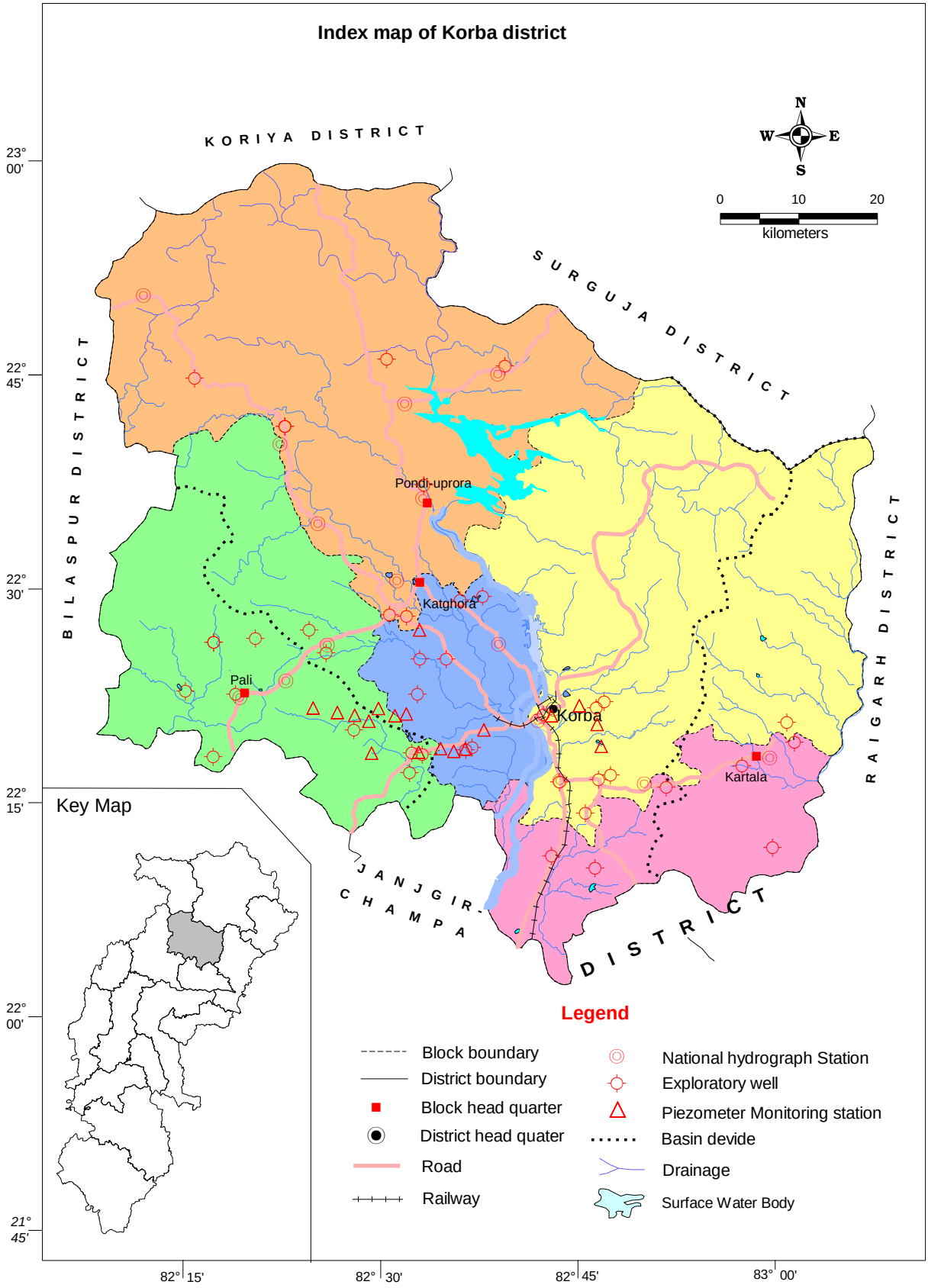
The Korba district covers an area of 7145.44 sq. km. It consists of 717 no of villages. For administrative convenience these villages are grouped into 5 tehsils and 5 development blocks. Korba is the district headquarters. The block head quarters are Korba, Pali, Poudi Uprora, Katghora and Kartala. The district is known mainly for its industrial development and mineral wealth. It is one of the leading Hydro and Thermal electricity producing districts of Chhattisgarh state. **Fig.1** shows the location of the district along with the drainage, block head quarters, location of NHS established by CGWB and exploratory wells drilled.

The entire area of the district is drained by River Hasdo except small area in eastern part. The tributaries are Tan, Teti Sondi Charnoi and Aharan Rivers. River Hasdo flows north to south through out its length in the district and eventually joins the Mahanadi River. The River Mand flows through eastern boundary of Korba district with Raigarh district. The tributaries for Mand River are Bijakera Nala, Chula Nala, Dhuwan Nala Korumsara Nala and Aonra Nala. The drainage pattern is typically dendritic in central and north western part and trellis in eastern part of the district controlled by initial slope. The drainage density is very high in the hilly areas of north and north-west part of the district indicating that the infiltration is low.

A major irrigation project, named Minimata hasdeo Bango project is constructed on River Hasdeo, 42 kms away from the district headquarter, Korba and 12 km from Katghora. The main reservoir is spread over an area of 187 sq.kms and the gross catchment area of the reservoir is 6730 sq.kms. The live storage capacity of the reservoir is 3416 mcm and it caters the irrigation requirement of the adjoining districts. A well distributed canal network is spread in Akaltara, Janjgir, Champa, Sakti, Kharsia blocks of the Janjgir Champa district to irrigate 2 lakh 55 thousand hectare agricultural land .

The district experiences Sub-tropical climate characterized by extreme cold in winter and extreme hot in summer. The normal annual rainfall for the district is 1506.7 mm.with 50-65rainy days. The annual temperature varies from 10^{o}C in winter to 46^{o}C in summer. The relative humidity varies from 82 % in rainy season to 35-40 % during winter.

Fig. 1


Index map of Korba district
KORIYA DISTRICT
SURGUJA DISTRICT
BILASPUR DISTRICT
RAIGARH DISTRICT
JANJGIR-CHAMPA DISTRICT
N
W
E
S
0
10
20
kilometers
Pondi-uprora
Katghora
Pali
Korba
Kartala
Key Map
Legend
Block boundary
District boundary
Block head quarter
District head quater
Road
Railway
National hydrograph Station
Exploratory well
Piezometer Monitoring station
Basin devide
Drainage
Surface Water Body
23° 00'
22° 45'
22° 30'
22° 15'
22° 00'
21° 45'
82° 15'
82° 30'
82° 45'
83° 00'

The district can be divided in to two Physiographic divisions. southern part of the district represents Chhattisgarh plains, with an elevation ranging between 290 and 320 m amsl. The northern part of the district is predominantly representing denudation hills. This is characterized by hilly tracks and intermediate plateau, flanked by high mounds and hillocks rising to an altitude of 1000 meters. The elevation of this region ranges from 400 to1000 meters. The slope is towards south direction. The main Geomorphological features and landforms developed in the district are structural plain, plateaus, and denudational hills.

The soils in the district are having wide variations. About 83% of the district area, is covered by yellowish to reddish Alfisols, These soils are derived from weathering of crystallines and metamorphic rocks. About 14% area of the district in north and eastern parts is covered by Ultisols in the form of laterites. The remaining part of the district is represented by light grey and shallow black inceptisols, covering small parts of Pondi Upreda blocks. Inceptisols are soils of relatively new origin.

2. Geology and Hydrogeology

The district is underlain mainly by three distinct geological formations ranging in age from Achaean to recent. The crystalline basement, occupy western and southwestern parts of the district, comprising of granite and granitic gneiss rocks belonging to Chhota Nagpur group, severally intruded by the quartz veins and basic dykes. The rocks of Chhattisgarh Super group are unconformably overlying the basement crystalline and are represented by the sandstone, limestone and shale sequence occupying small area at southern part of the district. The major part of the district is occupied by the rocks of Gondwana of Super Group are overlying the Chhattisgarh Super group and represented by the sandstone, shale and coal seam.

The ground water mainly occurs in phreatic (water table) conditions and at places under semi-confined conditions. In granites the weathered thickness varies from 18 to 40 m. and the weathered and fractured formation constitutes the aquifers. Invariably the fractures are limited to a depth of 9 to 133 m. In sedimentary formations, mainly in Barakar and Kampti sandstone, primary porosity constitutes the good aquifers. In limestone, the fractures/caverns are limited to a depth of 102-106 m.

In all, 13 no of observation wells (National Hydrograph Network Stations) and 4 no piezometers were established in the district to monitor water levels 4 times a year and water quality once a year. The pre-monsoon ground water level in the district (**Fig.2**) varies from 3.18 to 13.47 mbgl with average water level of 8.3 mbgl and the post monsoon water level (**Fig.3**) varies from 0.81 to 10.21 mbgl with average water level of 4.5 mbgl. The water level fluctuation varies from 2.5 to 9.36 m with average fluctuation of 4.4 mbgl The water level trend (10 years) for premonsoon period indicates a rising trend in 29% of the stations with no significant rise in any station and a falling trend 71% of stations with significant fall in 2 stations ie: Korba and Salihabhata. The post -monsoon water level trend indicates a rising trend in 29 % of the stations with a significant rise in 1 stations at Pondi and a falling trend in remaining 71% of stations with a significant fall in 1 stations ie: Kartala.

Nearly 75% of the exploratory wells drilled in hard rock terrain and remaining 25 %m in soft rock terrain by the department. The yield in granitic rocks varies from 0.5 to 3.5 lps. Nearly 15% of the exploratory wells in granitic rocks yielded more than 3 lps. The yield in Sedimentary formation varies from 0.28 to 7.1 lps. Nearly 27% of the exploratory wells drilled in Sedimentary formation yielded more than 3 lps. The Transmissivity values for granitic varies from 0.87 to 56 m^2/day and for sedimentary rocks, mainly sandstones, is 1.8 to 142.75 m2/day.

3. Ground water resource

The ground water resources for Korba district were estimated based on the GEC 1997 methodology and were projected to the year 2009. The estimates indicate that the annual replenishable ground water resource for the district was 456.15 mcm. . The net annual ground water availability was 424.83 mcm The gross annual draft was estimated as 63.65 mcm, out of which draft for irrigation was 40.34 mcm and for domestic purpose was 23.30 mcm.

4. Ground water development

The stage of ground water development estimated for Korba block is 14.98 %, for Kartala block is 30.16 %, for Katghora block 36.8% and for Pali block is 20.95 %. and for Poudi Uprera block is 5.87%.The over all stage of ground water development for the district is 14.98 %.The block wise stage of ground water development in the district is depicted in **Fig.4.** The hydrogeological map prepared

Fig. 2

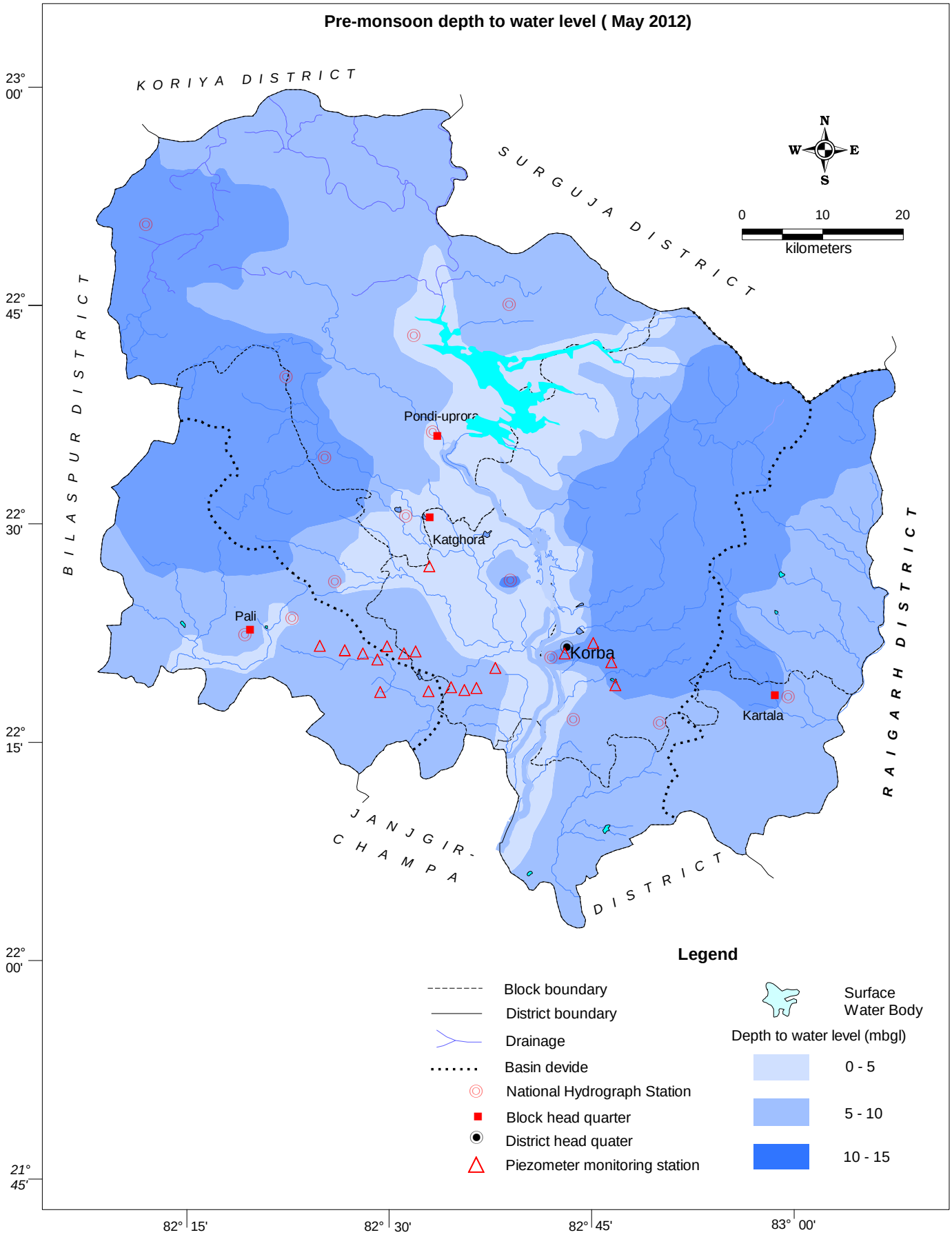

Pre-monsoon depth to water level (May 2012)
KORIYA DISTRICT
SURGUJA DISTRICT
BILASPUR DISTRICT
RAIGARH DISTRICT
JANJGIR-CHAMPA DISTRICT
N
W
E
S
0
10
20
kilometers
Pondi-uprora
Katghora
Pali
Korba
Kartala
23° 00'
22° 45'
22° 30'
22° 15'
22° 00'
21° 45'
82° 15'
82° 30'
82° 45'
83° 00'
Legend
Block boundary
District boundary
Drainage
Basin devide
National Hydrograph Station
Block head quarter
District head quater
Piezometer monitoring station
Surface Water Body
Depth to water level (mbgl)
0 - 5
5 - 10
10 - 15

Fig. 3

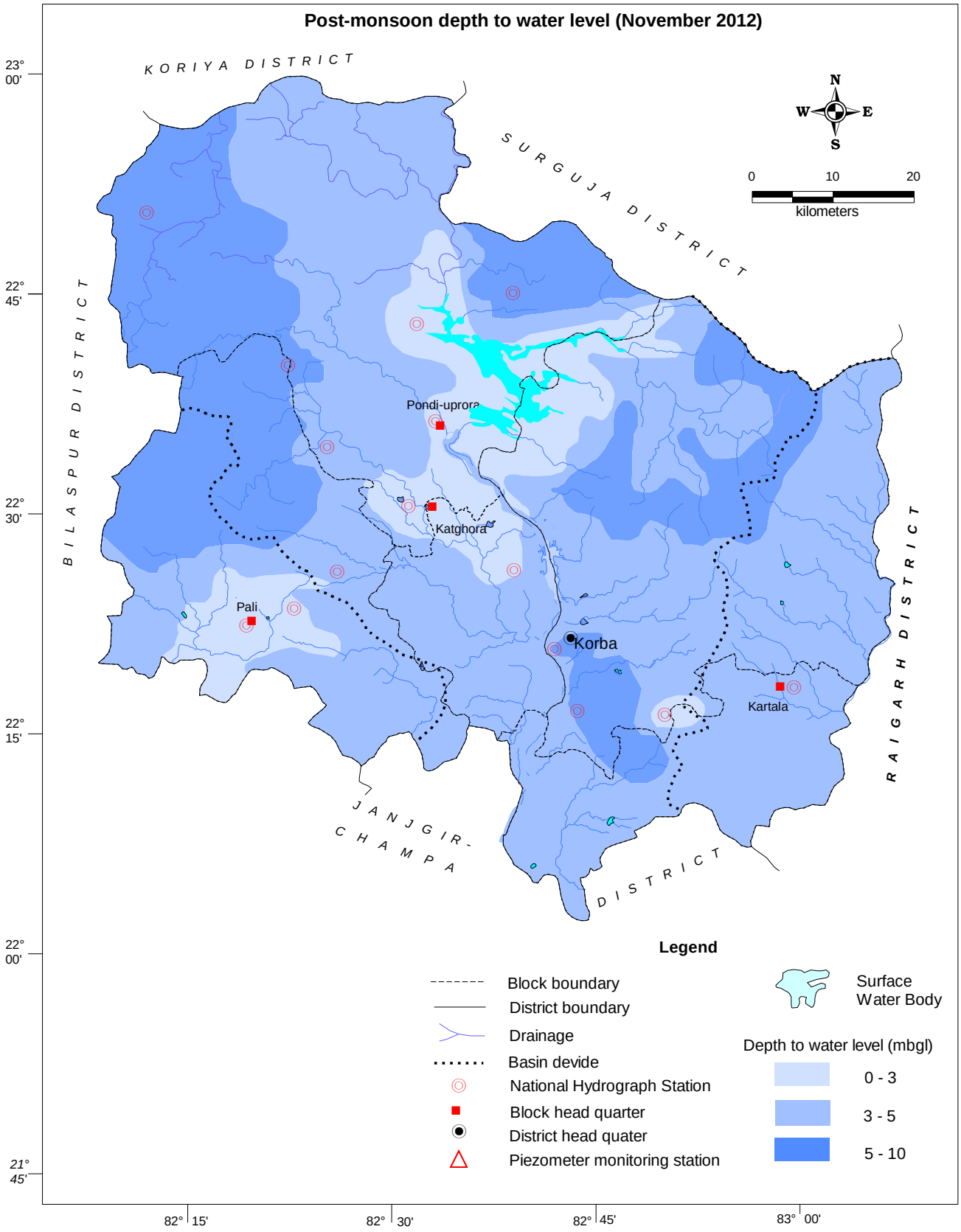
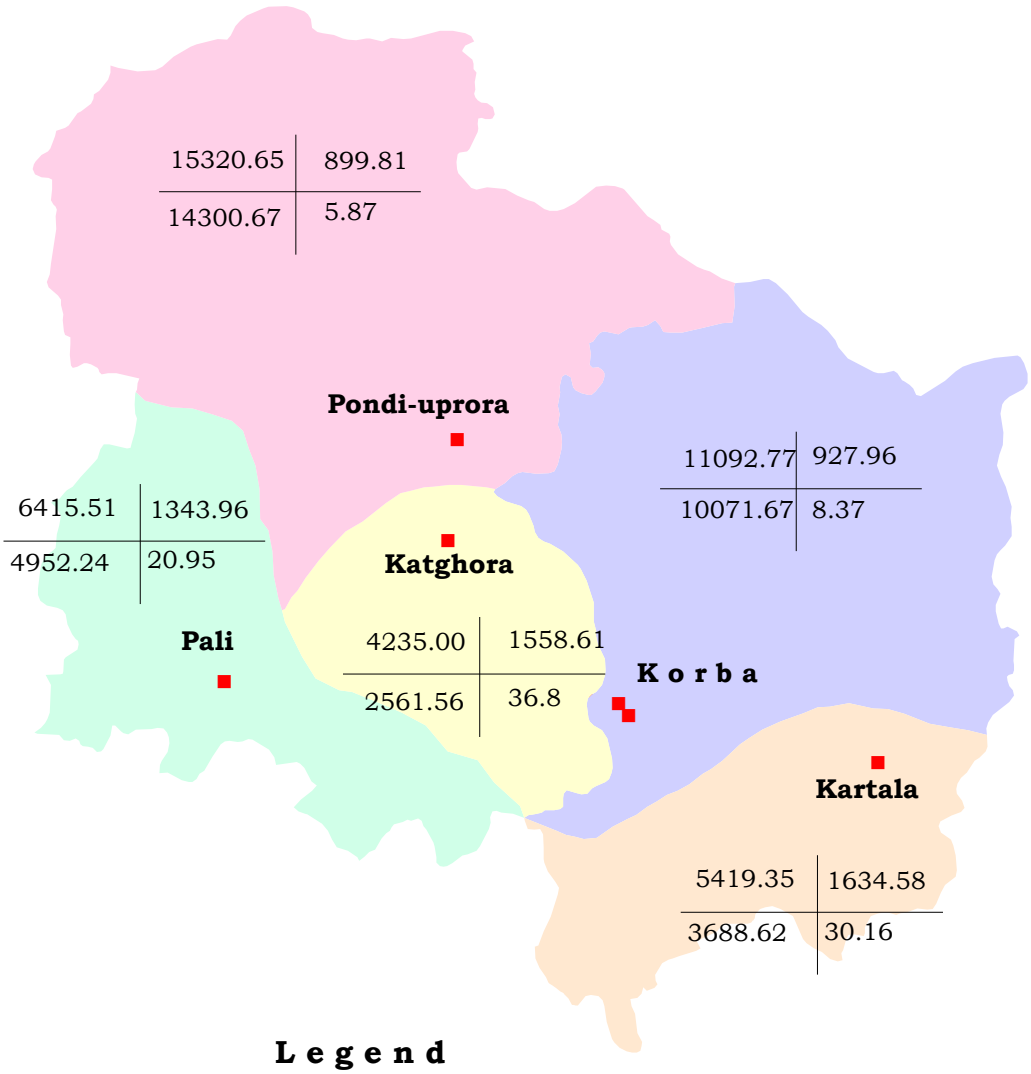

Post-monsoon depth to water level (November 2012)
KORIYA DISTRICT
SURGUJA DISTRICT
BILASPUR DISTRICT
RAIGARH DISTRICT
JANJGIR-CHAMPA DISTRICT
N
W
E
S
0
10
20
kilometers
Pondi-uprora
Katghora
Pali
Korba
Kartala
23° 00'
22° 45'
22° 30'
22° 15'
22° 00'
21° 45'
82° 15'
82° 30'
82° 45'
83° 00'
Legend
Block boundary
District boundary
Drainage
Basin devide
National Hydrograph Station
Block head quarter
District head quater
Piezometer monitoring station
Surface Water Body
Depth to water level (mbgl)
0 - 3
3 - 5
5 - 10

Fig. - 4

Ground Water Resource (as on March 2009) Map of Korba District



for the district is presented as **Fig.5**. The yield potential and the recommended suitable abstraction structures for the area are shown in **Fig.6**.

The total 5876 Dug well is being used for irrigation purposes. The dug well depth varies from 4 to 15 m and the dia varies form 2.00 to 3.5 m. Diesel or electric operated pumps of 0.25 to 1HP or traditional teda is used to lift the water from dug wells for the irrigation purposes. The bore wells 515 no. drilled in the area with 60 to 90m deep and dia varying from 0.10 to 0.15 m. The electrical pump or rope and bucket are used to lift the water for domestic purpose. Submersible electrical pumps of 3 to 5 HP are used for irrigation purpose in case of bore wells in the area. The bore wells in granitic terrain can irrigate an area of 0.5 to1.5 ha for paddy crops.

Ground water is the main sources of drinking water in the district. There are 11028 hand pumps installed covering 713 no of villages in the district . In all 515 no of bore wells and 5876 no of dug wells exist in the district. Together they irrigate around 1132 ha. The contribution of ground water for irrigation comes to nearly 15 % in the district. The use of ground water in non-command area is maximum.

5. Ground water quality

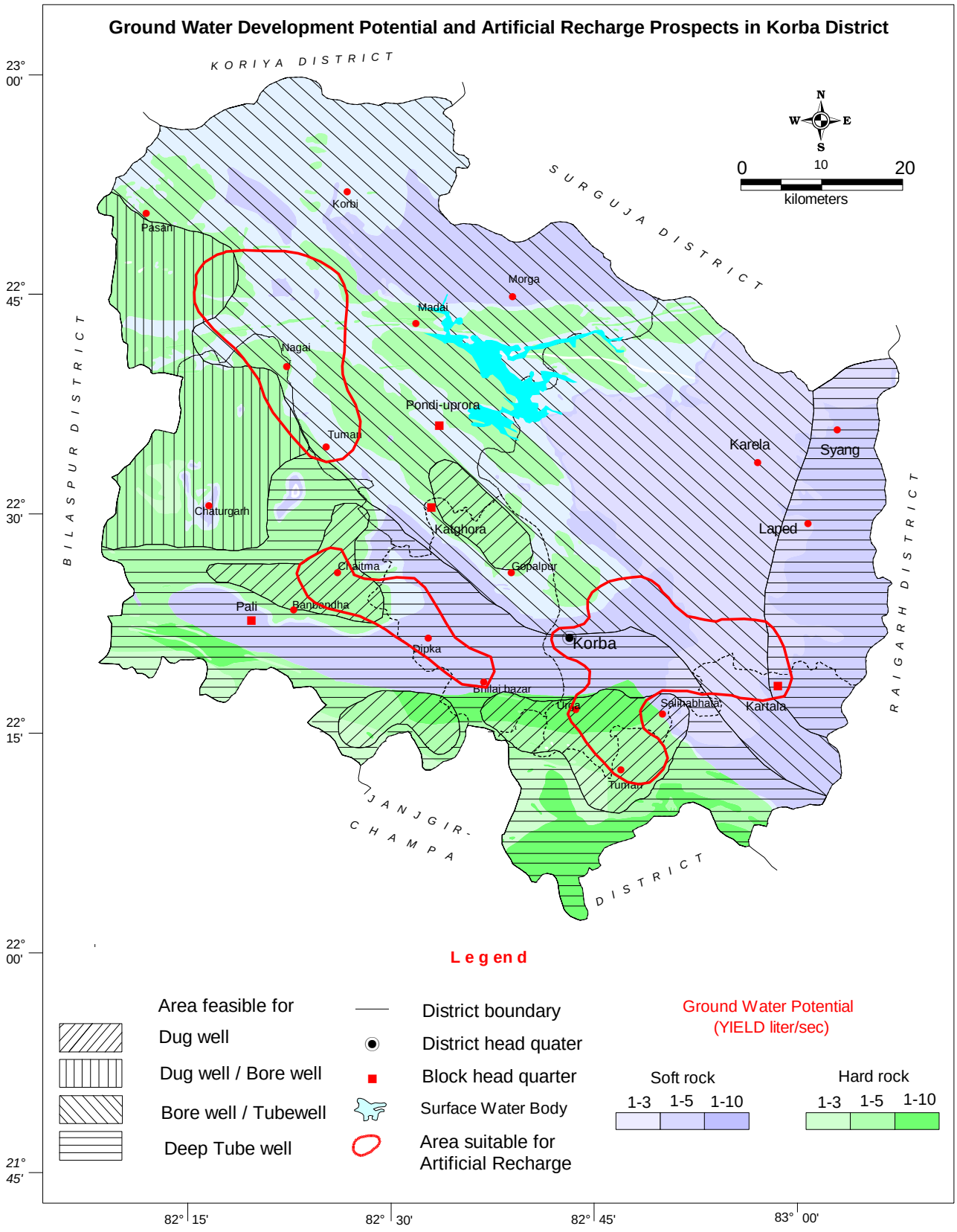
The water samples collected from NHS stations during the month of May 2007 (premonsoon) were analysed to determine the quality of ground water in the district. The analysis shows that the major ions are as per BIS standard and the ground water in the district is suitable for all purposes.

The plot of Piper tri linear diagram and US salinity diagram indicates that the ground water in the district is suitable for drinking, irrigation and all other purposes. The EC values particularly in granitic terrain range between 298 to 785 micro siemens/cm at 25^{o}C**.** and the pH values range between 7.7 and 8.1. In sedimentary rocks the EC values ranges between 300 and 685 micro siemens /cm at 25°C and the pH values ranges between 7.9 and 8.1. The over all composition of ground water indicates that it is moderately alkaline and predominantly $CaHCO_3$ type (Calcium bicarbonate type).

6. Ground water management strategy

There exists a wide scope for ground water development in the district. The available ground water resources for the district are of the order of 424.83 mcm and the ground water draft is 63.64 mcm. The Net Ground Water Availability for Future

Fig. 6


Ground Water Development Potential and Artificial Recharge Prospects in Korba District
KORIYA DISTRICT
SURGUJA DISTRICT
BILASPUR DISTRICT
RAIGARH DISTRICT
JANJGIR-CHAMPA DISTRICT
N
W
E
S
0
10
20
kilometers
Korbi
Pasan
Morga
Madai
Nagai
Pondi-uprora
Tumaan
Karela
Syang
Laped
Chaturgarh
Katghora
Chaitma
Gopalpur
Pali
Bandhandha
Pipka
Korba
Bhilai bazar
Urga
Silhabhata
Kartala
Tumaan
23° 00'
22° 45'
22° 30'
22° 15'
22° 00'
21° 45'
82° 15'
82° 30'
82° 45'
83° 00'
Legend
Area feasible for
Dug well
Dug well / Bore well
Bore well / Tubewell
Deep Tube well
District boundary
District head quater
Block head quarter
Surface Water Body
Area suitable for Artificial Recharge
Ground Water Potential (YIELD liter/sec)
Soft rock
1-3
1-5
1-10
Hard rock
1-3
1-5
1-10

Irrigation Development is in order of 356.05 mcm. The stage of ground water development is only 14.98 %.

7. Water Conservation and Artificial Recharge

The normal annual rainfall for the district is 1329 mm. There exist a huge surplus non-committed run off in the district. Rain water harvesting and artificial recharge structures at suitable locations can be constructed to improve the storage capacity of the surface and subsurface reservoirs. An area of about 899 sq.kms in the district has been identified feasible for artificial recharge of ground water and is shown in **fig.6**.

8. Awareness and Training activity:

So far Four Mass Awareness Training Programme on Roof Top Rain Water Harvesting and artificial recharge has been organized during 2005-06, 2009-10 and 2012-13 by Central Ground Water board at district Head Quarter, Korba. Representatives from PHED, State Ground Water Survey dept. and Forest department, NGO's and ground water professionals were participated in this training programme.

Fig. 5

Hydrogeological Map of Korba District

L E G E N D

Group	Formation	Lithology
Recent	Quaternary	Laterite
	Deccan trap	Basalt
Gondwana Super Group	Lameta Group	Calcareous Sandstone and Limestone
	Kamthi	Ferruginous Sandstone
	Barakar	Arkosic Sandstone, Shale and Coal seams
	Karharbari	Greywackes, Sandstone, pebbly Sandstone
	Talchir	Shale, Sandstone, Boulder bed
Chhattisgarh Super Group	Raigarh	Unclassified Shales, Limestone and Dolomite
	Chandrapur	Sandstone and Conglomerate
	Acid intrusives	Quartz and Pegmatite veins
	Basic intrusives	Dolerite sill and Dykes
Chhotta Nagpur gneissic complex	Chhotta Nagpur	Unclassified Granite gneiss
	Unclassified	Unclassified Metamorphics

- 450 — Water table countour (mamsl)
- → Ground Water flow
- Drainage
- ▲ 500 — Trianangulation height (mamsl)
- Lineament
- Water devide
- 1400 — Isohyet (mm)
- National Hydrograph Station
- Piezometer Monitoring Station
- Exploratory Well
- Block Head quarter
- District Head quarter
- District Boundary
- 400 — EC micro siemens/cm
- Surface Water Body

Ground Water Potential

(YIELD liter/sec)

Soft rock			Hard rock		
1-3	1-5	1-10	1-3	1-5	1-10