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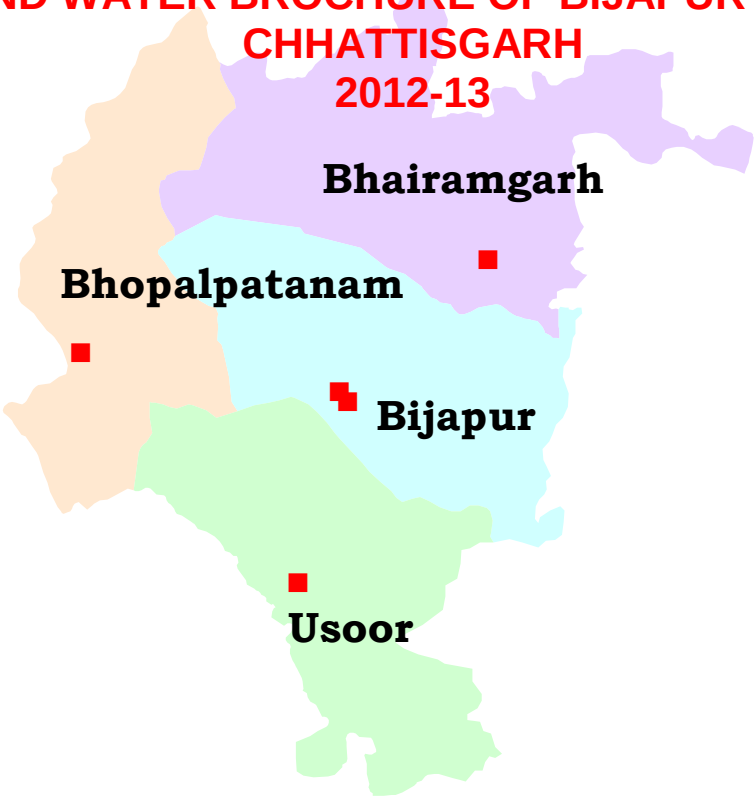
GOVERNMENT OF INDIA
MINISTRY OF WATER RESOURCES
CENTRAL GROUND WATER BOARD

GROUND WATER BROCHURE OF BIJAPUR DISTRICT, CHHATTISGARH
2012-13



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GROUND WATER BROCHURE OF BIJAPUR DISTRICT

DISTRICT AT A GLANCE

I. General Information:

1. Location	:Long (East): 80°14'48" to 81°14'01" : Lat (North): 18°08'20" to 19°24'16"
2. Geographical area	: 6552.96 sq.km.
3. Community Development blocks	:04no.
4. Villages	:738 no
5. Population	: 255180 (As per Census 2011)
6. Average annual rainfall(2004)	:1450 mm
7. Major physiographic unit	:Bastar plateau
8. River Basins and major drainage	:**Godavari Basin** :Major rivers and streams Indravati,Sabri,Dantewadaetc
8. Forest area	:4956.64 sq.km (Nearly 75.6% of geographical area)

II. Major Soils

1. Alfisols	:Red sandy soils :Red loamy soils

III. Principal crops (2005-06)

Crop seasons	:Two (Kharif and Rabi)
1. Rice	:3064ha
2. Pulses	:20 ha
3. Wheat	:20 ha

IV. Irrigation (2004-05)

1. Net sown area	:64854 ha
2. Gross irrigated area	:3164 ha
a) By dug wells	:82 no. (60 ha)
b) By tube wells	:25 no.s (50 ha)
c) By tanks/ponds	:446 no.s (3025ha)
d) By canals	:
e) By other sources	:76 ha

V. Geology : Bastar Gneisses& Bengpal Group and Pakhal group (Granite gneiss, Quartzite & Calc-Silicate rocks metasediments Sandstone,Shale and limesstone)

VI. Hydrogeology

Water bearing formations :Major formations are porous , fractured& weathered Sandstones, Granite gneisses, etc.

VII. Ground water monitoring (by CGWB)

1. No. of monitoring stations :08 no.s
   a) Dug wells :06no.s
   b) Piezometers :02 no.s

2. Water levels

a) Pre-monsoon water level depth (2007) :2.5to 12.0 mbgl
b) Post-monsoon water level depth(2007) :0.94 to 6.94 mbgl
c) Water level fluctuation :0.07 to 5.11 m
d) Water level trend (2003-2012) :On average water level trend is neither decline nor fall

VIII. Ground water exploration (by CGWB)

1. Total no. of wells drilled :01 no.s
   a) Exploratory wells :01 no.s
   b) Observation wells :0 no.s
   c) Piezometers :4 no.s
2. Depth range : 60 to 100 mbgl
3. Discharge : 0.5 to 6 lps
4. Transmissivity : -
5. Storativity : -

IX. Ground water quality : Suitable for all purposes

X. Ground water resources (as on 2009)

1. Annual available resources : 76858.28 ham
2. Ground water draft : 1221.29 ham
3. Stage of ground water development : 1.59%

XI. Awareness and Training activity : Neither Mass awareness nor training programme are organized in the district

XII. Artificial recharge and rain water harvesting

1. Projects by CGWB : Nil
2. Projects under technical guidance : Nil

XIII. Ground water control and regulation : Nil (No critical/ notified/ Overexploited area)

XIV. Major ground water problems and issues: Nil

Ground Water Brochure of Bijapur district, Chhattisgarh
By
Rajeev kumar Tripathy, AHg

1. General

The Bijapur district covers an area of 6552.96 sq.km. It consists of 738 no. of villages. For administrative convenience these villages are grouped into 4 no. of community development blocks. Bijapur is the districts headquarter. Nearly 75.6 % of the total geographical area of the district is covered by forest. **Fig 1** shows the location of the area along with drainage, block headquarters, Network Hydrograph Stations and location of exploratory wells established and drilled by Central Ground Water Board in the district respectively.

The district comes Godavari basin and the major tributaries of the Godavari river in the district are Indrawati, Berudi, Chint, Talperu, etc. The drainage pattern in the district is dendritic to sub-angular and the overall drainage density is high in the granitic terrain in comparison to protorozoic sedimentary formations, least drainage density is observed in the area covered with alluvium (along rivers Indravati).

The annual rainfall varies from 1340 to 1670 mm in the district. Presented in **Fig 5**, higher magnitude of rainfall recorded in Bhopalpatnam and Bijapur blocks where as low rainfall was recorded in the Usoor block of the district; the normal annual for the district is 1450 mm. The annual temperature varies from 10°C in winter to 40°C in summer. The relative humidity varies from 85% in rainy season to 35-45% during winter.

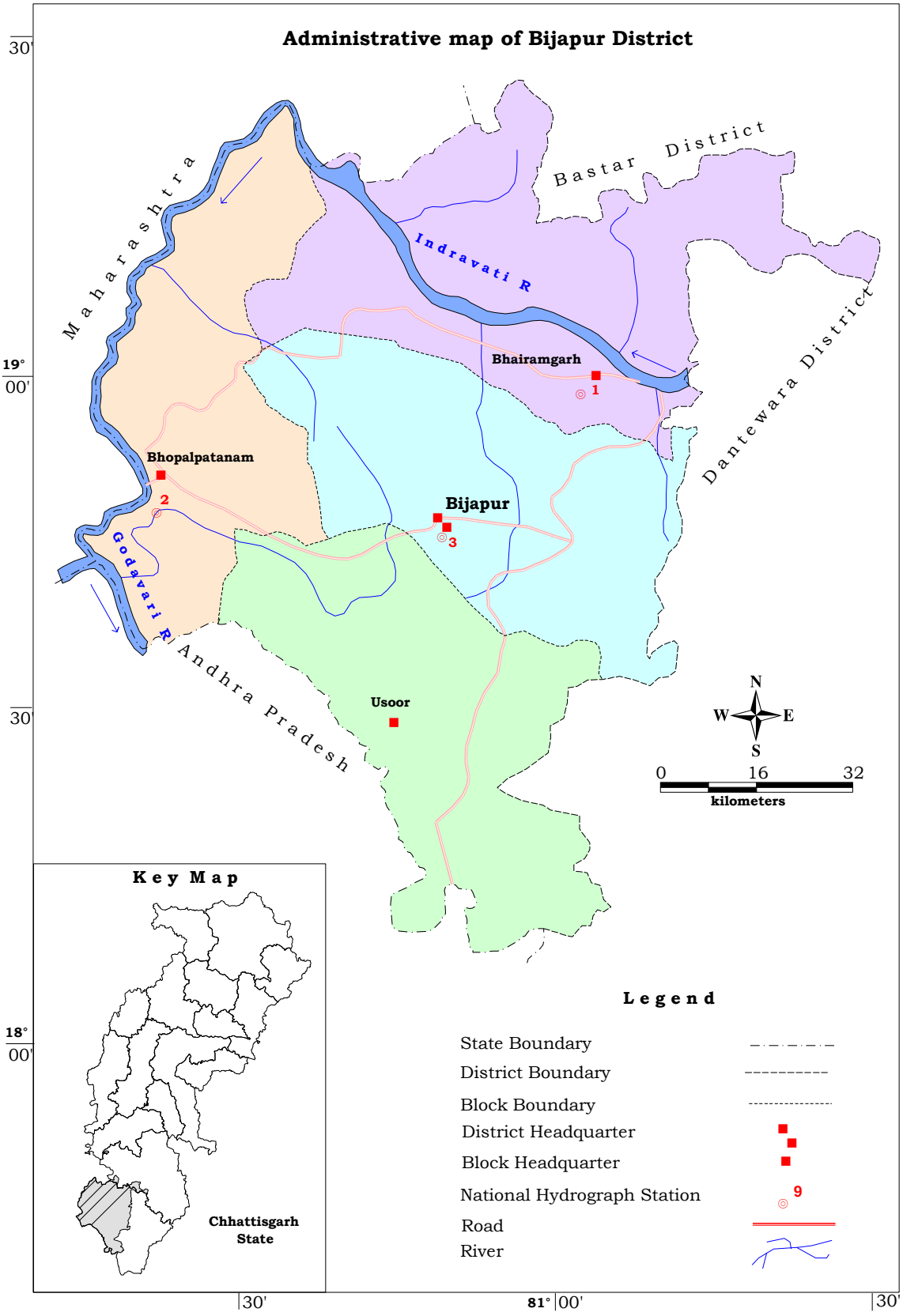
Physiographycally the district forms the part of Bastar plateau. The area is characterized by a highly undulating topography with hills and valleys. The area exhibits mainly structural hill , valley and pediment/pediplain along with some area of structural plains and some flood plains in the southern part. The plateaus and ridges in the area are of 600 m amsl. The maximum elevation observed for hilly areas is 940 m amsl (near Bailadila hill) and is at the eastern part of the district. The lowest elevation is 58 m amsl (Bhopalpatanam village) and is on the western part of the district.

The soils in the district are having wide variations, and are mostly insitu in nature. Most of the area is covered by Red sandy Alfisols. It occurs over the Bastar Gneisses and Bengal group. The red loamy Alfisols is present as patches in northern and eastern part.

2. Geology and Hydrogeology

The oldest basement crystalline rocks and gneisses belonging to the Bengpal group cover about 5 % area of the district mostly in the

Fig. - 1


Administrative map of Bijapur District
30'
19°
00'
30'
18°
00'
Maharashtra
Bastar District
Indravati R
Dantewara District
Bhairamgarh
1
Bhopalpatanam
2
Bijapur
3
Godavari R
Andhra Pradesh
Usoor
N
W
E
S
0
16
32
kilometers
Key Map
Chhattisgarh State
Legend
State Boundary
District Boundary
Block Boundary
District Headquarter
Block Headquarter
National Hydrograph Station
9
Road
River
30'
81° 00'
30'

central part of the district. The rock formations are mostly hard and compact Pink and Grey granites, Charnokites and gneisses associated rocks, often intruded by dykes and pegmatite veins. However Schist,.Weathered mantle is the main aquifer.Generally the weathered zone is immediately followed by a fracture. In granite and gneisses the yield of well depends upon structure, lithology and landform. Of these, structure controlled by lineament plays a major role in controlling the yield. Felsic rocks (Pink granite) have more fractures compared to mafic and mafelsic rocks.

The rocks of Lower Proterozoic Dongargarh Super Group, Comprising mainly of fine to medium grained Potash rich Dongargarh Granite and its equivalents are distributed in northern and central parts of the district. The area comes under plateau and hilly region. General elevation of the area is between 300 and 500 m. amsl Effect of weathering through joints down to 40 metrs can be very well observed during drilling in this formation. Intrusives of pegmatite /quartz vein can be often seen in this granite. The weathered thickness in granites ranges between 16 and 40 mbgl.Weathered granite followed by a fracture at bottom is the only aquifer which posses good quantity of water. In general the shallow fractured zone lies within 80 m.depth. The yield of this zone varies from 3 to 5 lps and specific capacity varies between 23 and 37lpm/mdd.

Rock of Pakhal group covers in the part of Bhopalpatanam blocks of the district covering an area of about 422 sq.kms.Deposition in this basin is simultaneous to the deposition of Chhattisgarh basin, which exhibit arenites, argillites and carbonate rock sequence over the basement crystallines.

Apart from these the recent alluvium and Pliestocene Laterites occur in isolated patches along Indravati rivers ,river deposits are mainly consist of clays and sand thickness varies from 10 to 30 meters ,alluvium formation formed potential aquifer in Bhopalpatan blocks ,yield of the formation varies from 1 to 5 lps.

The ground water in these formations occurs under water table conditions in the weathered mantle of the crystalline formation and weathered part of sedimentary formation (Pakhal group) and under confined to semi-confined conditions in the fractured part of the crystalline, metamorphic rock and cavernous zones in limestone of the Sabari formation . Weathered mantle over the hard and massive rocks mainly provides space for ground water movement and storage. The thickness of the weathered part in the area generally varies between 10 to 20 m. This province is found least potential with respect to ground water yield and development. Generally bore wells in the area yield 1- 3 lps and dug wells are having yield between 0.25 to 2.3 lps.

In all there are 8 no. of observation wells (i.e. National Hydrograph Network Stations); out of which 6 no.s are dug wells and 2 no.s are piezometers were established in the district to monitor the water levels four times a year and water quality once a year.

The pre-monsoon ground water level in the district (**Fig 2**) varies from 2.5 to 12.0 mbgl with an average around 4 to 9 mbgl and the post-monsoon water level (**Fig 3**) varies from 0.94 to 6.94 mbgl with an average around 3 to 6 mbgl. The water level fluctuation varies from 0.07 to 5.11m with an average around 2 to 4 m The water level trend (for 10 years) for pre-monsoon and post-monsoon period on an average indicates no significant change (rise or fall).

Fig. - 2

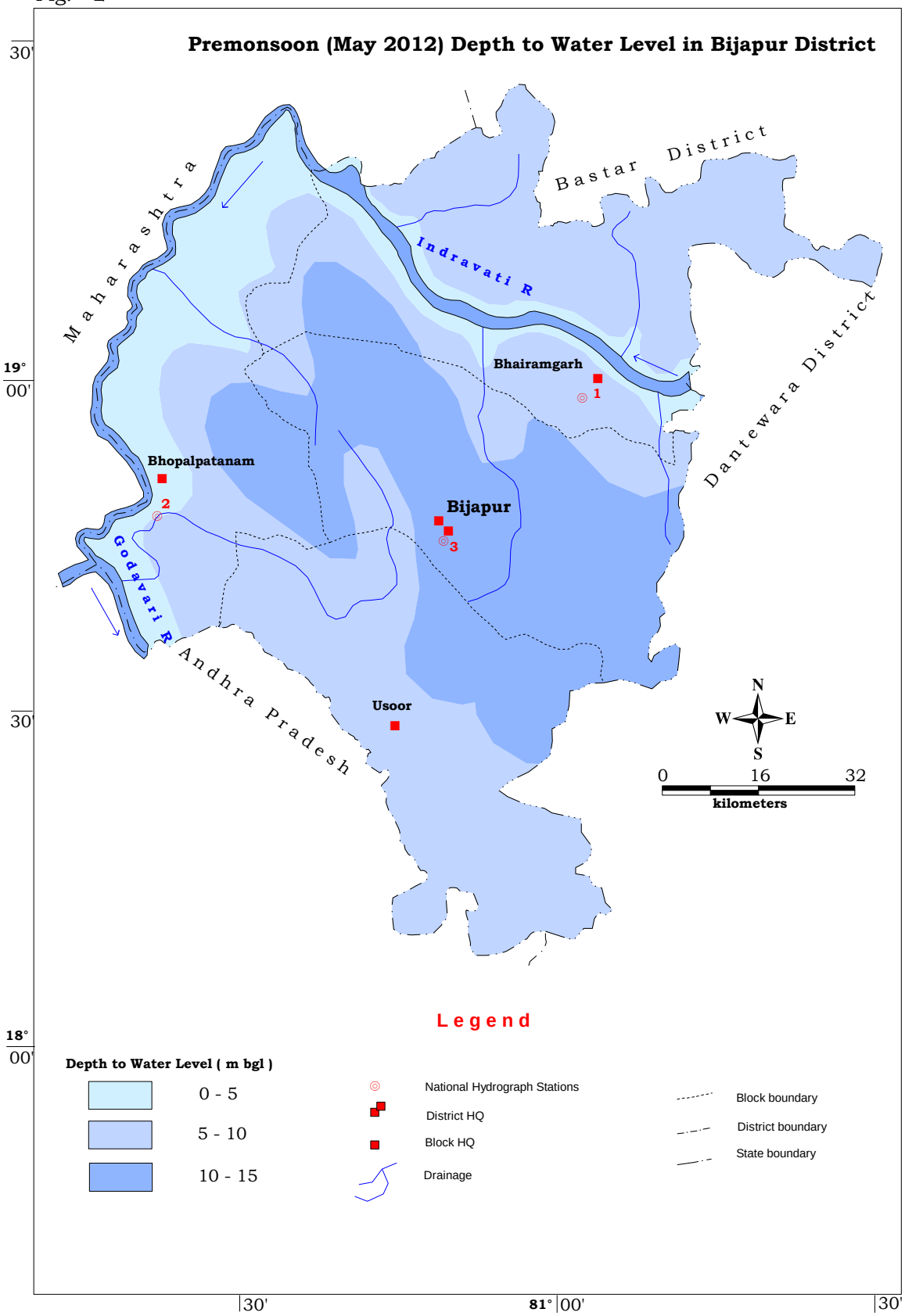
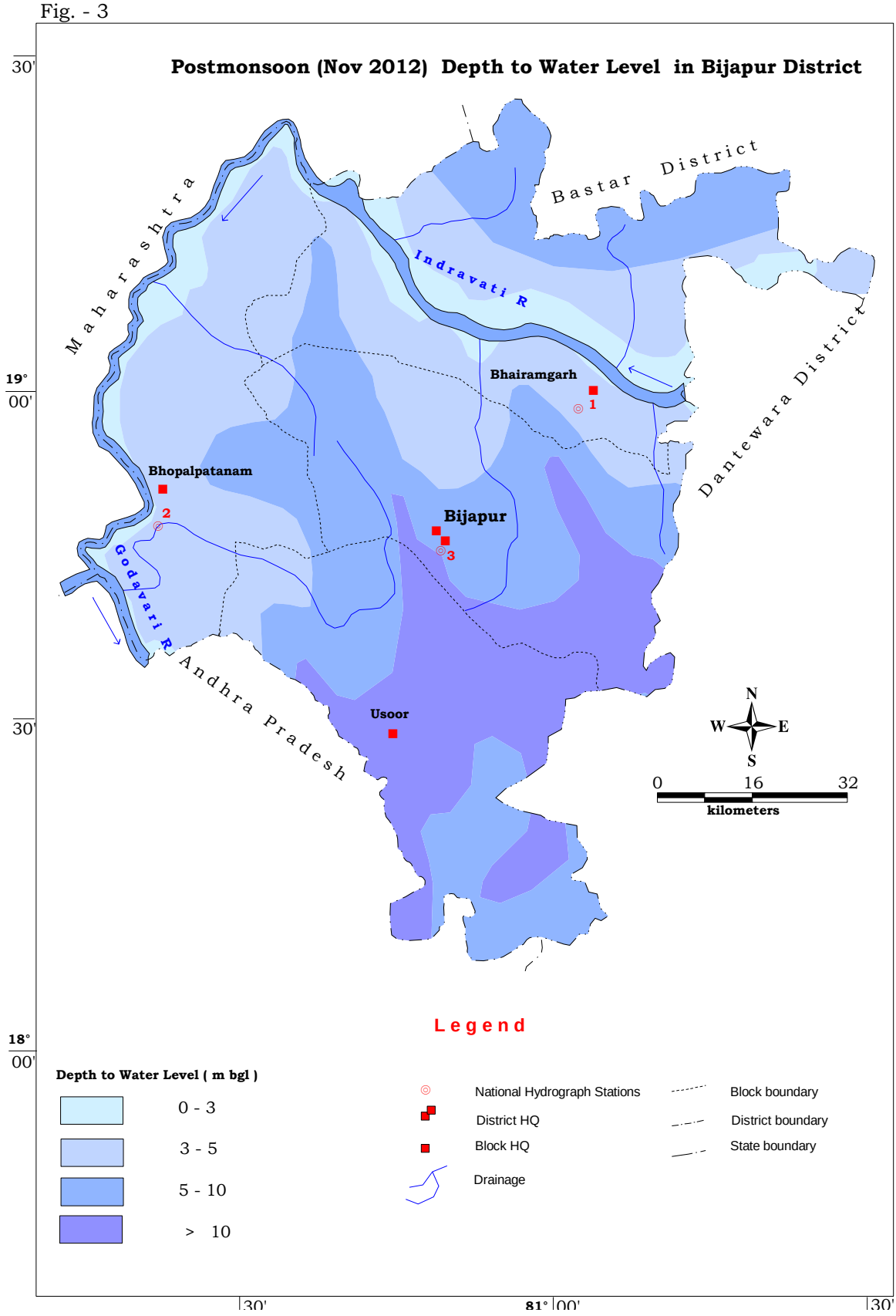

Premonsoon (May 2012) Depth to Water Level in Bijapur District
30'
19° 00'
30'
18° 00'
30'
81° 00'
30'
Maharashtra
Bastar District
Indravati R
Dantewara District
Bhairamgarh
1
Bhopalpatanam
2
Bijapur
3
Godavari R
Andhra Pradesh
Usoor
N
W
E
S
0
16
32
kilometers
Legend
Depth to Water Level (m bgl)
0 - 5
5 - 10
10 - 15
National Hydrograph Stations
District HQ
Block HQ
Drainage
Block boundary
District boundary
State boundary

Fig. - 3


Postmonsoon (Nov 2012) Depth to Water Level in Bijapur District
Maharashtra
Bastar District
Indravati R
Dantewara District
Bhairamgarh
1
Bhopalpatanam
2
Bijapur
3
Godavari R
Andhra Pradesh
Usoor
N
W
E
S
0
16
32
kilometers
30'
19°
00'
30'
18°
00'
30'
81° 00'
30'
Legend
Depth to Water Level (m bgl)
0 - 3
3 - 5
5 - 10
> 10
National Hydrograph Stations
District HQ
Block HQ
Drainage
Block boundary
District boundary
State boundary

3. Ground water resource

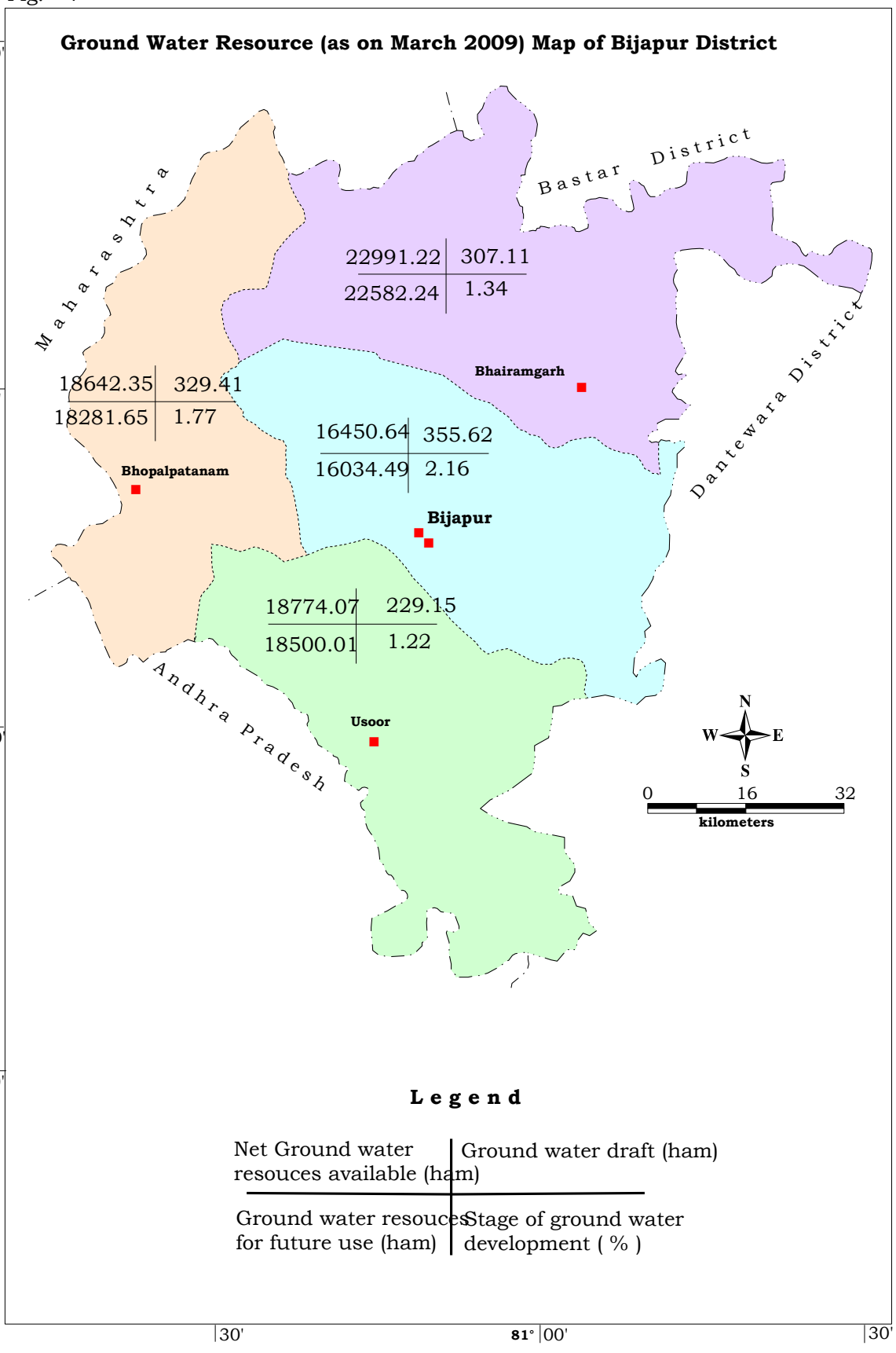
The ground water resources for Bijapur district has been estimated based on the GEC'1997 methodology and were projected to the year 2009. The estimates indicate that the annual replenishable ground water resource for the district is 80903.46 ham . The net annual ground water availability is 76858.28 ham. The gross annual draft has been estimated as 1221.29 ham and out of which, the draft for irrigation is 608.87 ham and for domestic purpose is 612.42 ham. The ground water resources for Bijapur district is given below and presented in fig 4

Ground water resources (as on March 2009) for Bijapur district

Assessment Unit / Block	Command / Non Command	Total Annual Recharge in Ham	Net Ground Water Availability in Ham	Existing Gross Ground Water Draft for Irrigation in Ham	Existing Gross Ground Water Draft for Domestic & Industrial Water Supply in Ham	Existing Gross Ground Water Draft for All Uses in Ham	Allocation For Domestic & Industrial Water Supply in Ham	Net Ground Water Availability for Future Irrigation Development in Ham	Stage of Ground Water Development in %
Bhairamgarh	Command								
	Non Command	24201.28	22991.22	99.21	207.9	307.11	309.77	22582.24	1.34
	Block Total	24201.28	22991.22	99.21	207.9	307.11	309.77	22582.24	1.34
Bhopalpatnam	Command	145.02	137.77	0	0.72	0.72	0.92	136.85	0.52
	Non Command	19478.51	18504.58	218.61	110.08	328.69	141.17	18144.8	1.78
	Block Total	19623.53	18642.35	218.61	110.8	329.41	142.09	18281.65	1.77
Bijapur	Command	0.5	0.47	0	0.04	0.04	0.05	0.42	8.33
	Non Command	17315.97	16450.17	196.22	159.36	355.58	219.88	16034.07	2.16
	Block Total	17316.47	16450.64	196.22	159.4	355.62	219.93	16034.49	2.16
Ussur	Command	0	0	0	0	0	0	0	0
	Non Command	19762.18	18774.07	94.83	134.32	229.15	179.23	18500.01	1.22
	Block Total	19762.18	18774.07	94.83	134.32	229.15	179.23	18500.01	1.22
	DISTRICT TOTAL	80903.46	76858.28	608.87	612.42	1221.29	851.02	75398.39	1.59

Fig. - 4

4.



Ground water development

The ground water development in the district is being done by dug wells and bore wells. The dug well depth varies from 6 to 17 m and the diameter varies from 1 to 4 m.The bore wells drilled in the area are 60 to 75m deep with diameter of 100 to 150 mm. Diesel or electric operated pumps of 1 to 5 HP or traditional teda is used to lift the water from dug wells for irrigation purposes. The electric 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 the area can irrigate an area of 1 to 2.5 ha for paddy.

Ground water is the main source of drinking in the district covering 738 no. of villages. In all 710 no. of bore wells and 40985 no. of handpump exist in the district (2010). And 82 irrigation dug well they irrigate around 60 ha. The contribution of ground water for irrigation comes to nearly 02 % in the district. The use of ground water in non-command area is maximum.

The stage of ground water development estimated for the district is very low i.e.1.59 % Usoor block is having the lowest stage of development i.e.1.12% while Bijapur block is having the highest stage of development i.e. 2.16 %. The districts as well as all the blocks fall within the Safe category. The block wise stage of ground water development in the district is depicted in **Fig 4.**The yield potential and the recommended suitable abstraction structures for the area are shown in **Fig 6.**

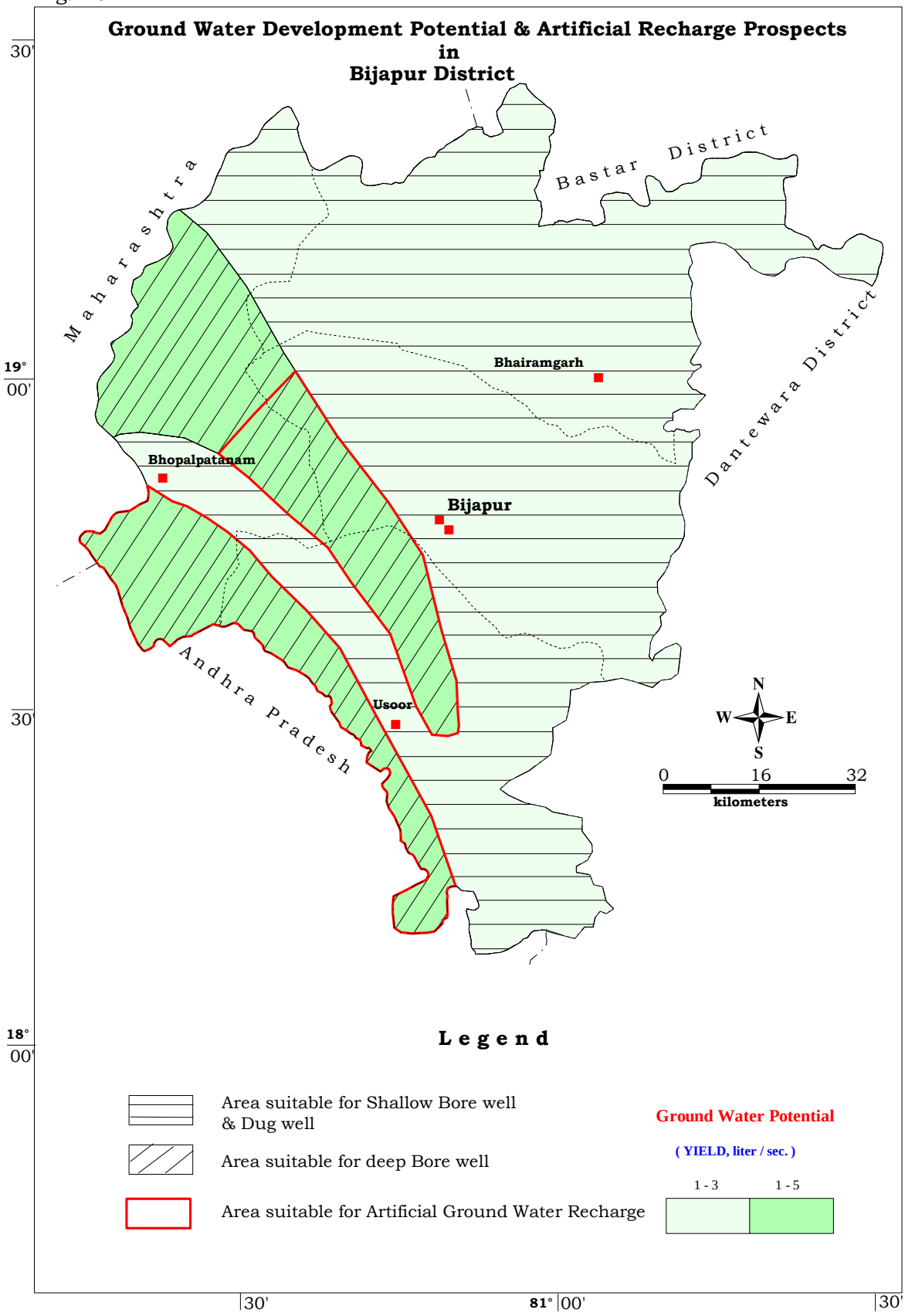
5. Ground water quality

The water samples collected from NHNS during the month of May'2012 (Pre-monsoon) were analysed to determine the quality of ground water in the district. The analysis shows that the concentrations of the major ions are within limit as per BIS Standards and the ground water in the district is suitable for all purposes.The EC values ranges between 65 to 1500 micro siemens/cm at 25°C (**Fig 5**) and the pH values ranges between 7.7 to 8.2. The overall composition of ground water indicates that it is moderately alkaline and predominantly CaHCO3 type (calcium bicarbonate).Higher concentration fluoride recorded in Bhopalpatanam (> 1.5 pp) and concentration of nitrate more than permissible limit are recorded at Bhopalpatanam area.

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 order of 76858.28 ham and the ground water draft is 1221.29 ham. The stage of ground water development is only 1.59 %. It is estimated that with the available ground water resources a total of 15255 no.s of bore wells and 38137 no.s of dug wells can be constructed in the district. By adapting suitable developmental strategies, the less developed blocks can be further developed by way of increased irrigation.

Fig. - 6


Ground Water Development Potential & Artificial Recharge Prospects
in
Bijapur District
Maharashtra
Bastar District
Dantewara District
Andhra Pradesh
Bhairamgarh
Bhopalpatanam
Bijapur
Usoor
N
W
E
S
0
16
32
kilometers
30'
19° 00'
30'
18° 00'
30'
81° 00'
30'
Legend
Area suitable for Shallow Bore well & Dug well
Area suitable for deep Bore well
Area suitable for Artificial Ground Water Recharge
Ground Water Potential
(YIELD, liter / sec.)
1 - 3
1 - 5

7. Water conservation and Artificial Recharge

The normal annual rainfall for the district is 1450 mm. There exist a huge surplus non-committed run off in the district. Rain water harvesting and artificial recharge structures at suitable locations in Bhopalpatam block can be constructed to improve the storage capacity of the surface and subsurface reservoirs. Areas recommended for artificial recharge are marked on **Fig 6.**

8. Awareness and Training activity –Nil

ACKNOWLEDGEMENT

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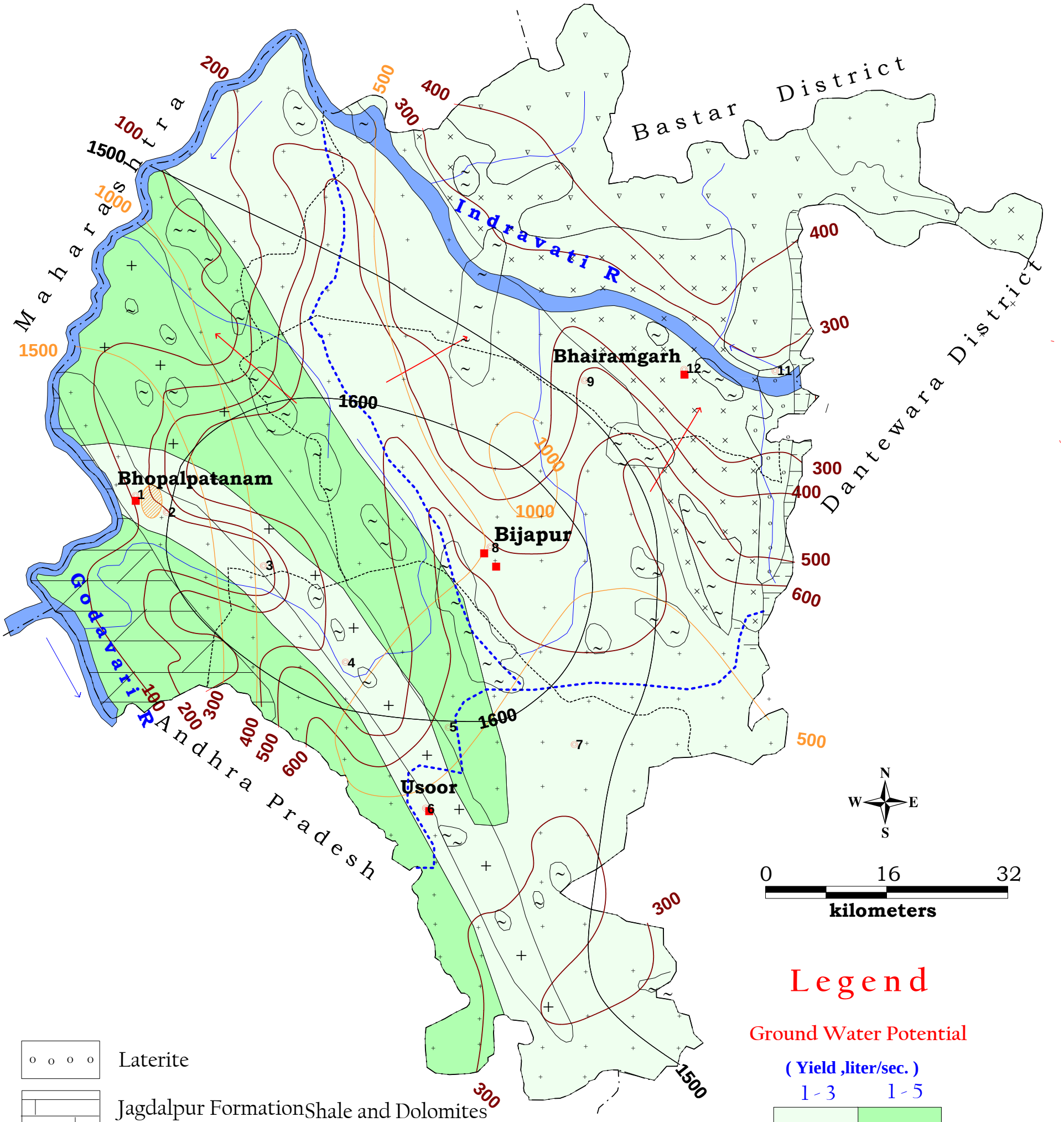
Rajeev kumar Tripathy,
Assistant Hydrogeologist

Fig. - 5

Hydrogeological Map of Bijapur District



19° 00'
30'
18° 00'
30'
81° 00'
30'