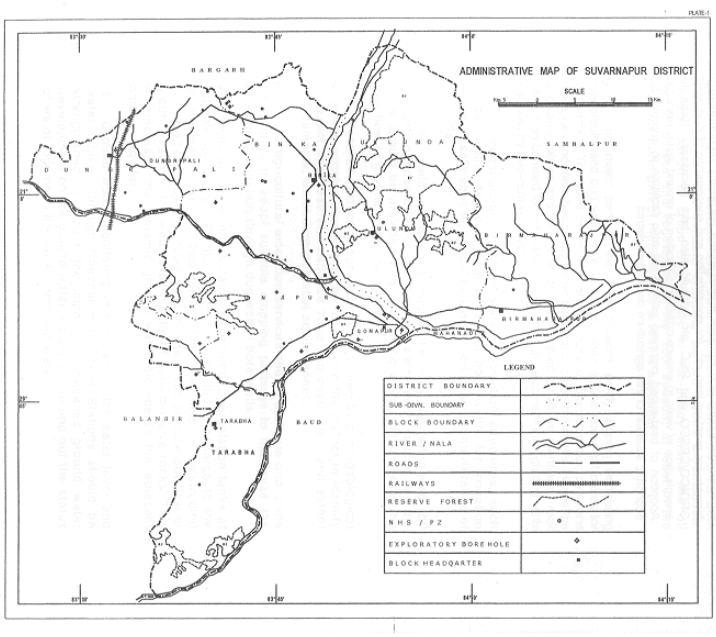
GROUND WATER INFORMATION BOOKLET OF SUVARNAPUR DISTRICT, ORISSA



CENTRAL GROUND WATER BOARD
MINISTRY OF WATER RESOURCE
SOUTH EASTERN REGION, BHUBANESWAR

DISTRICT AT A GLANCE

Sl No	ITEMS	STATISTICS
1.	**GENERAL INFORMATION**	
	i) Geographical area (sq km)	2337 sq. km
	ii) Administrative Division	2
	Number of Tehsil/Block	6
	Number of Panchayat/villages	80 nos of gram panchayat
	iii) Population (as on 2011 census)	652107
	iv) Average annual rainfall mm	1443.5mm
2.	**GEOMORPHOLOGY**	
	Major Physiographic units	Undulating plains dotted with residual hills
	Major Drainage	River Mahanadi, Tel and their tributaries
3.	**LAND USE (sq km)**	
	a) Forest area	410.00
	b) Net sown area	1070.00
	c) Cultivable area	
4.	**MAJOR SOIL TYPES**	Alfisols and Vertisols
5.	**AREA UNDER PRINCIPAL CROPS**	
6.	**IRRIGATION BY DIFFERENT SOURCES (Area and Numbers of structures)**	
	Dug wells	5282 –DW with Tenda 512-DW with pumpset
	Tube well/ bore well	22
	Tanks/Ponds	
	Canals	
	Other sources	
	Net irrigated area	
	Gross irrigated area	2119000 ha
7.	**NUMBERS OF GROUND WATER MONITORING WELLS OF CGWB (AS ON 31.3.11)**	
8.	**No of Dug well**	30
9.	**No of Piezometers**	

10.	**PREDOMONANT GEOLOGICAL FORMATIONS**	Precambrian crystalline
11.	**HYDROGEOLOGY**	
	Major Water bearing Formation	Granite, Khondalite, Charnokite, Quartzite
	Pre monsoon Depth to water level during 2011	2.12 m-8.26 m
	Post monsoon Depth to water level during 2011	1.06 m-3.18 m
	Long term water level trend in 10 years in m/yr	Pre monsoon (Rise 0.008-0.246 m/yr Fall 0.001-7.85 m/yr) Post monsoon (Rise 0.001-0.349 m/yr Fall 0.002-0.248 m/yr)
12.	**GROUND WATER EXPLORATION BY CGWB (as on 31.3.11)**	46
	No of wells drilled (EW,OW,PZ,Total)	17 EW +5 OW under ground water exploration programme 24 EW under AEDP
	Depth Range in m	94.4 m-203.3 m
	Discharge litre per second	0.2 lps-10 lps
	Storativity (S)	
	Transmissivity (M2/Day)	
13.	**GROUND WATER QUALITY**	
	Presence of chemical constituents more than permissible limit	Within the permissible limit except few patches
	Type of water	Fit for irrigation and drinking with a few exception
14.	**DYNAMIC GROUND WATER RESOURCES 2009**	
	Annual replenishable ground water resources	21429 HM
	Net annual ground water draft	3943 HM
	Projected demand for domestic and industrial uses upto 2025	1606 HM
	Stage of ground water development	18.40%
15.	**AWARENESS AND TRAINING ACTIVITY**	

	Mass awareness programme organized Date Place No of participants	Nil
	Water management training programme organized Date Place No of participants	Nil
16.	**EFFORTS ON ARTIFICIAL RECHARGE AND RAIN WATER HARVESTING**	
	Projects completed by CGWB (No & amount spent)	Nil
	Projects under technical guidance of CGWB (Numbers)	Nil
17.	**GROUND WATER CONTROL AND REGULATION**	
	Number of OE Blocks	
	No of critical Blocks	Nil
	No of Blocks notified	Nil
18.	**MAJOR GROUND WATER PROBLEMS AND ISSUES**	NO major ground water problem in the district.

1.0 INTRODUCTION

Sonepur was awarded the status of a district in April 1993 after being carved out from the erstwhile Bolangir district and was renamed as Suvarnapur. The district has a total geographical area of 2344 sq.km, with 2 Subdivision and 6 administrative blocks. The district is having 3 towns and 80 Gram Panchayats .It is one of the economically backward districts of Orissa and is presently under KBK region.
The district is situated between $20^{o}30'$ and $21^{o}11'$ North latitude and $83^{o}27'$ and $84^{o}16'$ East longitude covered under survey of India degree sheets no 64O, 64P and 73D. It is bounded on the north by Bargarh and Sambalpur district, on the east by Sambalpur and Angul districts, on the south by Boudh district and on the west by Bolangir district of Orissa.

The Suvarnapur district comes under Mahanadi basin.

The river Mahanadi, Tel and their tributaries constitute the main drainage system in the district. The tributaries are ephemeral in nature. The river Mahanadi flows an almost north south course as it enters the district, which changes to south east as it nears Sonepur and finally takes an easterly course after confluence of river Tel with it at Sonepur. River Tel flows in a north easterly course through the border of the district in the south western part before its confluence with Mahanadi. Ong is another important tributary of the river Mahanadi which flows in a south easterly course in the western part of the district and joins Mahanadi a few kilometers north of Sonepur. The drainage is effluent in nature.

The district gets irrigation from major, minor & lift irrigation projects and also from ground water source. The major source of flow irrigation projects is surface water, which mainly depends on rainfall, hence actual area-getting irrigation in different crop season s in different year varies. The irrigation potential created from all sources aggregates to 97690 Ha in the district.

The district was geologically studied by Geological Survey of India and the geological map of the district was prepared. The initial hydrogeological survey on regional scale was carried out by Central Ground Water Board during nineteen eighties. Subsequently the entire district was covered by Central Ground Water Board under reappraisal hydrogeological surveys during nineteen nineties. Under ground water exploration programme and accelerated exploratory drilling programme 46 numbers of exploratory wells including 5 observation wells were drilled by Central Ground Water Board to access the ground water potentials of rock formations at deeper depths. The ground water regime condition is being monitored by quite a large number of permanent hydrograph stations four times a year.

2.0 RAINFALL AND CLIMATE

The district enjoys tropical climate characterized by summer's cold winters & rainy. The winter season generally commences from late November & continues up to the end of February.

It is observed that about 90% of the total annual rainfall takes place due to South West monsoon between the middle of June & mid-October. The northeast monsoon gives erratic & insufficient rainfall. The normal annual rainfall is 1443.5mm. The rainfall is highly erratic both in space and time. There is a large spatial variation as observed from the rainfall data of various blocks.

The summer season commences from March & continues till middle of June where the maximum temperature varies from 34.3 ^{o} to 47.7 ^{o} C. May being the hottest with the mean daily maximum temperature of 41.4 ^{o} C while December is the coldest month of the year when the temperature drops down to 6 ^{o} C.

Humidity of the air is generally high during southwest monsoon season and decreases due to the effect of cold waves during the end of November. The relative humidity varies from 26% to 84% during different periods of the year.

Wind is generally light to moderate but it increases during summer. During summer wind direction is variable and in rainy season wind from southwest direction is very common.

3.0 GEOMORPHOLOGY AND SOIL TYPES

Physiographically the district comprises undulating plains dotted with residual hills and mounds except for a few patches of scattered hills and high relief areas in the east central and northern parts. A gently undulating terrain with a vast stretch of cultivable land characterizes the major parts of the district, the average elevation being 200m to 300m above mean sea level with a general topographic slope towards east.

Depending upon the mode of origin, occurrence and the physical and chemical characteristics, the soils at the district are mainly classified into two major groups in 1) Alfisols and 2) Vertisols.

The alfisols includes Red loamy soil and red Sandy Soil and are generally light textured with a PH ranging from 6.5 to 7.3. These soils are usually deficient in nitrogen, phosphate, organic matter and lime. The soils are in general having average to good fertility. These soil are suitable for cultivation of paddy and other crops.

The vertisols are medium black soil found around the course of Mahanadi and Tel rivers in the southern part of the district. These soils are highly argillaceous and contain high amount of iron, calcium and magnesium. The PH varies from neutral to alkaline and texture varies from loam to clay loam. These soil are highly argillaceous and contain high amount of iron, calcium and magnesium.

4.0 GROUND WATER SCENARIO

4.1 Hydrogeology

The district is mostly underlain by Precambrian crystalline, metamorphics, intrusive, sedimentaries of permocarboniferous ages and recent laterites and alluvium. Features like geological set up, rainfall distribution and the degree of primary and secondary porosity controls the hydrogeological framework of a place. As the district is underlain by diverse rock type as already discussed, it results in contrasting water bearing properties of these different geological formation. Depending on the nature of formations and their water bearing capacities etc, the rock formations of the district may be divided broadly into two major hydrogeological units viz –

1) Consolidated formations

2) Semi-consolidated formation

3) Unconsolidated formations

Consolidated formations – Almost the entire district is underlain by the consolidated formation containing granites gneiss, khondalite, quartizite, anorthosite and gabro. These rocks are hard and compact and are devoid of primary porosity. The secondary porosity in these rocks developed as a result of weathering and fracturing due to major & minor tectonic movements along with climatological actions. The secondary porosity forms the conditions for movement of ground water and also act as reservoir of ground water. Groundwater occurs under water table conditions in weathered residuum while it occurs under semi confined to confined conditions in the fractured & jointed rocks usually two to four water bearing fracture zone occurs down to a depth of 100 mgl.

Water Bearing Properties Of Major Litho Units

1.Granite and Granite Gneisses-These rock types in the district occupying the undulating plains, low lying area and sometimes forms hills and hillocks. These rocks are mostly represented by biotite gneiss, porphyritic granitic gneiss etc. They are porphyritic and non porphyritic in nature and are usually grey to light grey in colour. 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 pegmatites. The thickness of weathered zone in granitic rocks usually ranges from 10 to 15m and occasionally extends beyond 25m depth. For all the above factors, the granitc rocks form

the most potential aquifers both at shallow and deeper depths in comparison to other hard rock formation. . The available data on existing ground water structures indicate that ground water development is mainly through open wells and to some extent through bore wells. The specific capacity of dug wells tapping weathered zone ranges from 6 to 286 lpm/m drawdown.

The potentiality of the deeper aquifers (Saturated fractures) has been explored by deep drilling down to a maximum depth of 200m. It is found that though saturated fracture was encountered at the depth of 190 m but normally it is restricted within 150 m depth and it has also been noted that the saturated zones are more commonly found within 100m depth. The maximum number of saturated fractures encountered down to 190m depth is five. On an average, down to 150m depth 3 to 5 sets of saturated fracture zones occur. The yield of the wells varied from negligible to maximum of 14.0 lps. with the average yield of 2 to 5 lps. The maximum yield of 14.0 was recorded in the well located at Chun Chun Dungripalli area where 3 sets of saturated fractures were encountered down to 65.0m depth.

2. Charnockite suite : There is very limited occurrence of charnockite in the district**.**This suite of rocks comprises of pyroxene granulite, hypersthene granite and granodiorite etc. The acid and intermediate group of rocks are more common than other varieties. The charnockites are fine to coarse grained, greenish grey colour having greasy lusture. Texture is mostly granulitic and having gneissic structure. Due to hard and compact nature of the rocks ground water development prospects in charnockite is not good.

3. Khondalites : This suite of rocks comprises of mainly quartz-garnet-sillimanite schist and gneiss and minor occurrence of calcsilicates and quartzites. The rocks usually form hills and have limited ground water development. These rock have well developed joints . The weathered residuum and also fracture zones constitute the main repository of ground water.. The thickness of weathered zone ranges from 5 to 32m . The specific capacity of the dug wells ranges from 2.3 to 13.3 lpm/m drawdown.

4.Quartzite: These rocks occurs as distinct bands and are very resistant to weathering. The weathered mantle is thin and joints are less developed. As such these rocks do not form good aquifers.

5.Anorthosite: These are generally hard and massive in nature. Weathering yields white clayey material, while restricts movement of ground water. Joints and foliations are also not well developed and these rocks do not form good aquifers. Well drilled at Tarbha had a discharge of 1.0 lps.

6.Pegmatite and quartz veins: These are coarse grained and hard. These form good aquifers when fractured and friable.

Semi consolidated formations: These are represented by the rocks of lower Gondwana formations. These rocks occurs in small patch in the western side of the district in Sonepur block. The friable and loosely connected sandstones form the aquifers. Ground water occurs under water table conditions in the weathered zone and under semi confined condition in the deeper fracture and friable sandstone beds. The depth of open well ranges from 5 to 12 mbgl and depth to water level ranges from 3 to 10 mbgl. The yield of the well in the district is generally limited.

Unconsolidated Formation : Laterites and alluvium of Sub-recent to Recent age constitute the unconsolidated formations. Laterites occurring as capping over older formations are highly porous in nature and form good aquifers to be tapped through dug wells. The alluvial deposits of recent origin occur as thin discontinuous patches along the prominent drainage channels. The alluvium varies in thickness from 6 to 12 m. These mainly consist of silt, sand with gravel & pebble, which form potential shallow aquifers tapped through dug wells.

Depth to water level:- The phreatic zone constitutes the most potential ground water reservoir in the district. This zone has been mapped in course of hydro geological surveys**.** The depth to water table values depend on several factors like rainfall, topography drainage characteristics, lithology, water bearing and water yielding properties of the rocks, as also land use. A total of 30 no. of key wells were monitored during premonsoon (May/June) and post monsoon (Nov/Dec) period. The NHS data for the year 2011 shows that during premonsoon the depth to water level is minimum in Singhijuba (2.12 mbgl) and maximum in Sonepur (8.26 mbgl). During post monsoon the minimum and maximum water level is found in Diksira (1.06mbgl) and Bairasar (3.08 mbgl) respectively. These stations are being monitored on long term basis .A perusal of these data indicates that during post monsoon period (Nov) the depth to Water level in major parts of the district ranges between 0.5-4.81 below ground level. During premonsoon period (April) the depth to water level in major parts of the district ranges between 0.73 to 8.55 m below ground level. Depth to water levels more than 5 m are generally found in minor pockets.

Seasonal Fluctuations: - The seasonal fluctuation of water table map reveals that in the major parts of the district fluctuation of the water table is in the range of 2m to 4m. Some areas of Sonepur block have water level fluctuation in the range of more than 5m. The fluctuation of water table ranges from –1.45m to 6.45m. Negative fluctuation i.e. fall in water level during post monsoon with respect to that in pre-monsoon is observed in parts of Hirakud command area which is due to release of water in canals during pre-monsoon period.

Long term water level trend:-The decadal water level trends during pre monsoon period indicate that 44 % of the NHS station shows rising trend of water level, the maximum being 0.25m/yr. In most of the cases the rise is less than 0.1m/ yr, which has not much significance. The rest 56% stations show a falling trend and maximum fall

recorded is 0.39m/yr. However the majority of cases the magnitude of fall is less than 0.1m/yr.

The decadal water level trend analysis data of post monsoon period indicate that there is a rising trend of water level in 43% cases and rest 57% shows falling trend. The maximum rise recorded is 0.35m/yr with the majority of values being less than 0.10m/yr. The maximum fall is around 0.27m/yr with most values being less than 0.1m/yr.

Considering the minor magnitude of rise and fall of water level over a period of 10 years both the rise and fall values can be ignored in both the cases. From the long term trend data there is no significant variation in ground water level in the area.

4.2 GROUND WATER RESOURCES

Ground Water Resource- Estimation of Ground Water Resource is essential before planning any programme for development of ground water resource. It involves study of various factors affecting ground water recharge and discharge and demarcation of potential area of ground water development. Rainfall, seepage from tanks & ponds are some of the principal source of recharge to ground water. As per the study group for the year 2009 the following facts of ground water resource of sonepur district is revealed.

The Sonepur district has an annually replenishable ground water resource of 21429 Hectare Meter (HM), out of which 1606 HM is committed for the domestic and industrial requirements for coming 25 years based on the projected population. The block wise ground water resource as estimated by the study group has been presented in the following table. The present draft for irrigation use has been estimated as 3943 HM .

The overall stage of ground water development which includes both domestic and irrigation in the district as a whole is 18.40% .

Based on the hydrogeological, as well as availability of other source for irrigation, the ground water development in some blocks has been found to be very low. The stage of ground water development for all purpose (Irrigation + Domestic etc) has been found to be maximum in Tarva Sonepur block (30.97%) and the minimum development for all purposes has been found in Ullunda block (10.20%) with the net ground water development for all purposes has been found for future development is 1606 hm.

Block wise stage of ground water Development in Orissa, As on 31.3.2009 (in ha m)

Block	Ground water resource assessed	Existing Ground Water Draft for Irrigation	Existing Gross ground Water draft for domestic and industrial water supply	Existing Gross ground Water draft for all uses	Allocation for domestic and industrial requirement supply upto next25 years	Net ground water availability for future irrigation development	Stage of ground water development
Binka	3372.00	288.00	223.06	511.00	290.00	2794.00	15.15
B M Pur	3494.00	422.00	189.58	612.00	242.00	2830.00	17.52
Dungripalli	3985.00	327.00	265.81	593.00	346.00	3312.00	14.88
Sonepur	3530.00	817.00	202.34	1019.00	257.00	2456.00	28.87
Tarva	2354.00	544.00	185.00	729.00	245.00	1565.00	30.97
Ullunda	4694.00	296.00	182.91	479.00	226.00	4172.00	10.20
District total	21429.00	2694.00	1249.00	3943.00	1606.00	17129.00	18.40

4.3 GROUND WATER QUALITY

Quality of ground water in the Shallow aquifers: Chemical analysis of different parameters are done from the water samples collected, from the national hydrograph stations, during April . The collected water samples were analysed in the chemical laboratory of south Eastern Region as per the standard methods available in literatures. The Ph and electrical conductance (EC at 25.C) of the water sample were determined by the concerned instrument after calibration. The fluoride, iron and nitrate content of the water samples were determined spectrometrically.

Suitability of water for irrigation purposes-

The suitability for irrigational use of ground water from pheratic zone has been studied based on USSL classification of irrigation water by plotting data of sodium Adsorption Ratio and Sp.Conductance value.
SAR is given as

$SAR = Na / \sqrt{(Ca+Mg)/2}$,

Where Na, Ca and Mg are expressed in milliequivalent per litre (epm)
The chemical analysis data of 24 water samples collected from the network hydrograph stations have been plotted in USSL diagram.

A perusal of the data shows that majority of water samples fall in C_2S_1 (medium salinity hazard-low alkali hazard) and C_3S_1 (high salinity hazard- low alkali hazard).
Only in rare cases the samples fall in C_3S_2 (high salinity- medium alkali classes).
Almost all the water samples falls in low sodium hazard group (S_1).
This indicates that ground water can be used for irrigation with moderate leaching and moderate salt tolerant crops. The use of C_3S_1 and C_3S_2 type water requires suitable soil water management practices.

Suitability of ground water for drinking purposes-

As per the norms of Indian standard institution for water for drinking, mostly the ground water of suvarnapur district is suitable for drinking purpose except for a few places where concentration of NO_3 (Bairasar-140 mg/l), (Phulmuthi-145mg/l),and Dunguripalli-60mgl and that of fluoride-(Khari-2.06mg/) is found to exceed the permissible limit, which is due to the local pollution.

Chemical Quality of ground water in deeper aquifer: The ground water from deeper aquifers are suitable for drinking purposes as almost all the constituents are well within the permissible limit. The quality of ground water for irrigation use is also good.

A study of the chemical analysis data shows that in general ground water in the area is marginally alkaline in nature. Ground water is fresh with the average EC value within the permissible limits. NO_3 and F values are well within the permissible limit except only at a few places.

4.4 STATUS OF GROUND WATER DEVELOPMENT

Ground water development in the district is being mainly through dug wells; Dug cum bore wells and bore wells. Ground water is mainly used for domestic and irrigation purpose and in a very limited scale for industrial purpose.

Urban and rural water supply:- All the urban area ie Sonepur, Binaka and Tarabha gets piped water supply for domestic purpose.
In rural area RWS&S, Govt. of Orissa has installed a few piped water supply schemes . Apart from this RWS&S has also constructed hand pump fitted bore wells at different places to provide safe drinking water in rural areas.

Ground water for irrigation:- The present draft for irrigation in the district is 2694 HM and there are 5282 ground water extraction structures (dug wells with tenda) and 512 (DW with pumpset).
The block wise existing ground water structure for irrigation is given below

Block wise existing ground water structure for irrigation use

Sl no	Block	Nos of existing structures for irrigation use as on 31.3.2009			
		DW with tenda	DW with pumpset	FPTW	BW
1.	Binka	682	24		6
2.	B M Pur	572	8		2
3.	Dungripalli	821	55		10
4.	Sonepur	1472	145		1
5.	Tarva	1115	155		1
6.	Ullunda	620	35		2
	District total	**5282**	**512**		**22**

5.0 GROUND WATER MANAGEMENT STRATEGY

5.1Ground water development

The district has a net sown area of 94381 Ha out of the total geographical area of 2337 sq. km. Area in Dungripalli and Binaka Blocks comes under Hirakud Command area. Drought condition is a frequent phenomenon, which adversely affects the agricultural activities in the district. Hence from agricultural point of view use of both surface and ground water is a must. The balance irrigation potential in the district is ……ham. While the stage of ground water development is only 18.40%, which shows that there is ample scope for ground water development.

DUG WELL: These are most common ground water absraction structure in Sonepur district and are feasible in topographic lows in hilly terrain and intermontane valleys. These should tap the maximum thickness of water saturated zone. The standard dugwell may be 10-15 m deep and of 4.5 to 6 m diameter, 1.5 H.P centrifugal pumps may be suitable for dug wells. Depending upon the hydrogeological situation, thickness of weathered residuum the yield may vary from 2-3 lps. A total of 22167 additional dugwells for irrigation use are feasible in the district.

DUG CUM BOREWELL: These are essentially dug wells with a bore drilled through the bottom down to the depth of 25-30 m from ground water level tapping the saturated shallow fracture below the regolith and in the top portion of the hard basement. Generally the depth of the dug well is upto 12 m with diameter of 4.5 to 6 m. The wells should be fitted with 2 HP centrifugal pumps. The additional dug well feasible includes the dug cum bore wells, which can be constructed at suitable locations.

BORE WELL: These are feasible in fractured and jointed consolidated formations in the district. Bore wells are suitable structure in the areas where water level is deeper and hard rocks are encountered at shallow depth. Exploratory drilling data indicates good scope for ground water development through bore well in Sonepur district. The bore wells should 100-120m deep and 15m dia. 2-3 H.P submersible pumps may be suitable for ground water development depending upon the availability of productive water bearing fracture zones.

Since the surface water resources are inadequate and the district often comes under the grip of drought, development of ground water resource may help in expanding irrigated agriculture in the district.

5.2 WATER CONSERVATION AND ARTIFICIAL RECHARGE

Conjunctive Use of surface water and ground water should be taken up in the Hirakud Command area. Studies have been taken up in the Hirakud command area based on hydrogeological, Hydrological and other parameters like cropping intensity, cropping pattern etc. and suitable methods for better management of surface and ground water have been tentatively devised. Through this pilot study, ground water development plan has been brought out through ground water flow modeling wherein all types of hydrogeological, hydrological, geophysical, remote sensing data were extensively used. Water logging is one of the problems, which needs to be rectified through conjunctive use of surface water and ground water. The demand of water for 200% cropping intensity can be met from surface water (90%) and ground water (10%) for both the seasons. The existing cropping pattern needs modification. Diversification of crops from paddy to non-paddy crops like oil seed, pulses, vegetables during rabi season, at least in the high land and part of medium land areas is essential. The simulation studies brought out the fact that conjunctive use of surface water and ground water is necessary to rectify waterlogging condition, to augment irrigation potentials and to ensure safe agricultural practices in periods of delayed monsoon rainfall.

In Hirakud command area, development of ground water is feasible through dug wells and bore wells. Dug well are the most suitable ground water structures in the area.

SCOPE FOR ARTIFICIAL RECHARGE:

Major parts of Suvarnapur district is underlain by Precambrian consolidated formations. Parts of Ullunda, Sonepur, Tarabha and Dungripalli blocks of the district show deeper water level condition during the post monsoon period. This is mainly due to the prevailing topographic conditions and water table gradient, which facilitates flow of

ground water through nalas, rivers and streams as base flows. To arrest the rapid decline of water table in these areas special studies may be taken up to pin point the areas where water scarcity problems are more pronounced during pre-monsoon period. In these pockets suitable sites are required to be pin pointed to adopt artificial recharge techniques and rain water-harvesting methods based on site-specific conditions. This artificial recharge will help in increase in ground water storage and also in improving the quality of ground water. The most feasible artificial recharge and rain water harvesting structures are percolation tanks, nala/contour bunding, small check dams/weirs, renovation of old tanks to percolation tanks, water spreading, gully plugging, gabion structures etc.

6.0 GROUND WATER RELATED ISSUE & PROBLEMS

Ground Water Problems : The ground water problems include water logging, ground water pollution and depletion of ground water level etc.

Ground water Logging: An area is considered as water logged if depth to ground water level remains within 0-2m depth range throughout the year. Water logging conditions have developed in limited parts of Hirakud command in the district, in Dungripalli and Binika blocks, wjere water table is within 2 m from surface.Out of the total 435 sq. km under the Hirakud Command area only 4 sq.km area in Binika block and around 7 sq. km area in Dungripalli blocks are showing water logging conditions. Low topography, unlined canals, indiscrimate use of canal water and the prevailing paddy cultivation in both Kharif and rabi seasons are mainly responsible for excessive seepage of water and water table rise.

Ground Water Pollution: Based on the chemical analysis of water samples collected from different aquifers, it is observed that almost all chemical constituents are well within the permissible limit for drinking as well as irrigational purposes, except some pockets where high nitrate values(No3 at Bairasar-140ppm, Dungripalli-60ppm and Phulmuthi-145 ppm) have been observed.

Ground water table depletion : The stage of ground water development in the different blocks varies from 10.20% to 30.97% percent with the district average of 18.40per cent which is far below the safe withdrawal limit (70%). The analysis of water level trend for 10 years period for both pre monsoon and post monsoon period indicate that there is no noticeable change in water levels. This also indicate that no depletion in water table has taken place in the district.

Ground water quality problem: The water samples from shallow aquifers indicates that ground water can be used for irrigation with moderate leaching and moderate salt tolerant crops. The use of C_3S_1 and C_3S_2 type water requires suitable soil water management practices and the ground water is also suitable for drinking purpose except for a few places where concentration of NO_3 (Bairasar-140 mg/l), (Phulmuthi-

145mg/l),and Dunguripalli-60mgl and that of fluoride-(Khari-2.06mg/) is found to exceed the permissible limit, which is due to the local pollution.

The ground water from deeper aquifers are suitable for drinking purposes as almost all the constituents are well within the permissible limit. The quality of ground water for irrigation use is also good. Ground water is fresh with the average EC value within the permissible limits. NO_3 and F values are well within the permissible limit except only at a few places.

Awareness and Training Activity

7.1 Mass awareness programme (MAP) and water Management Training Programme by CGWB:- Till date no mass awareness and training programme has been conducted in Sonepur district by CGWB.

7.2 Participation in Exhibion , Mela, Fair etc:- NIL

7.3 Presentation and lecture delivered in public forum/ radio/T.V/ institution of repute/Grassroots association/NGO/Academic institution etc. :- NIL

8.0 Area notified by CGWA/SGWA :- No area has been notified by CGWA/SGWA.

9.0 Recommendations

The existing hydrogeological set up and availability of huge ground water resource indicate that there is scope for development of ground water on large scale. But this large scale development requires block as well as Gram Panchayat wise detail hydrogeological maps on large scale. For this purpose intensive hydrogeological survey and exploratory drilling aided by remote sensing studies and geophysical investigation may be taken up jointly by the state and central Govt. agencies. This will help in precise delineation of areas suitable for different ground water development structures and will also facilitate for designing different type of ground water extraction structures and defining specification of pumps etc.

1. In Hirakud command area, there are conditions of water logging at places and simultaneously scarcity of supplied water in the tail end areas. These situations can be rectified through conjunctive use of surface water and ground water, which shall also augment irrigation potentials and ensure agriculture in periods of delayed rainfall. The demand of water for 200%

cropping intensity can be met from surface water 90% and ground water 10% for both the seasons. The existing cropping pattern needs modification. Diversification of crops from paddy to non-paddy crops like oil seeds, pulses and vegetables during Rabi season, at least in the high land and part of medium land areas, is essential.

2. The major part of the area presents gently sloping undulating topography and dug wells which are best suited ground water structures for this terrain. The yield potential of shallow zone of granitic rocks, pyroxene granulites and meta-basics are better than that of other formations. Hence the undulating plains and valleys which are occupied by above mentioned rock types may be used for extensive ground water development through dug wells and also by dug-cum-bore wells.

3. In construction of ground water abstraction structures, such as dug wells, dug cum bore wells and bore wells, for irrigation minimum safe spacing should be maintained to avoid interference of the wells.

4. The yield of existing dug wells may be enhanced by converting those into dug cum bore wells wherever feasible and the wells should be provided with brick lining which will facilitate the free flow of ground water into the well.

5. Detailed surface geophysical survey aided by photogeological & remote-sensing studies may be taken up in the district to identify the exact thickness of weathered zone and occurrence and extent of lineaments, which form potential aquifer zones.

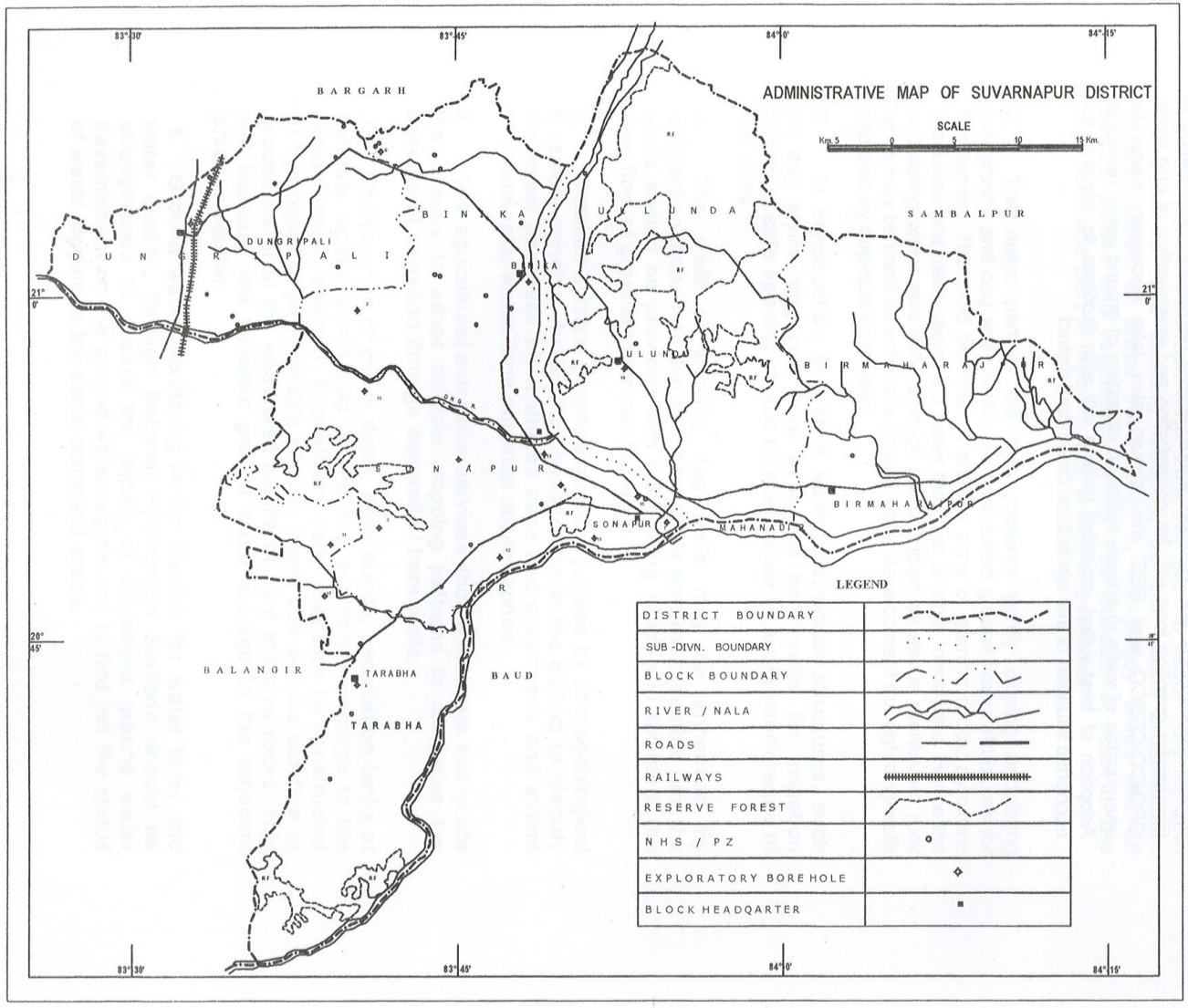
6. The agricultural extension services should motivate and guide the farmers to adopt suitable cropping patterns to maximize the benefits of irrigation through dug wells / bore wells.

7. Construction of check dams, nalla bunds, percolation tanks at suitable locations will help in effecting additional recharge to the ground water reservoir. Sub-surface dams may also be constructed at hydrogeologically suitable sites to arrest sub-surface out flow of ground water in the weathered mantle of hard massive rocks. This will increase the dynamic ground water storage in the adjacent phreatic aquifer.

8. Ground water monitoring in the district, for water level and water quality, through National Hydrograph Stations should be strengthened to assess the impact of envisaged ground water development on the ground water regime and to find out the status of water logging in the canal command areas.

9. As there is large scope for development of ground water, suitable schemes may be launched for ground water development to boost agricultural production in the district. The financial institutions should generously finance such schemes.

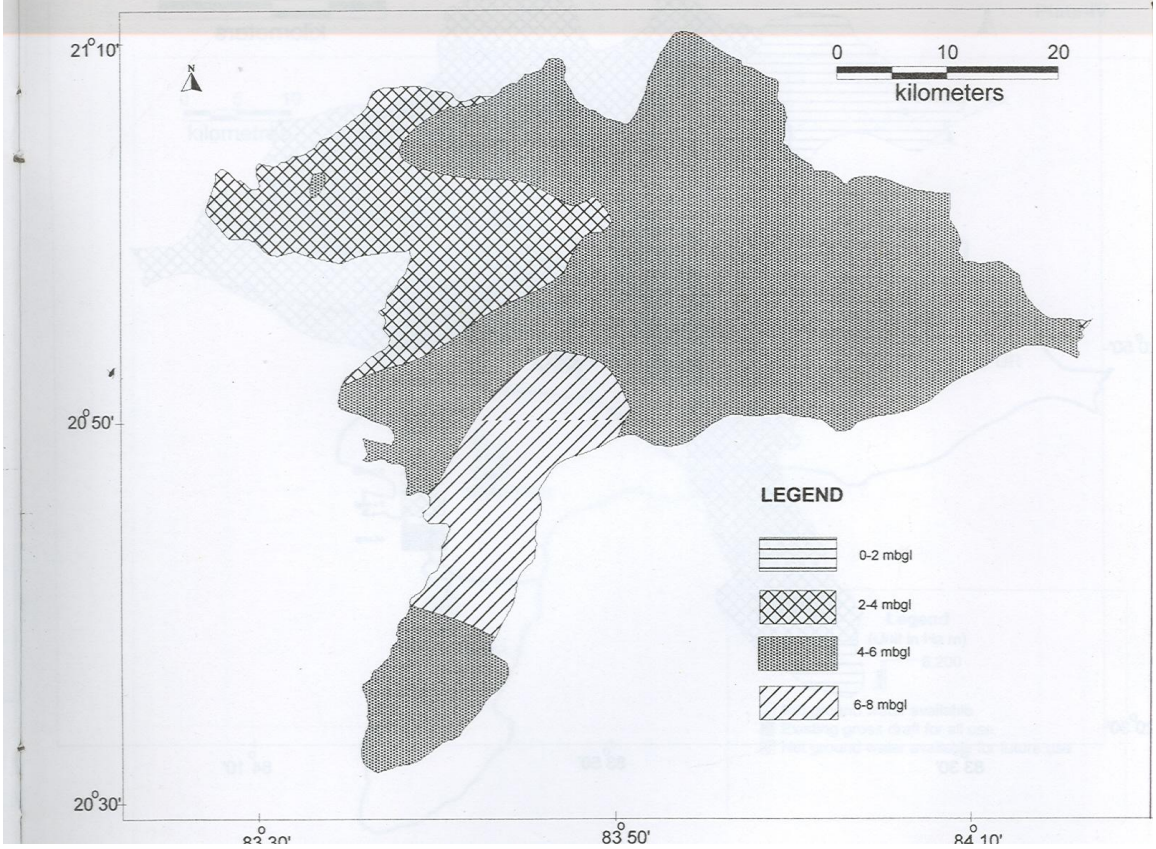
PLATE-1


ADMINISTRATIVE MAP OF SUVARNAPUR DISTRICT
SCALE
Km. 5 0 5 10 15 Km.
83°30'
83°45'
84°0'
84°15'
21° 0'
20° 45'
BARGARH
BINKA
ULUNDA
SAMBALPUR
DUNGRIPALI
BINKA
ULUNDA
BIRMAHARAJPUR
SONAPUR
MAHANADI
BIRMAHARAJPUR
BALANGIR
TARABHA
BAUD
TARABHA
LEGEND
DISTRICT BOUNDARY
SUB -DIVN. BOUNDARY
BLOCK BOUNDARY
RIVER / NALA
ROADS
RAILWAYS
RESERVE FOREST
NHS / PZ
EXPLORATORY BOREHOLE
BLOCK HEADQARTER

Pre-Monsoon Depth To Water Level Map of Suvarnapur District, Orissa

April-2011

Plate-II



Post-Monsoon depth To Water Level Map Of Suvarnapur District, Orissa
Nov-2011

Plate-III

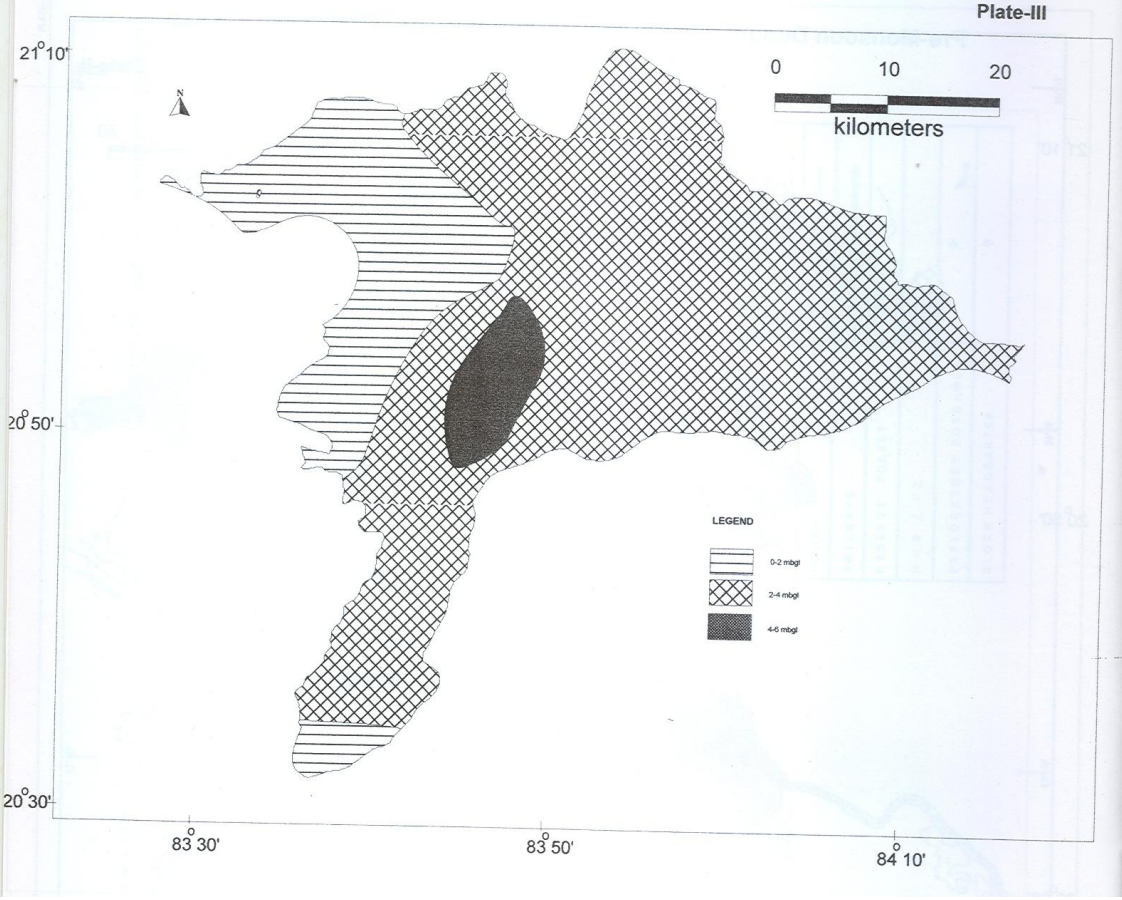
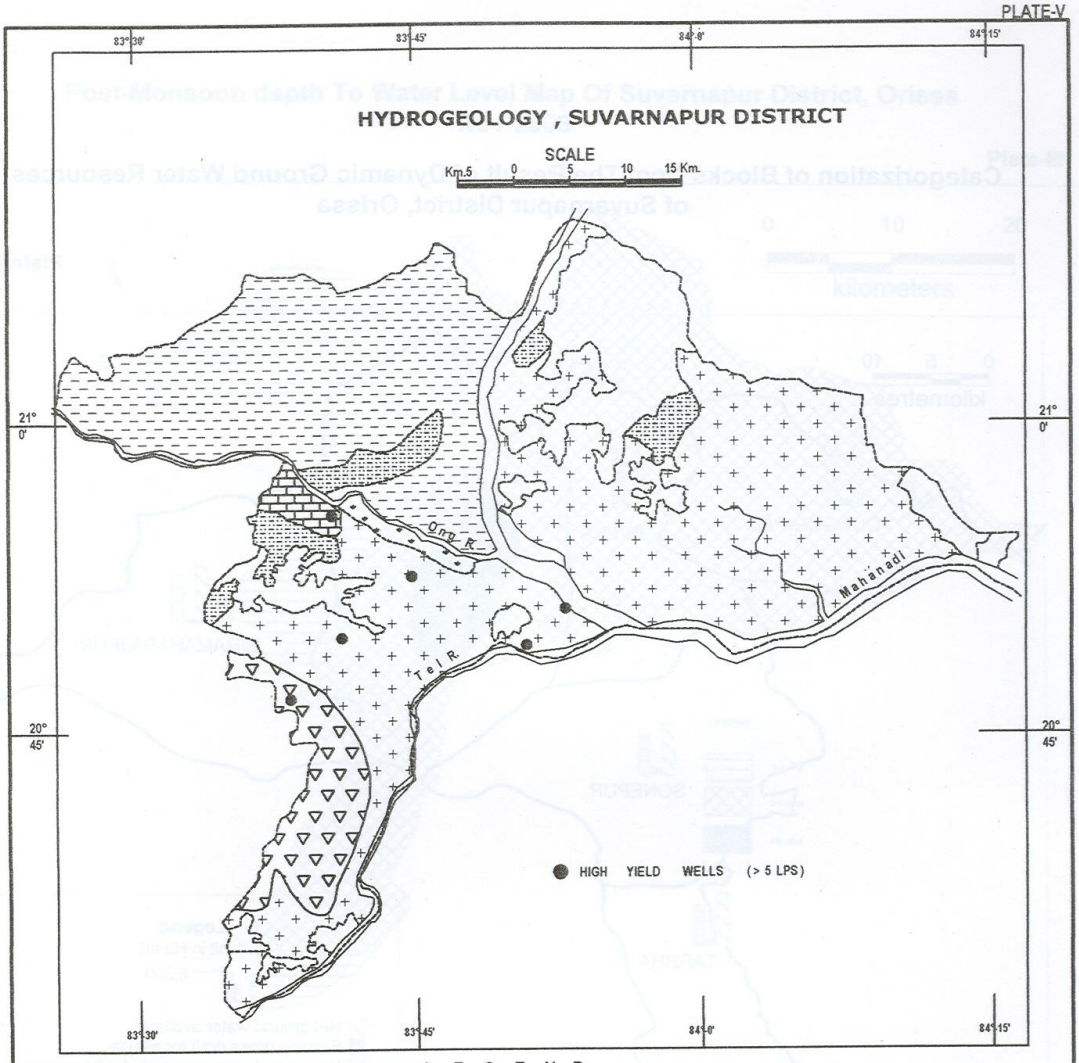


PLATE-V



L E G E N D

AGE GROUP	LITHOLOGY	HYDROGEOLOGICAL CONDITION
Recent to Sub- recent.	Alluvium	Very much restricted in occurran ce yield varies from 5 to 10 lps.
Lower Gondwana	Sand stone , Shale Conglomerate etc	Moderately thick in occurrance confined to semi- contined aquifer, yield less than 5 lps.
Pre- cambrian	Anorthosite / Gabbro	Ground water is restricted to weathered residuum & fractured zones . Low yield to moderate yield within (3 lps.)
	Bonai granite / Quartzite	Ground water occurs in weathered and fractured horizon yield up to 10 lps.
	Khondalite & Calcsillicate rocks	
	Granite and Granite gneiss	Most potential crystalline aquifer, groundwater occurs in weathered and fractured horizones. Yield up to 10 lps.
		Hilly areas, without productive zone. Yield less than 1 lps.

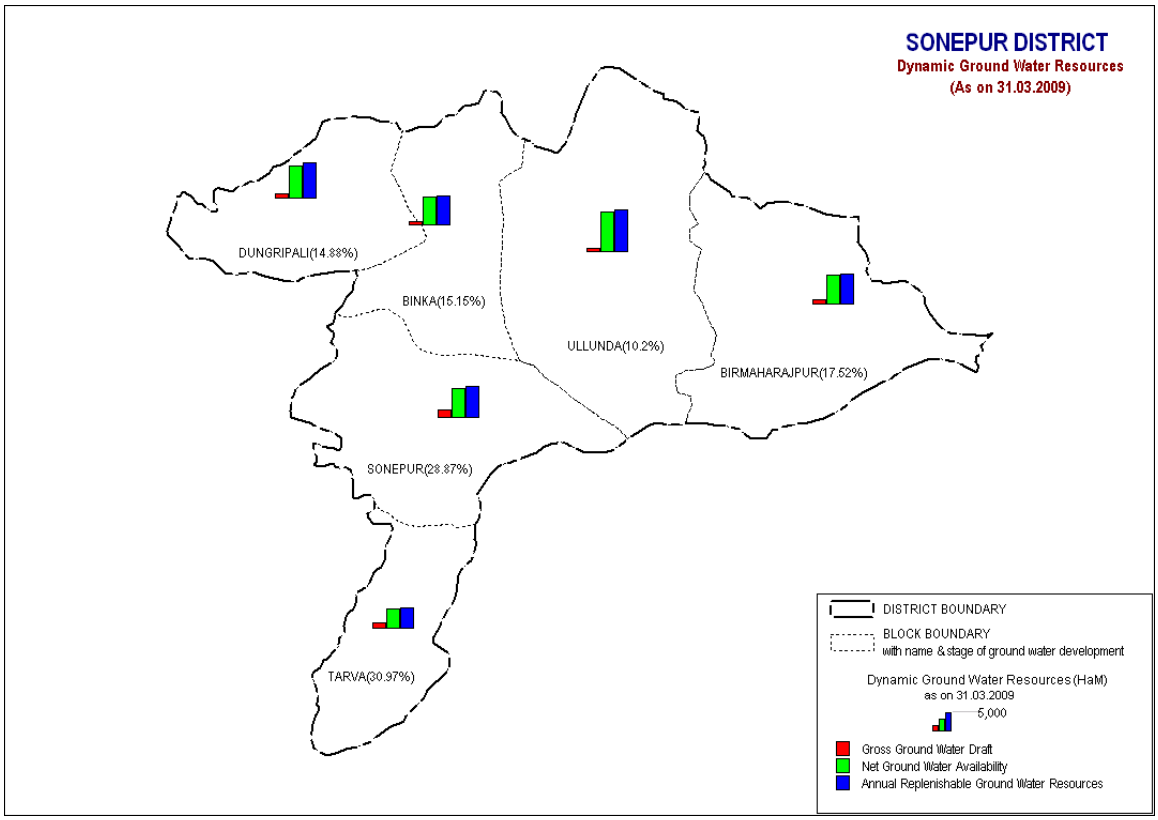
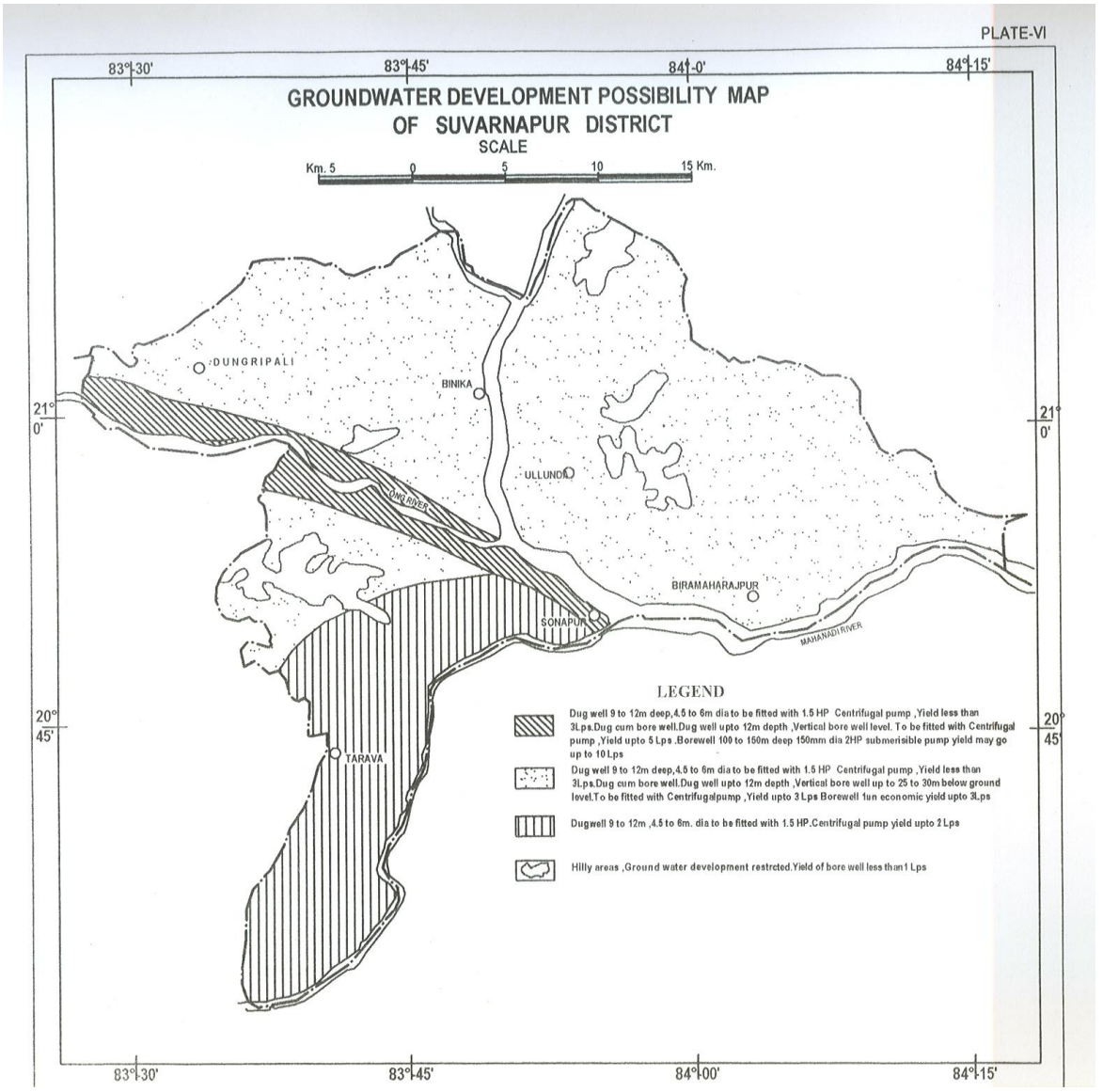
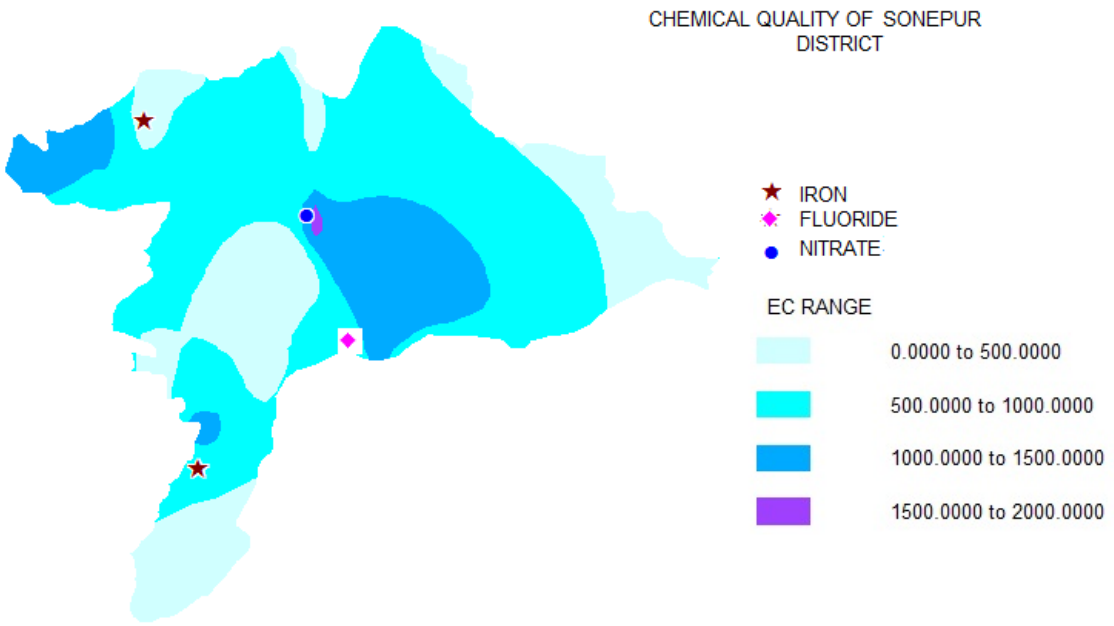

SONEPUR DISTRICT
Dynamic Ground Water Resources
(As on 31.03.2009)
DUNGRIPALI(14.88%)
BINKA(15.15%)
ULLUNDA(10.2%)
BIRMAHARAJPUR(17.52%)
SONEPUR(28.87%)
TARVA(30.97%)
DISTRICT BOUNDARY
BLOCK BOUNDARY
with name & stage of ground water development
Dynamic Ground Water Resources (HaM)
as on 31.03.2009
5,000
Gross Ground Water Draft
Net Ground Water Availability
Annual Replenishable Ground Water Resources

PLATE-VI


GROUNDWATER DEVELOPMENT POSSIBILITY MAP
OF SUVARNAPUR DISTRICT
SCALE
Km. 5 0 5 10 15 Km.
83°-30'
83°-45'
84°-0'
84°-15'
21° 0'
20° 45'
84°-00'
DUNGRIPALI
BINIKA
ULLUNDA
BIRAMAHARAJPUR
SONAPUR
TARAVA
MAHANADI RIVER
LEGEND
Dug well 9 to 12m deep,4.5 to 6m dia to be fitted with 1.5 HP Centrifugal pump ,Yield less than 3Lps.Dug cum bore well.Dug well upto 12m depth ,Vertical bore well level. To be fitted with Centrifugal pump ,Yield upto 5 Lps .Borewell 100 to 150m deep 150mm dia 2HP submerisible pump yield may go up to 10 Lps
Dug well 9 to 12m deep,4.5 to 6m dia to be fitted with 1.5 HP Centrifugal pump ,Yield less than 3Lps.Dug cum bore well.Dug well upto 12m depth ,Vertical bore well up to 25 to 30m below ground level.To be fitted with Centrifugalpump ,Yield upto 3 Lps Borewell fun economic yield upto 3Lps
Dugwell 9 to 12m ,4.5 to 6m. dia to be fitted with 1.5 HP.Centrifugal pump yield upto 2 Lps
Hilly areas ,Ground water development restrcted.Yield of bore well less than1 Lps


CHEMICAL QUALITY OF SONEPUR DISTRICT
IRON
FLUORIDE
NITRATE
EC RANGE
0.0000 to 500.0000
500.0000 to 1000.0000
1000.0000 to 1500.0000
1500.0000 to 2000.0000