GROUND WATER INFORMATION BOOKLET
BANKURA DISTRICT, WEST BENGAL

DISTRICT AT A GLANCE

Sl. No.	Items	Statistics
1.	**GENERAL INFORMATION :**	
	i) Geographical area (km^2)	
	ii) Administrative Divisions (as on 2001)	
	▪ No. of Sub-division	3
	▪ No. of Block	22
	▪ No. of Municipalities	3
	▪ No. of Villages	3577
	▪ Population as on 2001 Census	3192695
	▪ Average Annual rainfall (mm)	1211
2.	**GEOMORPHOLOGY :**	
	Major Physiographic Unit -	**Altitude:** more than 493 m amsl in the west to about 100 m amsl in the central part of the district. 10 – 50 m amsl in the eastern part of the district. **Land Slope:** 10 – 20 m/km in the Western Part & Central Part & more or less 10 m/km in the Eastern Part. **General Gradient:** North West – South East.
3.	**MAJOR DRAINAGE :**	The river Damodar, Darakeswar Silabati & Kasai.
4.	**MAJOR SOIL TYPE :**	Older alluvial soil, lateritic soil, red and yellow soil.
5.	**AREA UNDER PRINCIPAL CROPS (000 Ha) (As on 2004–05)**	Rice : 346.8 Wheat : 8.6 Maize : 0.6 Pulses : 0.4 Oilseeds : 32.1 Potato : 25.9
6.	**IRRIGATION BY DIFFERENT SOURCES (As on 2004 – 05) (Areas & No. of Structures)**	
	Dug Well :	21.67 Sq. Km. area irrigated through 2167 Nos. Dug Wells.
	Shallow Tube Well :	479.85 Sq. Km. area irrigated through 27,754 Nos. of Shallow Tube Wells.

Sl. No.	Items	Statistics	
	Deep Tube Well :	26.78 Sq. Km. area irrigated through 315 Nos. of Deep Tube Wells.	
	Tanks :	323.50 Sq. Km. area irrigated through 21,152 Nos. of Tanks.	
	Canal :	1098 Sq. Km. area irrigated through the Canal System.	
	Other Sources :	63.36 Sq. Km. area irrigated through other sources.	
	River Lift :	79.82 Sq. Km. area irrigated through 353 Nos. RLI points.	
7.	**NO. OF GROUND WATER MONITORING WELLS OF CGWB (AS ON 31.03.07)**	83	
	No. of Dug Wells	79	
	No. of Piezometers	04	
8.	**PREDOMINANT GEOLOGICAL FORMATION**	Metamorphics and granite gneissie of Achaean age, sedimentary sandstone and shale of lower Gondwana age, laterites and older alluvium of Pliestocene age, & Recent alluvium deposits.	
9.	**HYDROGEOLOGY**		
	➢ Major Water bearing formation	▪ Weathered residuum within 15 m bgl and fracture in granite gneissie in the depth span of 30 – 60 m bgl. ▪ In the alluvium sediments of both older and younger within the depth span of 30 – 270 m bgl.	
	➢ Pre-monsoon depth to water level during 2006	▪ In majority of the station 5–10 m bgl, and maximum recorded as 13.28 m bgl.	
	➢ Post-monsoon depth in water level during 2006	▪ In general, within 2–5 m bgl ad maximum recorded as 12.31 m bgl.	
	➢ Long term water level trend in 10 years (1997 – 2006) in m/yr.	▪ During Pre-monsoon period, rise of water level to the tune of 0.7 – 1.39 m/yr. and fall 0.4 to 1.85 m/yr. ▪ In Post-monsoon period rise 0.31 – 1.11 m/yr & fall 0.5 – 1.34 m/yr.	
10.	**GROUND WATER EXPLORATION BY CGWB, (as on 31.03.07)**	**Hard Rock**	**Alluvium**
	No. of wells drilled	--	21
	Depth Range (m)	--	24.86 – 306.10
	Discharge (lps)	--	2.3 – 34.44

Sl. No.	Items	Statistics	
	Transmissivity (m^2/d)		272.90 – 806.40
	Storativity (S)		1.019×10^{-3} to 2.18×10^{-4}
11.	**GROUND WATER QUALITY**		
	▪ Presence of chemical constituents more than permissible limit.	Sporadic occurrence of high fluoride (above 1.5 mg/l & as high as **8.60** mg/l in **10** blocks of the district.	
	▪ Type of Water	Mainly Ca – HCO_3 type.	
12.	**DYNAMIC GROUND WATER RESOURCES (2004) IN MCM**		
	▪ Net annual ground water availability	1899.26	
	▪ Existing ground water draft for all uses.	568.37	
	▪ Projected demand for Domestic & Industrial uses after 25 years.	63.76	
	▪ Stage of ground water development.	30%	
13.	**MASS AWARENESS & TRAINING ACTIVITY**	NIL	
	Water Management Training Programme Organized		
	▪ Date	3^{rd} & 4^{th} March, 2005	
	▪ Place	Bankura	
	▪ No. of Participants	30	
14.	**EFFORTS OF ARTIFICIAL RECHARGE & RAINWATER HARVESTING**		
	▪ Projects completed by CGWB (No. and amount spent)	13 Nos. subsurface Dykes completed. Rs. 99,000/-.	
	▪ Projects under technical guidance of CGWB	13 Nos. subsurface Dykes completed. Rs. 99,000/-.	
15.	**GROUND WATER CONTROL AND REGULATION**		
	▪ No. of OE Blocks	Nil	
	▪ No. of Critical Blocks	Nil	
	▪ No. of Blocks Notified	Nil	
16.	**MAJOR GROUND WATER PROBLEM & ISSUES**	▪ Water scarce hard rock & drought prone area. ▪ Areas with high fluoride in ground water in few blocks.	

GROUND WATER INFORMATION BOOKLET
BANKURA DISTRICT, WEST BENGAL

1.0 INTRODUCTION

- ADMINISTRATIVE DETAILS :
  - **Geographical Area :** 6881 Sq. Km.
  - **Location :** The district is located in the western part of the state and lies between north latitude 22°38' and 23°38' and last longitude 86°36' and 87°46'.
    The district is bounded by Barddhaman district in the north and north-east, Medinipur district in the south, Puruliya district in the West and Hugli in the East. The district has total 3 Nos. sub-division, namely Bankura, Bishnupur and Khatra, 22 Nos. C. D. blocks. 3 Nos. Municipalities, 190 Gram Panchayets.
    The river *Damodar* is one of the major drainage in the district, flows south easterly direction for a distance of 90 Km. in the district of Bankura, before entering the district of Bardhaman.
    Another important drainage of the district is the river Darakeswar which flows through the Central part of the district.
    In the southern part of the district, there are two more important drainage that flow almost parallel to *Darakeswar*, these are *Silabati* and *Kangsabati*. The entire district falls under *Damodar* and *Darkeswar* sub-basin in the north, and, Kasai sub-basin in the south, and the district as a whole fall in *Ganga* basin.

  - **Land Use :** The land use pattern differs in a pronounced manner from west to east with varying soil condition. The eastern alluvial tract is well cultivated and most of the area is double cropped. Uncultivable wastelands are not usually found in this part, except in the slopes and banks of drainage channel, which are not suitable for cultivation due to sheet and gully erosion. Baid type of land occurs at a lower level than the gullied waste land and covered with sandy loam soil on which paddy is grown. Lands with laterite or lateritic soil are generally covered by Sal forest except for cultivated patches within them.

  - **Irrigation :** For agriculture water is being provided by major irrigation system through network of canals, minor irrigation systems. About 52% of the total irrigated area is being irrigated by the major irrigation system and 48% of the total irrigated area by all minor irrigation systems/schemes.

  - **Agriculture :** The major crops produced in the area are Paddy, including Boro, Wheat, Maize and other Cereals, Oil Seeds Potato.

- STATUS OF SURVEY CARRIED OUT BY CGWB :
  - Under the programme of systematic hydrogeological surveys, entire district was covered in different phases during 1965 – 71.

- To understand the changes in quality and quantity in time and space, reappraisal hydrogeological survey was carried out during 1996 – 97, 2002 – 03, 2005 – 06.

- Part of the district has been covered under the programme of ground water exploration and total **20** Nos. exploratory wells have been constructed.

- To have a close observation on the trend of water levels and also on the changes in the quality of ground water with time and space water levels are being monitored four times in a year and water samples are being analysed once in a year.

2.0 RAINFALL & CLIMATE

- Normal annual rainfall is 1300 mm with1040 mm normal monsoon rainfall average maximum temperature is 44°C and minimum temperature 8°C respectively.

3.0 GEOMORPHOLOGY

There are three distinct geomorphic units with characteristic morphological assemblages, these are :-

a) **The hilly terrain in the West :** It is covered by crystalline rocks of Achaean age, characterized by hillocks, low ridges and valleys. Susunia hills (493 m) and Biharinath hills (447.8 m) are the highest surface elevation of the unit. The land slope of this unit ranges 10 – 20 m/km, towards southeast. There are other small hills like Mejhia, Karo around Gangajalghati block and in other blocks e.g. Khatra, Ranibandh, Raipur. The average elevation of these hills in the area ranges between 100 – 150 m, above mean sea level. The entire geomorphic unit is the continuation of Chotonagpur plateau.

b) **The eastern Plain Land :** The eastern part of the district comprising the blocks of Bishnupur, Kotalpur, Indus etc. is flat land which promotes intense cultivation. The surface elevation of this unit ranges between 10 – 50 m above mean seal level, with gentle slope of less than 10 m/km. towards southeast. At places the flat land shows dissected type of topography and is devoid of natural swamps or lakes.

c) **The marginal undulating tract :** This is relevant in the central part of the district where hilly terrain of the western part slowly merges into plain alluvial land. This geomorphic unit is favourable for the growth of forest area in the district.

The morphology of this unit presents highly dissected topography, where the average surface elevation is of the order of 100 m above mean sea level and the surface slopes with a gradient of 10 – 20 m/km towards south east.

- **Drainage** : The main rivers in the districts are *Damodar, Darkeswar, Kangsabati,* along with their network of tributaries. They have in general a southeasterly flow. The courses of the principal rivers are approximately parallel to each other.

  The river *Darakeswar* which flows approximately through the middle of the district and divides into two halves.

- **Soil** : Soil of Bankura district can be broadly grouped into three principal types viz. a) Red soil, b) Alluvial soil, 3) Lateritic soil.

  The typical red soil has limited distribution in the south central, south eastern, and south western parts of the district around Bishnupur, Kotalpur & Raipur respectively.

  The alluvial soil have wide distribution in the east – central and south eastern parts of the district. The older alluvial soils is also a predominant type and this group of soil is unaffected by floods and siltation and show prolific development, where as the younger or newer alluvial, found mostly in the Damodar flat land areas, are enriched by silt deposition during floods.

  The lateritic soil have wide distribution in south central to the south western part of the district.

  According to the textural types, soils of the district can be classified under the following types :-

  1) Sands, 2) Sandy Loam, 3) Loam, 4) Sandy Clay Loam, 5) Clay Loam, 6) Clay.

  Clay, clay dominated loam and loamy soils are mostly confined to the flood plain of the *Damodar* and *Darakeswar* river through sporadic occurrences. These types of occurrences also seen in small river valleys. The district as a whole is covered generally by **Sandy Loam** soil.

4.0 GROUND WATER SCENARIO

- **Geology** : The district is characterized broadly by four lithounits as under :-

  i) Crystalline granite gneisse of Achaean age is exposed in the western part of the district covering blocks of Chatna, Bankura I & II, Indpur, Khatra, Hirbundh, Gangajalghati, Raninbandh, Sarenga and parts of Saltora and Mejia.

  ii) Sedimentary sandstone and shale of lower Gondwana age occupy the northern and north western parts of the district as small patches, covering parts of Saltora & Mejia blocks, which is the southern extension of Ranijanj Coalfield.

iii) Quaternary alluvium occupy the eastern & south eastern parts of the district covering Bishnupur, Sonamukhi, Kotalpur, Indus, Joypur and Patrosayer blocks.

iv) The marginal tract covering Simlapal, Taldangra, Onda & parts of Barjora and Bishnupur blocks, covered by laterites and quaternary alluvium underlain by basement rock at shallow depth within 40 m.

- **Hydrogeology :** The diverse geological set up of Bankura district control the hydrogeological condition of the district.

  In areas underlain by hard crystalline and Gondwana rocks, ground water occurs under unconfined condition in the weathered residuum down to thedepth of about 15 m bgl with maximum upto 25 m bgl, and under semi-confined to confined condition in the fracture zones in the depth span of 30 – 60 m bgl. Resistivity survey shows that at places a deeper fracture zone is also expected to occur in the depth span of 80 – 100 m bgl. Ground water in these areas generally being developed through open wells in the weathered zone and the available discharge can only meet the domestic need, but not sufficient for any large scale development of ground water.

  Ground water from the zone of secondary porosities is being developed through bore wells and yield to the tune of 45 – 150 lpm.

  About ⅗rd of the district is covered by alluvium, older alluvium and laterites occur in Central – southern part of the district, ground water exploration carried out in the area indicates that the thickness of the alluvial sediments increases eastward from 36 m. in the marginal part to 150 m in the eastern most part. The potential aquifers exist between 30 – 95 m bgl and the discharge of the wells tapping such aquifers varies from 20 – 124 m^3/hr. with drawdown to the tune of 6 – 13 m, depending upon the geometry of the aquifers. Depth to water level in the older alluvium varies from 6 – 15 m bgl during pre-monsoon period. The dug wells in the laterites usually dry up in summer, but those wells which have penetrated through the laterites upto lithomerge, are found to contain water during the summer months also.

  A number of flowing tube wells exist along the banks of the Darakeswar, Jaipanda and Silai rivers. These tube wells are of 30 – 75 m deep (38 – 50 mm dia.) & free flow discharge to the tune of 23 – 30 lpm. along Darakeswar river, and both the banks of Jaipanda river in Taldangra block and Bishnupur block, the depth of existing auto flow tube well ranges between 45 to 75 m and free flow discharge ranges between 126 – 252 lpm. the pressure head maximum recorded as 1.10 m bgl. These wells are used for small scale irrigation purpose.

Recent alluvium occupies in the eastern and north central parts of the district and extends down to the drilled depth of about 300 m bgl. The thickness of the alluvium increases eastward. Potential granular zones exist in the depth span of 30 – 270 m bgl, yielding about 80 – 150 m^3/hr. with a drawdown between 6 to 10 m.

In general co-efficient of Transmissivity of deeper aquifer ranges from 272 – 806 m^2/day, and storativity ranges from 1.019×10^{-3} to 2.1×10^{-4}.

During the pre-monsoon period in major part of the area depth to water level has been found to be in the ranges between 5 to 10 m bgl and during post-monsoon period depth to water level was found in between 2 to 5 m bgl, in case of about 60% of the wells.

Seasonal fluctuation in water level between Pre-monsoon and Post-monsoon period has been compared and it has been found that there is a general rise in water level to the tune of 2 – 4 m. except in restricted places where a fall has been recorded between 0 – 2 m.

Long term water level trend analysis from some hydrograph station shows falling trend in water level ranges between 0.4 to 1.88 m/yr. and rising trend 0.7 to 1.39 m/yr in the Pre-monsoon period, during Post-monsoon period a falling trend .05 to 1.34 m/yr. rising trend in some well ranges between .031 to 1.11 m/yr.

4.2 GROUND WATER RESOURCES :

The dynamic ground water resources of Bankura district has been estimated jointly by CGWB & SWID following the GEC 1997 methodology, as on 31.03.04, which is as under :-

▪ Total Ground Water Resources	:	209153 ham
▪ Net annual ground water availability	:	189926 ham
▪ Existing ground water draft for all uses	:	56837 ham
▪ Stage of ground water development	:	30%
▪ Allocation for domestic and industrial water supply requirement upto 25 years.	:	6376 ham
▪ Net ground water availability for future irrigation development	:	131453 ham
▪ Categorization of blocks	:	all the blocks in the district are **"Safe"**

4.3 GROUND WATER QUALITY :

The analysis of water samples indicate that the Sodium Adsorption Ratio, in general ranges from 0.58 to 4.02 falling in the category of C_1S_1, C_2S_1, C_3S_1 and a few in C_4S_1 indicating low sodium and low salinity

hazard, and therefore the ground water can be grouped as excellent to good, for irrigation use.

In drinking water supply scheme concentration of iron and fluoride is a serious problem in the district.

Groundwater in 10 blocks namely Taldangra, Simlapal, Raipur, Indpur, Bankura II, Saltora, Barjora, Hirbundh, Chatna, Gengajalghati is affected sporadically by high concentration fluoride in ground water i.e. more than the permissible limit (>1.5 mg/L) in different type of hydrogeological formation.

- In fractured granite within 40 to 50 m.
- In older alluvium sediments 40 to 50 m.

In **Simlapal block** concentration of fluoride has been reported to be as high as 8.61 mg/L.

4.4 STATUS OF GROUND WATER DEVELOPMENT (BLOCKWISE) :

BLOCK	Occurrence of Aquifer & its potentiality (as available with CGWB)	Feasibility of Ground Water Abstraction Structures.	Ground Water Resource Available & Status of Ground Water Development (as on March'04)	REMARKS
1	2	3	4	5
1. Ranibandh	Ground water occur in the weathered residuum in the depth range of 5 – 15 m bgl & fracture in the granite gneisse down to 50 m bgl.	Dug wells or bore wells or dug – cum – bore wells are feasible in the area. General yield of the bore wells of about 50 m. deep yield 10 m^3/hr.	Net Ground Water Availability : 6102 Ham Irrigation Draft : 173 Ham No. of Irrigation Well : STW : Nil DW : 480 Category of block : Safe	Ground water in the adjacent areas contaminated with fluoride. Measures to be taken for estimation of fluoride concentration in ground water before use for drinking.
2. Raipur	Ground water occur in the weathered residuum in the depth range of 5 – 15 m bgl & fracture in the granite gneisse down to 50 m bgl. & also in the area covered by older alluvium down to 130 m bgl.	Dug wells or bore wells or dug – cum – bore wells are feasible in the area. General yield of the bore wells of about 50 m. deep yield 10 m^3/hr. & yield 50 – 100 m^3/hr. of tube wells 100 – 130 m. deep.	Net Ground Water Availability : 6983 Ham Irrigation Draft : 1624 Ham No. of Irrigation Well : STW : 899 DW : 155 Category of block : Safe	Ground water in the area contaminated with fluoride in the dug well and tube well. Hence it is suggested that measures to be taken for defluoridation of ground water before use for drinking.
3. Hirbundh	Ground water occur in the weathered residuum in the depth range of 5 – 15 m bgl & fracture in the granite gneisse down to 50 m bgl.	Dug wells or bore wells or dug – cum – bore wells are feasible in the area. General yield of the bore wells of about 50 m. deep yield 10 m^3/hr.	Net Ground Water Availability : 3667 Ham Irrigation Draft : 88 Ham No. of Irrigation Well : STW : Nil DW : 197 Category of block : Safe	Sporadic occurrence of high fluoride in ground water has been observed, it is suggested measures to be taken for deflouridation of ground water before use for drinking.

1	2	3	4	5
4. Khatra I	Ground Water occur in the weathered residuum in the depth range of 5 – 15 m bgl & fracture in the granite gneisse down to 50 m bgl.	Dug wells, bore wells, dug – cum – bore wells are feasible in the area. General yield of the bore wells of 50 m. deep is about 10 m^3/hr.	Net Ground Water Availability : 3810 Ham Irrigation Draft : 30 Ham No. of Irrigation Well : STW : Nil DW : 70	The area is not potential for ground water of development. Development of ground water to be done in a scientific manner.
5. Indpur	Ground Water occur in the weathered residuum in the depth range of 5 – 15 m bgl & fracture in the granite gneisse down to 50 m bgl.	Dug wells, bore wells, dug – cum – bore wells are feasible in the area. General yield of the bore wells of 50 m. deep is about 10 m^3/hr.	Net Ground Water Availability : 11439 Ham Irrigation Draft : 46 Ham No. of Irrigation Well : STW : Nil DW : 130	The area is not potential for ground water development. Development of ground water is to be done in a scientific manner.
6. Gangajalghati	Ground Water occur in the weathered residuum in the depth range of 5 – 15 m bgl & fracture in the granite gneisse down to 50 m bgl.	Dug wells, bore wells, dug – cum – bore wells are feasible in the area. General yield of the bore wells of 50 m. deep is about 10 m^3/hr.	Net Ground Water Availability : 6314 Ham Irrigation Draft : 156 Ham No. of Irrigation Well : STW : Nil DW : 438	The area is not feasible for ground water development. Development of ground water is to be done in a scientific manner.
7. Chhatna	Ground Water occur in the weathered residuum in the depth range of 5 – 15 m bgl & fracture in the granite gneisse down to 50 m bgl.	Dug wells, bore wells, dug – cum – bore wells are feasible in the area. General yield of the bore wells of 50 m. deep is about 10 m^3/hr.	Net Ground Water Availability : 7503 Ham Irrigation Draft : 117 Ham No. of Irrigation Well : STW : Nil DW : 317	The area is not feasible for ground water development. Development & ground water is to be done in a scientific manner.

1	2	3	4	5
8. Mejhia	Ground water occur in the weathered residuum in the depth range of 5 – 15 m bgl & fracture in the granite gneisse down to 50 m bgl.	Dug wells, bore wells, dug – cum – bore wells are feasible in the area. General yield of the bore wells of 50 m. deep is about 10 m^3/hr.	Net Ground Water Availability : 2936 Ham Irrigation Draft : 239 Ham No. of Irrigation Well : STW : 99 DW : 160	The area is not feasible for ground water development. Development of ground water is to be done in a scientific manner.
9. Bankura I	Ground water occur in the weathered residuum in the depth range of 5 – 15 m bgl & fracture in the granite gneisse down to 50 m bgl.	Dug wells, bore wells, dug – cum – bore wells are feasible in the area. General yield of the bore wells of 50 m. deep is about 10 m^3/hr.	Net Ground Water Availability : 3024 Ham Irrigation Draft : 154 Ham No. of Irrigation Well : STW : Nil DW : 419	The area is not feasible for ground water development. Development of ground water is to be done in a scientific manner.
10. Bankura II	Ground water occur in the weathered residuum in the depth range of 5 – 15 m bgl & fracture in the granite gneisse down to 50 m bgl & in the thin patches of laterite & older alluvium in the eastern part of the block.	Dug wells, bore wells, dug – cum – bore wells are feasible in the area. General yield of the bore wells of 50 m. deep is about 10 m^3/hr. & in the areas in the eastern part of the block tube wells are feasible within 120 m bgl and expected yield is ranges from 15 – 30 m^3/hr. In places it may vary upto 100 m^3/hr.	Net Ground Water Availability : 4346 Ham Irrigation Draft : 1158 Ham No. of Irrigation Well : STW : 581 DW : 390	The area is not feasible for ground water development. Development of ground water is to be done in a scientific manner in the area. Part of the area fluoride contamination in ground water is reported; measures to be taken before use ground water for drinking.

1	2	3	4	5
11. Barjora	In general ground water occur in thin patches of Recent Alluvium formation Aquifers ranges in thickness from 6 to 9 m. down to the explored depth of 100 m.	Tube wells upto 100 – 130 m bgl are feasible and expected yield is 150 m3/hr. dug wells are also feasible.	Net Ground Water Availability : 10362 Ham Irrigation Draft : 2773 Ham No. of Irrigation Well : STW : 1502 DW : 145	The ground water in the area is contaminated with high fluoride to the tune of 3.90 mg/l hence remedial measures to be taken for defluoridation before use ground water for drinking.
12. Sonamukhi	In general ground water occur in the alluvial formation in the area. The tube wells in the area yielding high tapping the multiple aquifers down to 200 m bgl. The thickness of the aquifer ranges in thickness from 22 to 38 m. The potential aquifer encounter in the depth span of 34 to 161 m bgl.	Large diameter tube wells upto 200 m. depth are feasible and yield may range from 100 – 220 m^3/hr. Drawdown may ranges from 4.28 m. to 9.75 m.	Net Ground Water Availability : 14665 Ham Irrigation Draft : 6295 Ham No. of Irrigation Well : STW : 3329 Deep TW : 17	The aquifers are potential and the block is under safe category. Ground water development may be taken up in a planned manner.
13. Patrasayer	Ground water in the area occur in the alluvial formation. Ground water in the area occur under unconfined to semi-confined condition. Multiple aquifer system encountered in the area within the available drilled depth of 200 mt. The potential aquifers were encountered in the depth range of 30–37, 47–59, 88–100, 104–111, 131–149 m.	In general large diameter (250 mm) tube wells are feasible. Yield of these tube well ranges from 32 to 138 m^3/hr. with a economic drawdown ranges from 9 – 13 m.	Net Ground Water Availability : 14511 Ham Irrigation Draft : 5882 Ham No. of Irrigation Well : - STW : 3103 - Deep TW : 13	The aquifers in the area are potential and the block is under 'safe' category. Ground water development may be done in a planned manner.

1	2	3	4	5
14. Indus	In general ground water in the area occur under unconfined to semi-confined condition. Multiple aquifer system encountered in the area upto the explored depth of 295 m. The potential aquifers were encountered in the depth span of 32-58 m, 82-100 m, 116-126 m, 228-259 m.	Medium duty to heavy duty tube wells are feasible in the area, yield of the tube wells ranges from 90 – 160 m^3/hr. with drawdown ranges from 6.4 to 9.14 m.	Net Ground Water Availability : 13452 Ham Irrigation Draft : 5353 Ham No. of Irrigation Well : STW : 2936 Deep TW : 10	The aquifers in the area are potential and the block is under safe category. Ground water development may be done in a planned manner.
15. Kotalpur	Ground water in the area occur under unconfined to semi-confined condition. Potential aquifers in general occur in the depth span of 44 – 50, 95 – 124 m. upto the explored depth of 167 m.	Medium to heavy duty tube wells are feasible. The yield of the tube well ranges from 81 to 212 m^3/hr. with a drawdown ranges from 8.53 to 12 m.	Net Ground Water Availability : 12387 Ham Irrigation Draft : 6802 Ham No. of Irrigation Well : STW : 3545 Deep TW : 27	The aquifers are potential and the block is under safe category, ground water development programme may be taken up in a planned manner.
16. Joypur	Ground water in the area occur under unconfined to semi-confined condition. Potential aquifers in general occur in the depth span of 64–76 m, 80–100 m, 105–112 m, 140–152 m, 165–177 m, 181–199 m upto the explored depth of 210 m bgl.	Medium to heavy duty tube wells are feasible. The yield of the tube well ranges from 60 – 150 m^3/hr. and drawdown ranges from 12 to 16 m.	Net Ground Water Availability : 12647 Ham Irrigation Draft : 3723 Ham No. of Irrigation Well : STW : 1903 Deep TW : 11	The aquifers in part of the block is potential and feasible and ground water may be developed in planned manner. The aquifers in the north central part are not very potential and large scale development is not feasible.

1	2	3	4	5
17. Simlapal	Ground water in the area occur under unconfined to confined condition. Potential aquifer occur in the depth span of 73–81 m, 96–115 m, within the explored depth of 144 m.	Medium to heavy duty tube wells are feasible. The yield of the tube well may as high as 166 m^3/hr. and drawdown 8.83 m.	Net Ground Water Availability : 7080 Ham Irrigation Draft : 1442 Ham No. of Irrigation Well : STW : 799 Deep TW : Nil	The part of the area along the bank of Joyponda auto-flow tube wells are feasible but ground water in the area is contaminated with high fluoride. Measures to be taken for defluoridation, prior to use the water for drinking.
18. Taldangra	Ground water in this area occur under semi-confined to confined condition. Potential aquifers may encounter in the depth span of 45–75 m bgl and yield may vary to the tune of 126–252 m. The pressure head varies from 1.10–1.60 m bgl. The aquifers are mainly older alluvium of Quarternary age.	Medium duty tube wells are feasible in the area with an expected yield of 50 – 150 m^3/hr.	Net Ground Water Availability : 8829 Ham Irrigation Draft : 2119 Ham No. of Irrigation Well : STW : 1131 Deep TW : 4	The aquifers over a small area in the eastern part is potential for development and the block is under safe category. The western part of the block is covered by hard massive rock, ground water development through large dia tube wells are not feasible.
19. Bishnupur	Ground water in this area occur under semi-confined to confined condition. Potential aquifers exist between the depth span of 50–60 m, 80–110 m, 131–160 m, 178–190 m, the drilled depth of 203 m auto-flow zones within the depth span of 89–90 m, 60–71 m were also encountered in some places, pressure head 1 m agl.	Medium to heavy duty tube wells are feasible in the area and expected yield ranges from 115 – 180 m^3/hr. and drawdown of 6.70 m to 18.28 m.	Net Ground Water Availability : 11883 Ham Irrigation Draft : 6667 Ham No. of Irrigation Well : STW : 3426 Deep TW : 19	The aquifers in the area are potential and fall under safe category. Ground water development may be taken up, baring a small part in the northern side of the Bishnupur.

1	2	3	4	5
20. Onda	Ground water in this block occur under unconfined to semi-confined condition in older alluvium and laterites. Exploratory drilling data of CGWB reveals that potential granular zone exist in different depths, 66 – 75 m, 86 – 95 m, 100 – 109 m down to the drilled depth of 120 m, further drilling was not feasible due to early encountering of hard rock. Maximum yield was recorded 25 – 30 m^3/hr with a drawdown of 9 m.	Low to medium duty tube wells are feasible in the area, moderate yield is expected. Large diameter dug wells are also feasible.	Net Ground Water Availability : 17568 Ham Irrigation Draft : 6101 Ham No. of Irrigation Well : STW : 3344 Deep TW : 6 DW : 135	Ground water potential of the block is limited. Any sites for construction of large scale development may be selected in a scientific manner.
21. Saltora	Ground water in the area occur under water table condition in the weathered mantle and in the secondary porosities of underlying formation. Thickness of the weathered mantle varies from place to place and extends down to 20 m bgl, fractured rock occasionally extends upto 60 m bgl.	Large diameter dug well of 15 – 20 m. deep are feasible, bore wells of 60 m. deep are also feasible in suitable places, locating sites with the help of geophysical survey may help to make a successful tube wells. Yield may expected 10 – 15 m^3/hr.	Net Ground Water Availability : 5004 Ham Irrigation Draft : 63 Ham No. of Irrigation Well : STW : Nil Deep TW : Nil DW : 218	Ground water potential of the block is very limited. Large diameter dug wells are feasible, but it has been found fluoride concentration in ground water is high defluoridation technique may be adopted prior to use the water for drinking.

1	2	3	4	5
22. Sarenga	Ground water in the area occur under semi-confined condition in the laterite and moderately thick discontinuous patches of older alluvium.	Shallow tube wells and large diameter dug wells are feasible in the area, yield of the wells may range from 10 – 20 m^3/hr.	Net Ground Water Availability : 5415 Ham Irrigation Draft : 1113 Ham No. of Irrigation Well : STW : 642 DW : 22 Deep TW : Nil	Ground water potential in the area is limited hence the block falls under safe category. Selection of sites for construction of any ground water structure for large scale development may be done in a planned scientific manner.

* DW: Dug Well; DTW: Deep Tube Well; STW: Shallow Tube Well.

5.0 GROUND WATER MANAGEMENT STUDY

Bankura district is covered almost half of its area by hard rock and the remaining area by alluvium of both Recent and Older age.

Blockwise strategy for ground water development has been given in item no. 4.4.

A general strategy, as applicable, in the district is summarized below :-

Hard rock areas covered by crystalline rocks/Godwana sedimentaries, following ground water abstraction structures are feasible.

- Large diameter dug well of 15 – 20 m depth, tapping the weather residuum.
- Bore well of 60 m. depth may sustain a yield 45 – 150 lpm. Selection of site may be done in a scientific manner, specially with the help geophysical survey.
- Considering the limited potentialities attempts to be made to augment ground water resources. It has been observed that suitable rainwater harvesting structures if constructed at suitable locales along the existing streams, the base flow may be arrested and lowering of water level in the nearby dug wells/tube wells can be restricted.
- Special care is to be taken for the areas having fluoride concentration is above permissible limit, defluoridation of water is essential.

In the alluvial terrain, thickness of the alluvium gradually increases from west to east. In these areas ground water may be developed through different abstraction structures, considering the availability of potential aquifers, thickness of the aquifer, stage of ground water development etc.

- Shallow tube wells of 50 – 60 m deep, tapping the cumulative thickness of 10 – 12 m is feasible and sustain an yield 20 – 30 m^3/hr. with a reasonable drawdown.
- Medium to heavy duty tubewells in the depth span of 150 – 270 m is also feasible, 20 – 35 thick aquifer, may sustain an yield 60 – 200 m^3/hr. with a reasonable drawdown as recorded in general 4 – 10 m, also as high as 16 m.
- Fluoride contamination in ground water has been reported from the tube wells with 50 m. depths in the blocks reported very high are Simlapal, Barjora, Raipur etc. The deeper aquifers beyond 50 m bgl may be explored to find out the quality of water whether suitable for drinking or not.

5.2 WATER CONSERVATION & ARTIFICIAL RECHARGE :

In modern days water conservation and artificial recharge through rainwater harvesting is essential, mainly in Bankura district where majority of the area

faces severe water scarcity during the lean period. The annual rainfall is 1300 mm and which is sufficient to design suitable rainwater harvesting structure.

Conservation of Water : In the areas along the western boundary and also in the south western part of the district where hard formation is prevalent, potentiality in general is limited to poor; dug wells are the main ground water abstraction structure. But with the onset of summer these dug wells are dried up, and scope of further development is also not feasible, to mitigate the crisis of drinking water problem, rainwater conservation is the best option. Conservation of rainwater can be done from the water that is available from both rooftops and also from the land.

- The water available from roofs can be stored giving considerations to all types of losses in cemented tanks or in PVC tanks. Before conserving the water should be passed through a filter media.

- Rainwater available from the surrounding land surface can be stored in any ponds and in this case design of ponds are to be finalized considering local hydrogeological condition.

- In undulating terrain gully plugs are feasible on cultivated land to conserve limited quantity of water and there by soil moisture can be increased and will be beneficial for crop production.

- In the alluvial areas of the district rainwater conservation is also feasible depending upon the requirement, and prevailing hydrogeological condition.

Artificial Recharge to Ground Water : Feasibility of artificial recharge to ground water is site specific. The guiding factors for selecting sites and type of structure for artificial recharge to ground water as follows :-

- Non – committed rainwater is to be utilized for artificial recharge to ground water.

- Hydrogeological conditions should be suitable to get recharged by rainwater.

- The site is to be located in a plain terrain so that water does not drain out in natural condition through streams/nallahs, before development.

- Post-monsoon water level should be more than 3 m bgl.

In Bankura district, the feasible artificial recharge structures are recommended as follows :-

- Percolation tanks are feasible as with the depletion water level of Post-monsoon period.

- Check dam are feasible supported by properly designed recharge well. In case the check dams are on sloppy streambed, these are to be supported by gabion structures on upstream side to control the velocity of water and

accumulation of silt. The height of the check dam is to be finalized based on leveling survey, in order to protect the land from sub mergence.

- Dry dug wells after cleaning can be used for artificial recharge to ground water. And before recharging the water is to be passed through a filter media.

- During monsoon, the large ponds mainly at Bishnupur Bankura and other places, overflow and the surplus water can be used, considering feasible hydrogeological condition with the help of contour bandh.

- Subsurface dykes are also most feasible structure.

Scheme on Rainwater Harvesting for Artificial Recharge : Under Central Sector Scheme, artificial recharge of groundwater has been proposed through construction of 13 Nos. subsurface dykes across three stream courses in Bamontore G.P. of Saltora block. The dimension of the subsurface dykes were 6.7 m × 2.16 m. × 2.69 m. The other salient features of the structures are as follows :-

		Catch mt. area	Water retention capacity (cum)	Area benefited Ha	Avg. rise in water level (m)
1.	Subsurface dyke at Chowdhury Bandh nala (6 Nos. SSD)	2.67×10^6 Sq.km.	2.208×10^6	90	0.45
2.	Across Kechkajhor (4 Nos. SSD)	1.84×10^6 Sq.km.	1.470×10^6	60	0.48
3.	Across Tentulrakh nala (3 Nos. SSD)	1.38×10^6 Sq.km.	1.104×10^6	45	0.42

It may be noticed that an average increment of 0.45 m at the ground level and 0.20 m. in the surface water level has been occurred. The scheme was executed by SWID, Govt. of West Bengal, under the technical guidance of CGWB.

6.0 GROUND WATER RELATED ISSUES & PROBLEMS

No water logged area was noticed/marked in the district, though considerable area is covered by canal irrigation.

The district is a drought prone district and part of the blocks eg Chatna, Gangajalghati, Indpur, Hirbundh, Mejia, Ranibandh, Saltora face severe drought and declared as drought blocks. The area stretching from NW, W & SW covering almost half of the area underlain by Achaeans, and Gondwana suffer from water scarcity owing to poor potentiality of the formations. In these areas groundwater occur under water table condition in the weathered zone and semi confined to confined condition in the zone of secondary porosities.

The drought prone blocks as mentioned above are severely water scarce areas in the district.

It has been observed from the record that in Khatra block a large number of hand pump fitted tube wells have become inoperative due to lowering of water level in the peak summer months.

Groundwater in the district is contaminated with fluoride. In the district about1,71,800 population are living in a risk zone over 309 hebetations in 10 blocks.

The collective information of drilling from different agencies indicate that the half of the area is covered by massive crystalline rock and thickness of weathering is less and devoid of secondary porosity, hence drilling of tube wells in these areas may not be successful. It is suggested that the areas for drilling to be selected in a scientific manner specially through geophysical investigation, this will help to reduce the economic burden.

As such, till date no significant record of natural disaster was reported.

7.0 AWARENESS & TRAINING ACTIVITY

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

- Mass Awareness Programme : Not yet taken up in the district.

- Water Management Training Programme (WMTP)

Place	:	Bankura
No. of Participants	:	30
Date	:	3rd & 4th March 2005.
Theme	:	Water Management Training on Rainwater Harvesting.

The training programme was organized by CGWB, lectures covered on different topics on hydrogeological situation of the district and the main focus was on rainwater harvesting, artificial recharge technique, groundwater quality. The participants were mainly from SWID, PHED, Panchayet, Zilla Parishad, College etc.

7.2 Participation in Exhibition, Mela, Fair etc. : Nil

7.3 Presentation & Lecture delivered in Public Forum/Radio/TV/Institution of repute/ Grass root association/NGO/Academic Institution etc.

No such event took place, which requires to be mentioned.

But it is not out of place to mention that. Bankura district is one of the district in West Bengal, received the **"Bhoomijal Sambardhan Puraskar"** on Panchayat Category.

Gopalpur Panchayat in Hirbundh block a sever water scarce area. The panchayat took a commendable initiative to complete the rainwater harvesting schemes in the area, and brought a significant area under cultivation through implementing these schemes. These schemes ultimately brought changes on socio-economic condition of the people in the Panchayat area.

The "Sambardhana Puraskar" was given by the President of India in the National Water Congress, organized by CGWB, MOWR in New Delhi during Sept. 2007 to observe the "Water Year".

8.0 AREA NOTIFIED BY CGWA / SGWA

No such area was notified in the district.

9.0 RECOMMENDATION

Blockwise recommendation of construction of ground water structures are given in Item No. (4).

However, it is recommended based on the available information and hydrogeological surveys.

- In part of Taldangra block along Silai river, Simlapal block along Joyponda river, a number autoflow tube wells were found, hence it is suggested the extension of the **"autoflow"** areas to be marked and conjunctive use of groundwater and surface water may be done in a planned manner. The same may be done in parts of Bishnupur block. Also,
- The majority of the area of the district is underlain by hard crystalline rocks, groundwater development plan is to be done in a scientific manner.

- There are 5 vast water bodies (pond) in Bishnupur Town namely, Krishnabundh, Lalbundh, Jamma Bandh, Shyambandh, Gatai Bandh. These ponds if properly renovated including de-selting huge quantity of rainwater can be conserved and the Bishnupur Municipality which faces acute water scarcity during summer, may cater the domestic need.

Similar steps may taken up for Bankura Municipality, near Kesekole site situated east of Gondeswari river in its flood plain, a large water reservoir can be constructed.

- Check dams, sub-surface dykes may be useful if constructed at certain intervals in the drainage channels of Kangsabati river in its lower valley, Silabati, Joyponda, Tarafeni, Burai etc. It has been observed small drainage channels of these rivers show "base flow" and if these can be arrested lowering of water level in the surrounding area can be restricted, and also it has been found that submergence will not take place. Through the small drainage channels in the command area of Kansabati Reservoir there is a flow of excess water from the irrigation canals during *Khariff* and *Rabi* which can also be used according to the need.

- In the blocks where excess fluoride concentration in groundwater has been recorded, proper defluoridation technique to be adopted prior to use for drinking.