

DISTRICT GROUND WATER INFORMATION BOOKLET



NARSINGHPUR DISTRICT MADHYA PRADESH



**Ministry of Water Resources
Central Ground Water Board
North Central Region
Government of India**

2013

NARSINGHPUR DISTRICT AT A GLANCE

S.No.	Items	Statistics		
1.	General Information			
	Location	Latitude (N) 22°45' - 23°15' Longitude(E) 78°38' - 79°38'		
	i) Geographical area	5,125.55 km ²		
	ii) Administrative Divisions (As on 2006)			
	Number of Tehsil/Blocks	5/6		
Number of Panchayats/Villages	457/1086			
iii) Population (Census 2011)	1,092,141			
iv) Normal Rainfall (mm)	1217.6			
2.	Geomorphology			
	1. Major Physiographic Units:	Southern Satpura hill range Narmada Alluvium plain and Northern Vindhyan Range		
	2. Major Drainage:	Narmada, Shakkar and Dudhi		
3.	Land Use (In Km²)			
	i) Forest area:	342		
	ii) Net area sown:	3036.99		
	iii) Cultivable area:	3884.15		
4.	Major Soil Types			
		Alluvium		
5.	Principal Crops			
		3884.15 km ²		
6.	Irrigation By Different Sources		No.	Area irrigated km²
	Dugwells	25913	929.75	
	Tube wells/Bore wells	4738	774.13	
	Tanks/Ponds	1	0.8	
	Canals	13	10.95	
	Other Sources	-	0	
	Net Irrigated Area	-	1769.10	
	Gross Irrigated Area)	-	1851.70	
7.	Number of Ground Water Monitoring Wells of CGWB (As on 31.3.2013)			
	No. of Dug Wells	19		
	No. of Piezometers	5		
8	Predominant Geological Formations			
		Alluvium, Deccan Trap basalts, Gondwana , Vindhyan sandstone, Bijawars and Archeans		
9	Hydrogeology			
	Major Water Bearing Formation	Alluvium, Weathered/vesicular basalt, flow contacts and fractured sandstone.		
	Pre-monsoon depth to water level during 2012	4.15 – 18.6 m bgl		
	Post-monsoon depth to water level during 2012	2.26 – 20.72 m bgl		
	Long Term water level trend in 10 years	Pre-monsoon		

	(2003-2012) in m/yr	0.6 m/annum Rise Post-monsoon 0.08 – 0.3/annum fall
10.	Ground Water Exploration By CGWB (As on 31.3.2013)	
	No of wells drilled (EW,OW,PZ,SH, Total)	EW 77 OW 27 Pz 11
	Depth Range (mbgl)	43 to 403.25
	Discharge (liters per second)	0.20 to 52.42
	Storativity	2.01×10^{-6} to 1.15×10^{-3}
	Transmissivity (m^2/day)	23- 2400
11.	Ground Water Quality	
	Presence of Chemical constituents more than permissible limit (e.g. EC, F, As, Fe)	EC: 297-1365 μScm^{-1} NO ³ :8-74 F: 0.13-1.57
	Type of Water	potable
12	Dynamic Ground Water Resources (2009) in MCM	
	Net Ground Water Availability	1226.0
	Gross Annual Ground Water Draft.....	945.9
	Projected Demand for Domestic and Industrial uses up to 2025.....	26.76
	Stage of Ground Water Development....	77%
13	Awareness and Training Activity	
	Mass Awareness Programmes organised Water Management Training Programmes	Nil Nil
14	Efforts of Artificial Recharge & Rainwater Harvesting	
	Projects completed by CGWB (No. & Amount Spent)	Nil
	Projects under technical guidance of CGWB (Numbers)	Nil
15	Ground Water Control and Regulation	
	Number of OE Blocks	Nil
	Number of Critical Blocks	1-Narsinghpur
	Number of Semi Critical Number of Notified Blocks	3- Chanwar Patha, Ghotegaon and Kareli Nil
16	Major Groundwater Problems and Issues	
		Declining water levels

1.0 INTRODUCTION

Narsinghpur district, spanning over an area of about 5126 km², lies in the south central part of the state of Madhya Pradesh. There are five tehsils fall under this district namely Narsinghpur, Gotegaon, Gadarwara, Tendukheda & Kareli and the district further divided into six administrative blocks namely Saikhera, Babai Chichali, Chawarpatha, Kareli, Narsinghpur & Gotegaon.

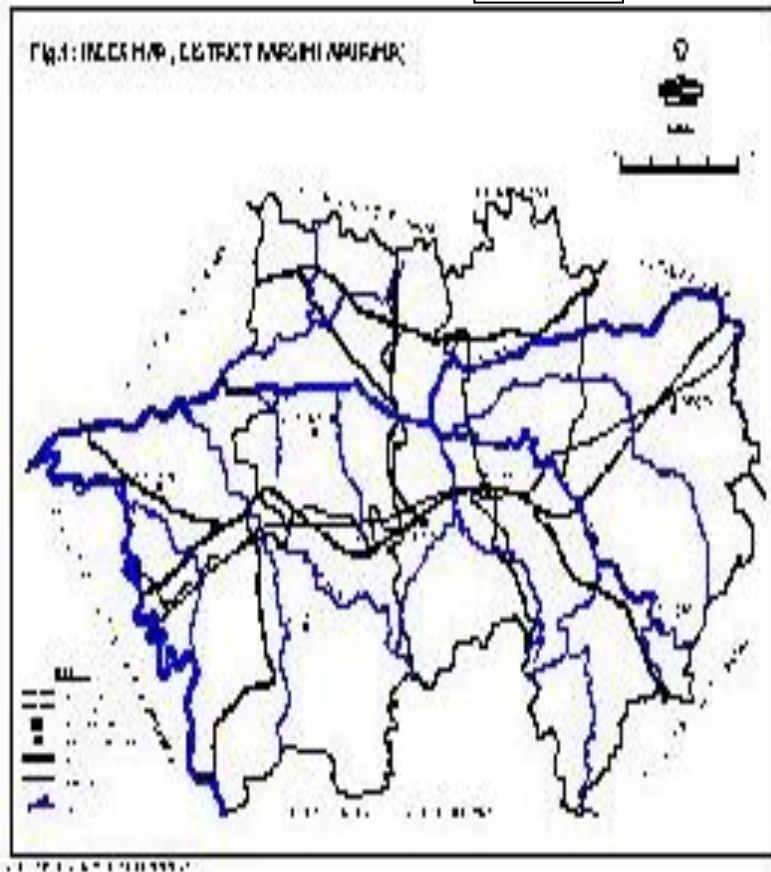
The district is bounded by Seoni district on the southeast, Chhindwara in South, Hoshangabad & Raisen in the west, Jabalpur in the northeast and Sagar in the North. The district lies between North latitude 22°36' and 23°16' and east longitude 78°27' and 79°40', falling in Survey of India topo sheet No. 55/I, 55/J, 55M & 55/N. Narsinghpur is well connected with all parts of country by Rail and roads. It lies on Mumbai- Varanasi and Bhopal - Bilaspur main railway line. National Highway no.12, 26 and state Highway no.22 pass through the district. Important town and villages are well connected by road.

The index map of Narsinghpur district is shown in Figure-1. As per 2011 census, the population of Narsinghpur district is about 1,092,141. For administrative purposes the district has been divided into 5 tehsils and 6 blocks. It has five city (Narsinghpur, Kareli, Gotegaon, Gadarwara & Babai Chichali), and 1052 villages.

The agricultural activity in Narsinghpur district is mainly dependent on the monsoon. Irrigation aims at making good the deficiencies of rainfall, thereby bringing more land under cultivation. At present the main source of irrigation in the district are Canals & tubewells.

After the reorganization of states in 1956 there has been a gradual increase in surface water Development.

Fig 1



Central Ground Water Board (CGWB) Activities-

In most of the parts of the district, comprehensive hydrogeological surveys were conducted during 1984-85, 87-88 and 92- 93.

- a- Sh. L.N. Mothgare, conducted systematic hydrogeological surveys in district during 1984-85. Sh P. Srinivasan, conducted systematic hydrogeological surveys in the remaining part of the district during 1987-88. Reappraisal survey of the area was carried out by Sh. Parvinder Singh and Ku. A.Bhatia during 1992-93.

- b- Central Ground Water Board has drilled 77 exploratory wells in the district. all boreholes were drilled in alluvium, Basalt and sand stone terrain.
- c- In Narsinghpur district neither mass-awareness nor groundwater management-training programme have been organized by CGWB.

2.0 RAINFALL AND CLIMATE

The climate of Narsinghpur district is generally dry except during the southwest monsoon season. The year can be divided in to four seasons. The winter commences from middle of November and lasts till the end of February. The period from March to about first week of June is the summer season. May is the hottest month of the year. The southwest monsoon starts from middle of June and lasts till end of September. October and middle of November constitute the post monsoon or retreating monsoon season.

The normal annual rainfall of Narsinghpur district is 1217.6mm. District received maximum rainfall during south west monsoon period i.e. June to September . About 91.3 % of the annual rainfall received during monsoon season. Only 8.7 % of the annual rainfall takes place between October to May period. The rainfall forms the sole source of the natural recharge to ground water regime and is mainly available during the south west monsoon period only.

The normal maximum temperature received during the month of May is 42.5⁰ C and minimum during the month of January is 8.2⁰ C. The normal daily mean monthly maximum temperature is 33.2⁰ C and daily mean minimum temperature is 18.1⁰ C.

The summer season is the driest period of the year. The relative humidity generally exceeds 90% in the month of August. In the rest of year is drier. The driest part of the year is summer, when relative humidity comes down lowest in 39% in the month of April. It varies between 39% and 90% at different time in different seasons. The wind velocity is high during the monsoon period as compared to pre and post monsoon.

The wind velocity is highest in June around 8.0 km/hr and lowest is 2.0 km/hr in November. The average normal annual wind velocity of the district is 4.2 km./hr. Normal climatological parameter of Narsinghpur district is given below:

S. N.	Parameter	Jan	Feb.	Mar	Apr.	May	June	Jul.	Aug	Sep.	Oct	Nov.	Dec	Annual
1	Max.Tem	26.8	30.3	35.3	40.3	42.5	38.1	31.4	29.7	31.9	33.5	30.7	27.3	33.2
2	Min.Tem	8.2	11.1	15.6	21.4	25.9	26.1	23.9	23.1	22.5	17.9	12.4	8.6	18.1

3	Rela.Hum	74	64	50	40	39	66	85	90	84	70	70	76	67
4	Wind vel.	2.4	3	3.8	4.4	5.9	8	6.8	6	3.8	2.2	2.2	2	4.2
5	Rainfall	11	17.3	12.1	6.2	7	168.9	334.8	423.6	160.8	23.5	14.3	12.6	1192.1

3.0 GEOMORPHOLOGY & SOIL TYPES

Physiographically, the district area can be broadly divided into three sectors- namely 1) Narmada Valley alluvial plain, 2) Satpura range in the south and 3) the Vindhyan range in the north. The vast alluvial plain of Narmada valley stretches from east to west throughout the district on both the sides of the Narmada river. The regional slope of the area is westward.

Soil Characteristics

The areas in Northwest, East and Southeast of the district are generally covered with black soils derived from Basaltic rocks varying in the depth from 0.33m to over a meter. The soils are usually clayey to loamy in texture with calcareous concretions invariably present. They are sticky and in summers, due to shrinkage, develop deep cracks. The soils predominantly consist of montmorillonite and beidellite type of clay minerals.

In rest of alluvial areas, mixed clays, black, brown to reddish brown, derived from sandstones and basalt rocks are observed and are predominantly sandy - clayey in nature with calcareous concretions. Near the banks of the rivers and at river confluences, light yellow to yellowish brown soils are noticed which were deposited during the recent past. These soils are clayey to silty in nature. The soils near the foot hills are gravelly with good porosity.

4.0 GROUND WATER SCENARIO

4.1 Geology

The general geological successions in the district are given in table-4.

Table-1: General Geological successions of Narsinghpur district.

Age	Stratigraphic Unit	Lithology
Recent Pleistocene		alluvium & soil cap

			comprising clays, sand, gravels etc.
----- Unconformity -----			
Cretaceous to Eocene		Deccan trap and intertrappeans	Basaltic lava flows and intertrappean bed comprising red bole.
----- Unconformity -----			
upper cretaceous		Lametas	sandstones, silt stones , limestones & Marls
Permian to upper cretaceous	Upper Gondwana	Jabalpur series, (Jabalpur stage, chaugan stage)	soft porous sandstones and light coloured shales & clays
		Mahadeva series (Bagra stage & Denwa stage)	pebble beds & conglomerates white & yellow sandstones and shales
----- Unconformity -----			
upper carboniferous to Permian	lower Gondwanas	Danuda series, Barakar stage	white to lava coloured sandstones & grits with occasional conglomerates and shales
		Talchir series, Talchir stage	green boulder with clays & shales
----- Unconformity -----			
Cambrian	Vindhyan	Upper Bhandar series	reddish purple to buff coloured sandstones and quartzites.
----- Unconformity -----			
upper to middle Precambrian	metamorphic	calcareous crystalline quartzite phyllites & schist bijawars granitic gneiss	dolomite lime stone & calcareous shales quartz tic & cal-granulites phyllites & various schist marbles and banded ferrigenous quartzites granites & granitic gneiss

4.2 Hydrogeology

Groundwater is the principal source of irrigation in the district and all the alluvial deposits of Narmada valley in the district forms very potential aquifers. Hydrogeological set up of the district is shown in Fig 2-

Aquifer System

The Archaean schists and phyllites form phreatic aquifers wherever weathered /jointed . In general the aquifer systems in these rocks have poor potential and very few dug wells are found in the areas occupied by Schist \Phyllites . The yield of these dugwells range from 1 to 2 lps.

The dolomitic limestones of the Bijawars have a high potential and the aquifer system formed by solution cavities and fractures /joints sustain a good yield of the order of 7 lps, wherever solution cavities are encountered directly e.g. around Chanwarpatha village , [55 I/16 ,55M /4] and a moderate potential if the structure is located in jointed fractured rock . The yield of these structures range from 3 to 5 lps.

The fractured Vindhyan sandstones and shales occurring in the northern part of the district form poor phreatic aquifers and dug wells tapping these formations sustain only 2 to 3 hours of pumping daily . The Vindhyan encountered in some bore holes at depth ranging between 50 to 80 m. bgl do not form aquifers as such but their upper contact with overlying rocks yield 2 to 3 lps water .

The phreatic aquifers occurring in the southern part of the district are formed by weathered zone of shales of Gondwana formations and fine to medium grained Vindhyan sandstones. These aquifers have moderate potential . The yield of the dug wells constructed in these aquifer systems range from 2 to 3 lps.

Gondwana formations occurring at depth below alluvium form confined to semi-confined aquifers which are not very productive and yield less than 5 lps water . In the exploratory bore holes drilled by CGWB during Narmada Project , granular zones in the Gondwana were encountered at Dabkia , Bikrampur , Dhamna , Singhpur etc.

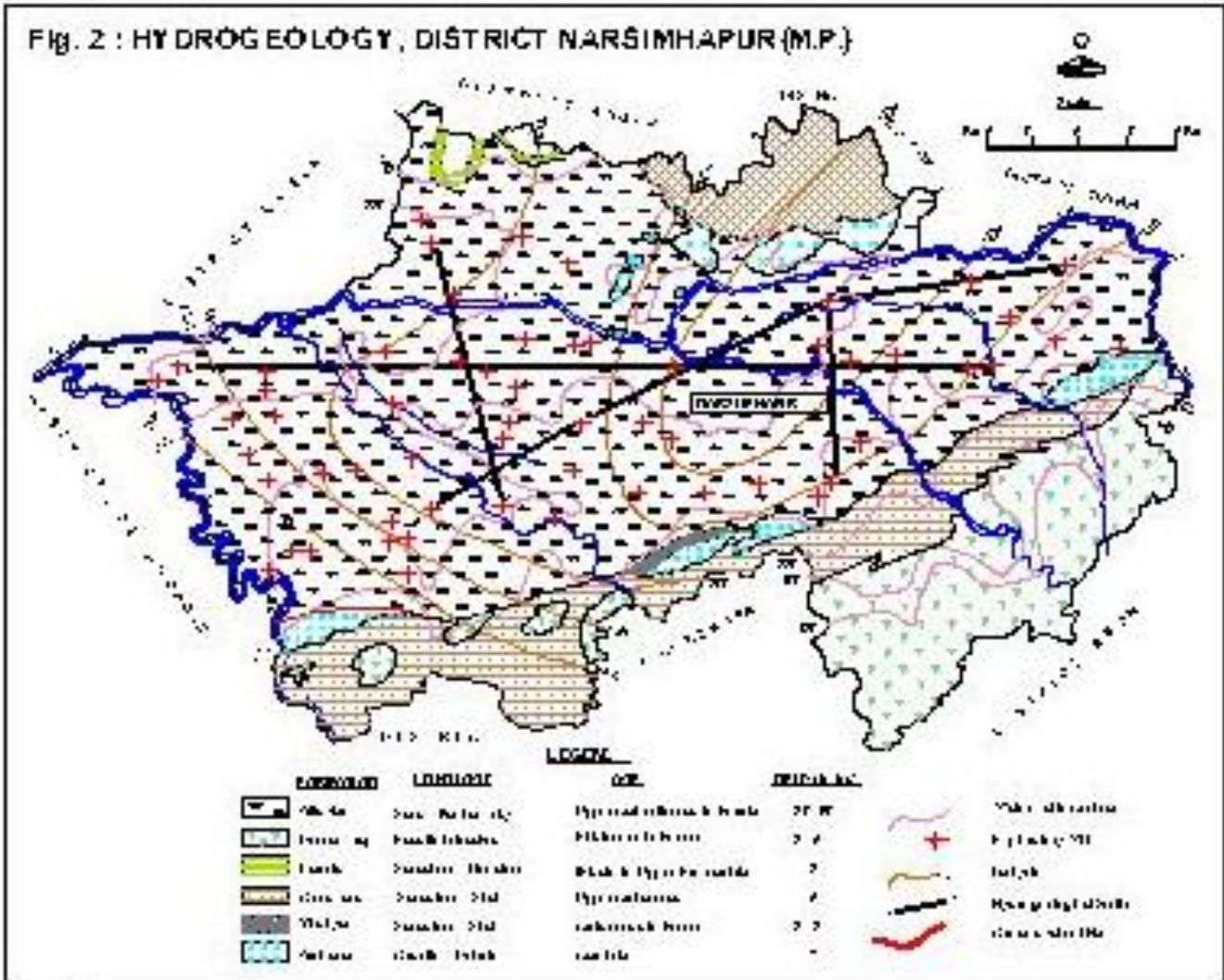
The Lametas , occurring only in North Western part of the district are weathered on surface and dug wells in the weathered portion yield a poor discharge ranging from 1to 2 lps .

Deccan traps in the Northern part of the district overlie the Lametas and occur at the hill tops where no ground water structure exists . However in the South Eastern part of the district , Deccan traps form moderate to good phreatic aquifers and dug wells sustain a good discharge ranging from 2 to 5 lps .

The alluvial aquifer system is most extensive one in the district . Two to three and places more number of granular zones are encountered in the alluvium ,comprising fine to medium to coarse grained sand ,gravel and kankar separated by clay lenses .The upper phreatic aquifers in general ranges in thickness from 2 to 10 m. and its top is encountered at a depth range of 5 to

20 m bgl . The yield of dugwells tapping the phreatic aquifer ranges from 7.5 to 12 lps.

Fig 2



Aquifers Parameters

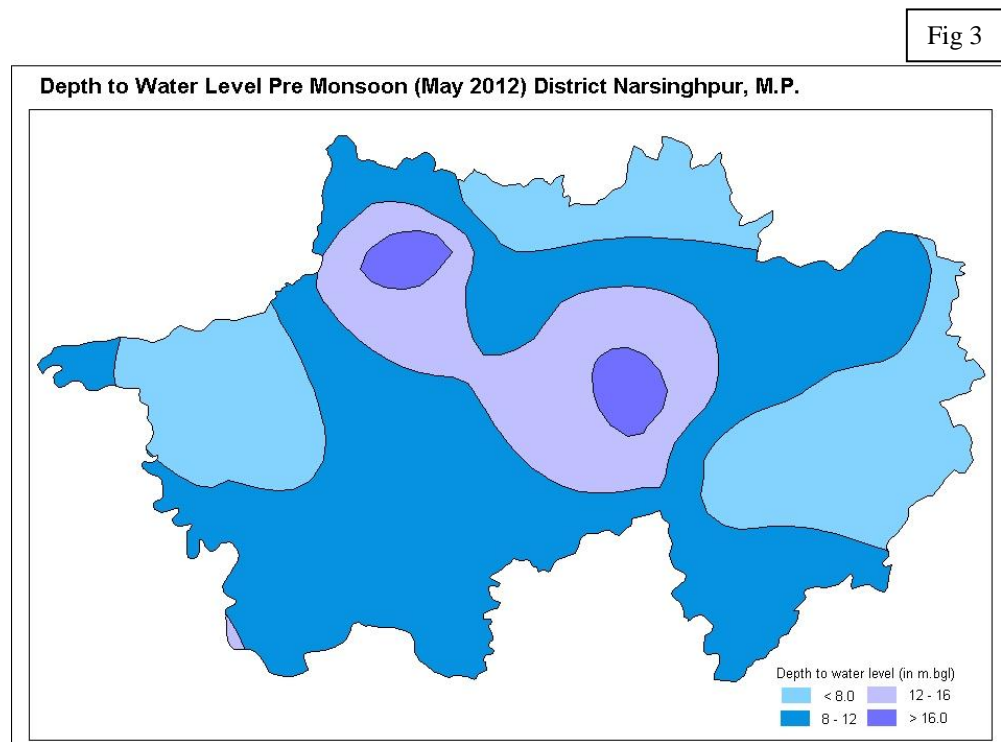
The results of the pumping tests show that the Transmissivity of the alluvial aquifers tapped by dug wells ranges from 57 to 400 m²/day while the hard rock aquifers have very low Transmissivity of the order of 19 m²/day

Exploratory wells tapping multi-aquifer system . The Transmissivity of these confined to semiconfined aquifers ranges from 23 to 2400 m²/day. Storativity values ranges from 2.01×10^{-6} to 1.15×10^{-3} indicating confined to semi confined nature of deep aquifers .

4.3 Water Levels

4.3.1 Pre-monsoon (May 2012)

The pre-monsoon depth to water level (figure-3) in Narsinghpur district ranges between 4.15 mbgl to 18.60 mbgl. The major part of the district have water levels in the range of 8 to 12 m bgl during the pre monsoon.



4.3.2 Post-monsoon (November 2012)

During post-monsoon period, November 2012, (figure-5) the water levels varied from 2.26 to 20.72 m bgl. It is observed that the major part of the district was covered by the water levels varying between 5 to 15 m bgl during the period.

			Availability (ham)	for Irrigation (ham)	Draft for Domestic & Industrial water Supply (ham)	Draft for All uses (ham)	industrial requirement supply to next 25 year (2033) (ham)	irrigation d development (ham)	(%)	
1	ChanwarPatha	Command								
		Non-Command	25098	18219	360	18579	500	6380	74	Semi Critical
		Block Total	25098	18219	360	18579	500	6380	74	Semi Critical
2	Chichli	Command								
		Non-Command	17656	11676	360	12036	553	5427	68	Safe
		Block Total	17656	11676	360	12036	553	5427	68	Safe
3	Gotegaon	Command	2556	547	38	586	55	1954	23	Safe
		Non-Command	15573	13567	346	13913	346	1660	89	Semi Critical
		Block Total	18129	14115	385	14499	401	3614	80	Semi Critical
4	Kareli	Command								
		Non-Command	21806	16335	290	16625	445	5026	76	Semi Critical
		Block Total	21806	16335	290	16625	445	5026	76	Semi Critical
5	Narsinghpur	Command								
		Non-Command	22062	20376	335	20711	335	1352	94	Critical
		Block Total	22062	20376	335	20711	335	1352	94	Critical
6	Saikheda	Command								
		Non-Command	17848	11845	295	12140	443	5561	68	Safe
		Block Total	17848	11845	295	12140	443	5561	68	Safe
		District Total	122600	92565	2025	94590	2676	27359	77	

4.3 Ground Water quality of Satna district

Quality of ground water is fresh to saline with EC ranging from 297 to 1365 mmhos/cm at 25° C, nitrate from 8 to 74 mg/l and fluoride from 0.13 to 1.57 mg/l.

