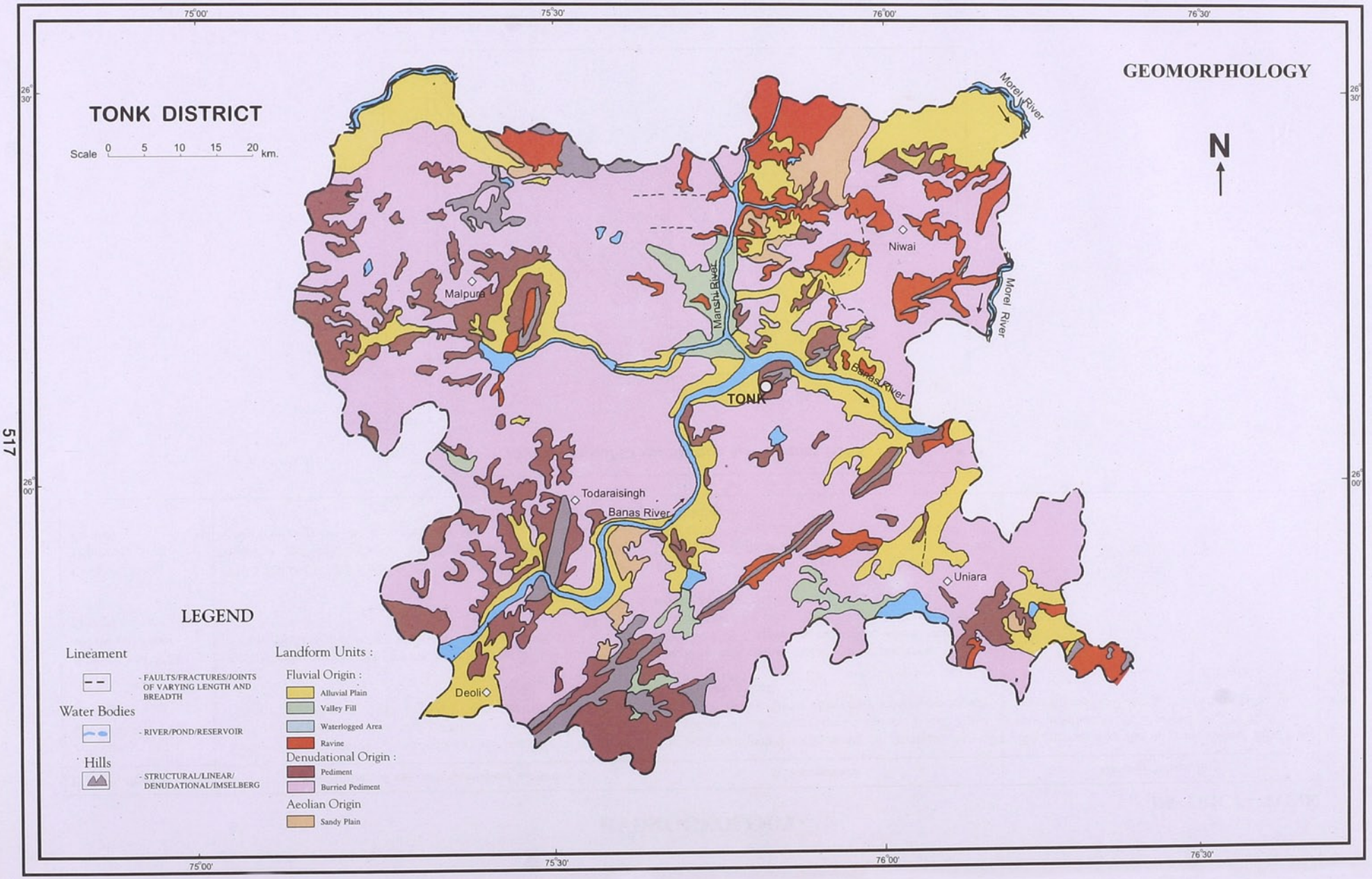
GEOMORPHOLOGY

DISTRICT—TONK

Landform Units	Symbol	Lithology / Material / Description	Occurrence in district	Land use/Land cover
Fluvial Origin				
Alluvial Plain	AP	Mainly undulating land scape formed due to fluvial activity, consists of gravels, sand, silt and clay. Terrain mainly undulating, produced by extensive deposition of alluvium.	Mainly along river Banas, south of river Morel & Mashi, north and east of Tordi Sagar & around Galwa talab.	Double crop, single crop (Rabi / Kharif), fallow.
Valley Fill	VF	Formed by fluvial activity, usually at lower topographic locations, comprising of boulders, cobbles, pebbles gravels, sand, silt and clay. The unit has consolidated sediment deposits.	In between Nagar town and Galwa Sagar along rivers Mashi, Sahadre and south of Moti Sagar.	Marginal Double crop, single crop (Rabi / Kharif), river sand.
Waterlogged	WL	Area submerge in water or having very shallow water table. So that it remains submerged in water during rainy season.	Negligible in southern part of the district.	Marginal Rabi crop, mainly marshy land.
Ravine	RV	Small, narrow, deep, depression, smaller than gorges, larger than gulley usually carved by running water.	Scattered in north east part and in foot hills.	Single crop (Kharif), open scrub.
Denudational Origin				
Pediment	P	Broad gently sloping rock flooring, erosional surface of low relief between hills and plain, comprised of varied lithology, criss crossed by fractures & faults.	Mainly concentrated in east, around Malpura town, north and east of Todaraisingh, west of Galwa Dam and southern part.	Single crop (Kharif), fallow, open scrub.
Burried Pediment	BP	Pediment covered essentially with relatively thicker alluvial, colluvial or weathered materials.	Covers all most entire district.	Marginal double crop, single crop (Rabi / Kharif) fallow, open scrub.
Aeolian Origin				
Sandy Plain	SP	Formed by aeolian activity, wind blown sand with gentle sloping to undulating plain, comprising of coarse sand, fine sand, silt & clay.	Around Janla village and banks of river Banas.	Single crop (Kharif), land with or without scrub.
Linear Ridge	LR	Long narrow low-lying ridge usually barren having high run-off may form over varying lithology with controlled strike.	North east of Tordi Sagar & small patches in north.	Barren, land with or without scrub, forest, open scrub, mining.
Denudational Hill	DH	Steep sided, relict hills undergone denudation, comprising of varying lithology with joints, fractures and lineaments.	Northeast of Tonk town.	Open scrub.
Structural Hill	SH	Linear to arcuate hills showing definite trend-lines with varying lithology associated with folding, faulting etc.	South of Todaraisingh in southern part of district.	Forest, open scrub.

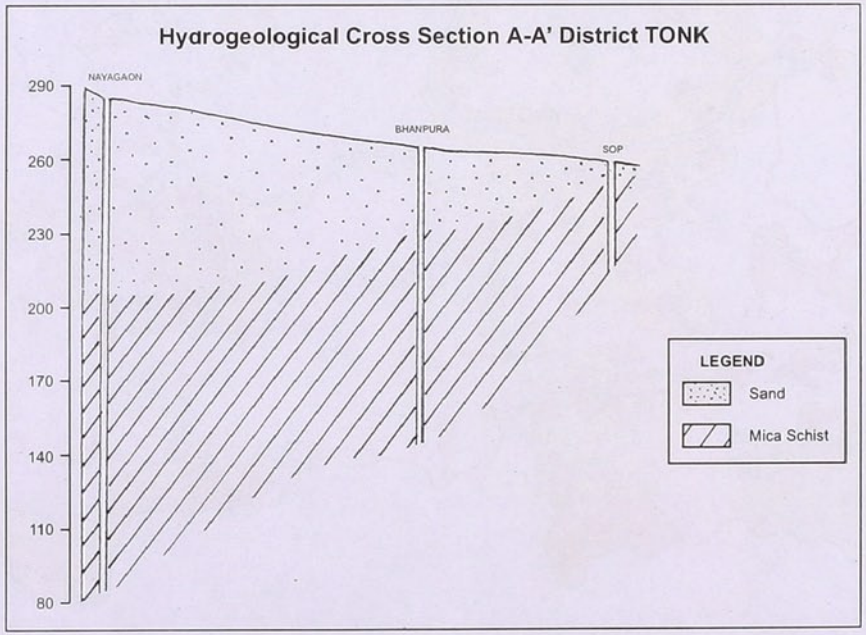
GEOMORPHOLOGY

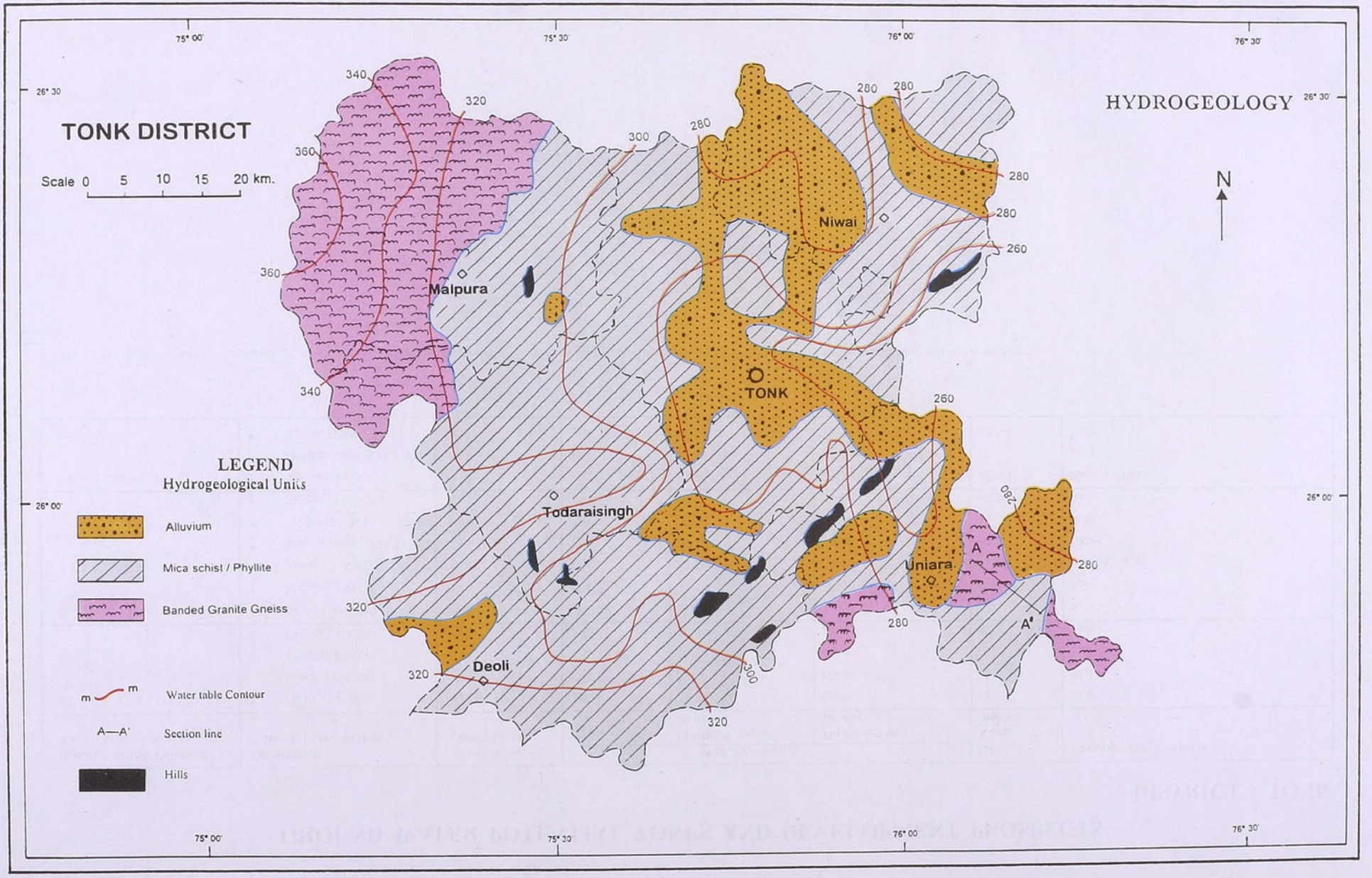


HYDROGEOLOGY

DISTRICT—TONK

Hydrogeological units	Description of the unit/Geological section	Occurrence	Ground Water flow
Alluvium (Quaternary)	The litho unit comprises fluvial deposits consisting of fine to coarse sand, gravel with little clay and kankar in varying proportions. In valley fills thickness of alluvium has been recorded upto 300 m.	The litho unit mainly occurs along the drainage courses and valley fills. It covers part of Uniara, Tonk, Niwai and Deoli blocks. Older alluvium encompasses nearly 20% potential area.	The general direction of ground water flow has been inferred W to E or NW to SE. Hydraulic gradient around Tonk is comparatively gentle.
Phyllite and Schist (Bhilwara Super Group)	Amongst the various type of rocks belonging to Bhilwara Super Group, phyllite and schist are most prevalent rocks.	The litho unit covers major part of the area. Area west of Malpura is exception, where other litho unit occupies the area. Phyllite and schist encompasses nearly 64% potential area.	
Granite Gneiss (Bhilwara Super Group)	The litho unit is characterised by bands of light coloured siliceous material and dark coloured ferromagnesian minerals. At places hornblende gneiss has also been noticed.	The litho unit occupies major part of Malpura. Part of Uniara and Todaraisingh blocks are covered by other rock units. Granite and gneiss encompasses nearly 16% potential area.	



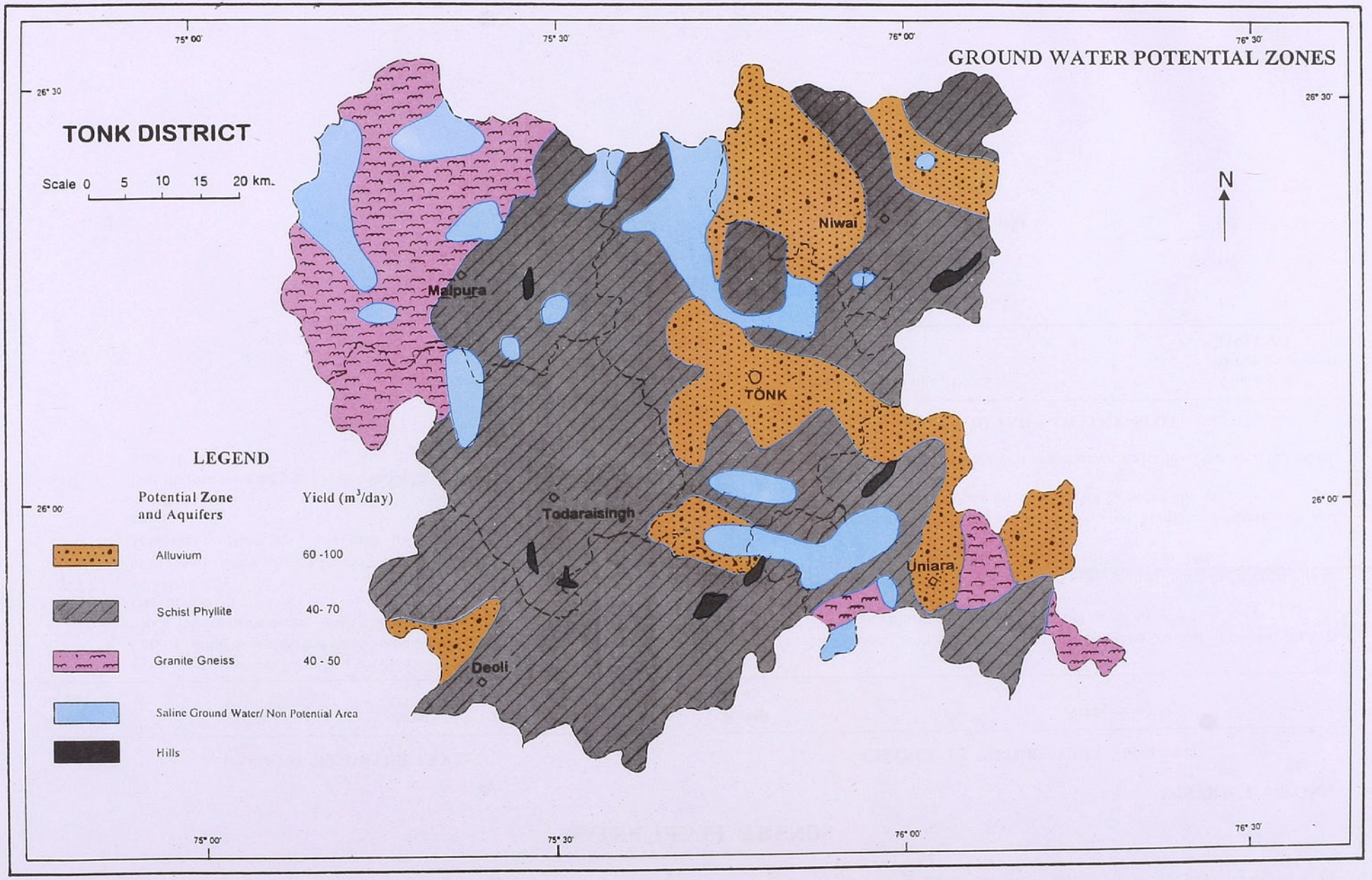

TONK DISTRICT
HYDROGEOLOGY
Scale 0 5 10 15 20 km.
N
Malpura
Niwai
TONK
Todaraisingh
Uniara
Deoli
A
A'
LEGEND
Hydrogeological Units
Alluvium
Mica schist / Phyllite
Banded Granite Gneiss
Water table Contour
Section line
Hills
75° 00'
75° 30'
76° 00'
76° 30'
26° 30'
26° 00'
340
320
360
300
280
260

GROUND WATER POTENTIAL ZONES AND DEVELOPMENT PROSPECTS

DISTRICT - TONK

Aquifer in the Potential Zone (Area in Km²)	Occurrence * Block (Area in Km²)	Water Level (1997) in m.	Well Parameters			E.C. X10³µ siem/cm	Development Prospects
			Type	Proposed depth in m	Discharge in m³/day		
Alluvium (1307.75)	* Deoli (147.90)	<20	DW	25-40	60-90	<2	Safe
	* Niwai (455.60)	<10	DW	20-30	60-90	<2	Safe
	* Tonk (355.56)	<15	DW	20-30	60-90	<2	Safe
	* Uniara (348.69)	<20	DW	30-40	60-90	<2,2-4	Safe
Phyllite & Schist (4203.78)	* Deoli (1094.19)	<20	DW	25-40	30-60	<2	Safe
	* Malpura (586.60)	<10	DW	20-30	30-60	<2,2-4	Safe
	* Niwai (548.97)	<15	DW	20-30	30-60	<2	Semi Critical
	* Todaraisingh (773.93)	<15	DW	20-30	30-60	<2	Safe
	* Tonk (809.34)	<15	DW	20-30	30-60	<2	Safe
	* Uniara (390.75)	<15	DW	20-30	30-60	<2,2-4	Safe
Granite Gneiss (1014.19)	* Malpura (653.12)	<10	DW	20-40	25-50	<2,2-4	Semi Critical
	* Todaraisingh (138.21)	<15	DW	20-30	25-50	<2	Safe
	* Uniara (222.86)	<15	DW	20-30	25-50	<2,2-4	Safe

DW - Dug wells **Safe** - <65% stage of development **Semi Critical** - 65-85% development **Critical** - 85-100% development **Over exploited** - >100% development


GROUND WATER POTENTIAL ZONES
TONK DISTRICT
Scale 0 5 10 15 20 km.
N
75° 00'
75° 30'
76° 00'
76° 30'
26° 30'
26° 00'
Malpura
Niwai
TONK
Todaraisingh
Uniara
Deoli
LEGEND
Potential Zone and Aquifers
Yield (m³/day)
Alluvium
60 -100
Schist Phyllite
40- 70
Granite Gneiss
40 - 50
Saline Ground Water/ Non Potential Area
Hills

WATER LEVEL TRENDS

DISTRICT : TONK

DEPTH TO WATER LEVEL

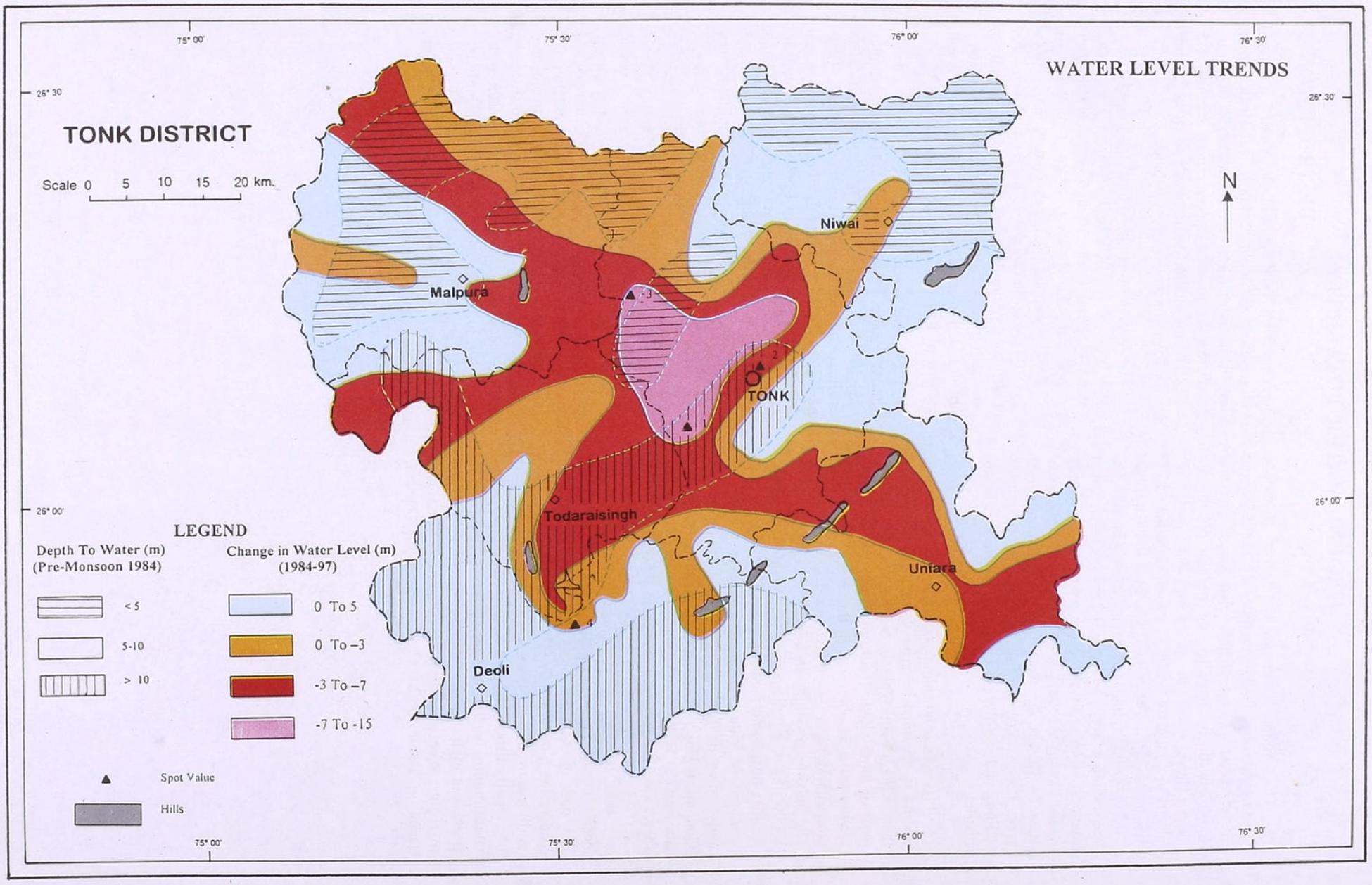
Range in m	Area
< 5	Part of Malpura and Niwai blocks and a pocket along Mashi river in Tonk block has shallow water level. These regions have depth to water level less than 5 m.
5 to 10	Major part of the district leaving aside southwestern area extending upto Tonk and northern peripheral area, have depth to water level between the range.
> 10	Part of Todaraisingh and Deoli blocks have deep water level ranging more than 10 m.

CHANGE IN WATER LEVEL (1984-1997)

Range in m	Area
0 to 5	Niwai and Deoli blocks area west of Malpura, east of Tonk and pockets in Uniara block exhibit rise in water level upto 5 m.
0 to -3	Northern part of Malpura block and pockets distributed in different blocks show marginal depletion in water level less than 3 m.
-3 to -7	Central part of the district extending upto Malpura, Todaraisingh and Uniara exhibit depletion in water level between the range.
-7 to -15	Area around Tonk show steep depletion in water level between the range.

DETAILS OF THE SPOT

Spot code	Village (Block)	Change in water level in m (1984-97)
1.	Dardabind (Tonk)	(-) 13.10
2.	Jairana (Tonk)	(-) 7.60
3.	Sarwarabad (Tonk)	(-) 15.60
4.	Satwara (Deoli)	(-) 7.50


WATER LEVEL TRENDS
TONK DISTRICT
Scale 0 5 10 15 20 km.
N
75° 00'
75° 30'
76° 00'
76° 30'
26° 30'
26° 00'
Malpura
Niwai
TONK
Todaraisingh
Uniara
Deoli
LEGEND
Depth To Water (m)
(Pre-Monsoon 1984)
< 5
5-10
> 10
Change in Water Level (m)
(1984-97)
0 To 5
0 To -3
-3 To -7
-7 To -15
Spot Value
Hills

GROUND WATER POTABILITY

DISTRICT TONK

The ground water in the district is mostly characterised by bicarbonate type of water (55%) out of which 46.4% are sodium bicarbonate type and 8.6% are of calcium and magnesium bicarbonate type. These water are fresh in nature and have electrical conductivity (EC) generally less than 1500 µS/cm at 25°C. The mixed type of water constitute 20.7% of the ground water samples in which 17.8% are sodium mixed type and rest 2.9% are calcium and magnesium mixed type. These water are marginally saline having EC varying from 1500 to 4000 µS/cm. Rest 24.3% ground water are of sodium chloride type. These waters are usually characterised by high salinity and are observed in northwestern part of the district.

It is seen from salinity map that most part of the district is occupied by ground water of salinity less than 2000 µS/cm. Only in Northwest part covering most of the Malpura block, medium to high salinity ground water is observed. In this block nearly 52% ground water have salinity more than 2000 µS/cm. The maximum salinity in the district is observed as 13000 µS/cm in village Bachhera of Malpura block. Besides this, some medium salinity pockets are also seen around village Borkhandi, Jhirana, Arniyamal and Sonwa in Tonk block; Uniara, Ranipura and Gothara in Uniara block and Bhotunda, Ratwai and Sunwaria in Todaraisingh block. However, the EC of these waters are mostly less than 4000 µS/cm.

Both low to high fluoride concentrations have been observed in ground water of the district. Nearly 2/3 part of Malpura block, the northern part of Todaraisingh, central part of Tonk and Uniara blocks, northeastern part of Niwai block and the lower part of Deoli block is characterised by fluoride concentration between 1.5 to 3.0 mg/L. Some closed pockets of high fluoride ground water (more than 3.0 mg/L) are seen around villages Jhanpura, Sirohi and Thala in Deoli block; Chandsen, Chosla, Dewal, Diggi and Tordi in Malpura block; Akodra, Kareriya and Sunara in Niwai block; Bawara and Hadikalan in Tonk block and Nayagaon in Uniara block. In rest of the district the fluoride concentration is below 1.5 mg/L. The maximum fluoride is observed as 7.6 mg/L in village Kareriya of Niwai block.

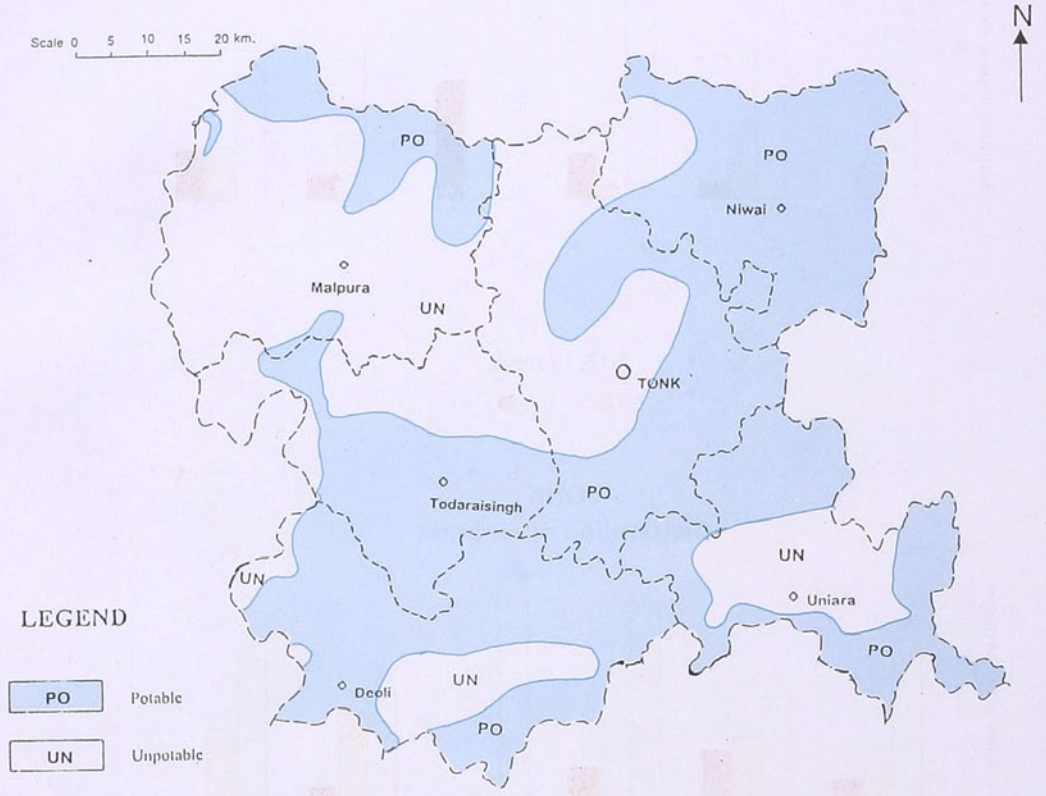
The concentration of nitrate in ground water varies from nil to 1050 mg/L. Nearly 72% ground water have nitrate below 50 mg/L and hence most of the area in the district is free of nitrate problem. In 12.3% water samples the nitrate content ranges from 51 to 100 mg/L and in rest 15.8% ground water the nitrate concentration is above 100 mg/L. High nitrate water (>100 mg/L) are observed mostly in western part of Todaraisingh block, north of Tonk block and southern part of Uniara block.

The district is also characterised by low hardness in ground water. Nearly 85% ground water samples show hardness in the range of 0-300 mg/L. The percentage of such water is even more in Deoli, Tonk and Uniara blocks. On the other hand, ground water at Beejawar and Ramthala in Deoli block; Raholi in Niwai block; Ratwai in Todaraisingh block and Palai and Uniara in Uniara block show ground water hardness above 600 mg/L. The minimum and maximum hardness values have been observed as 54 mg/L (Saidabad; Uniara) and 946 mg/L (Beejawar; Deoli) respectively.

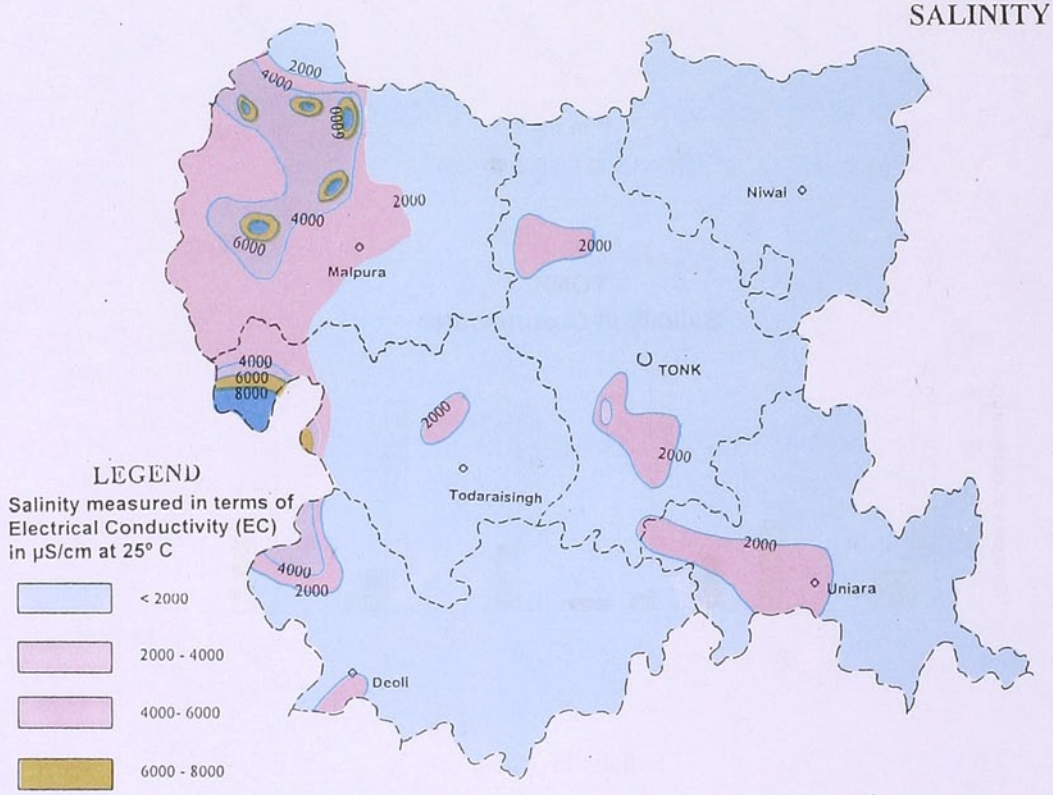
On viewing the overall quality of ground water, it is inferred that while the ground water is mostly suitable for irrigation, high value of nitrate and fluoride at many places make it unsuitable for drinking purposes. An integrated quality map prepared on the basis of salinity, fluoride and nitrate distribution shows considerable area occupied by inferior water quality for drinking in Malpura, Tonk, Deoli and Uniara blocks. These water have one or more constituents above the maximum permissible limits as per ICMR or BIS standards for drinking water.

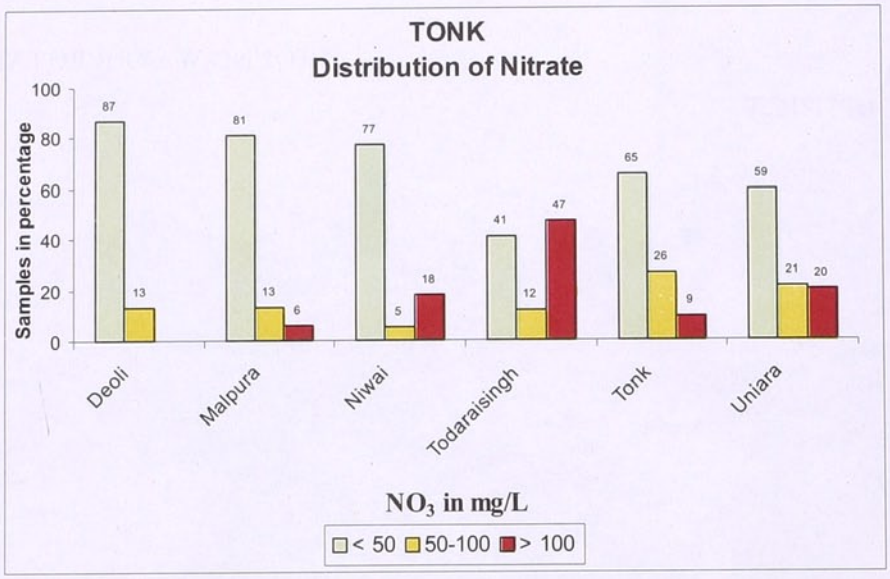
GROUND WATER POTABILITY

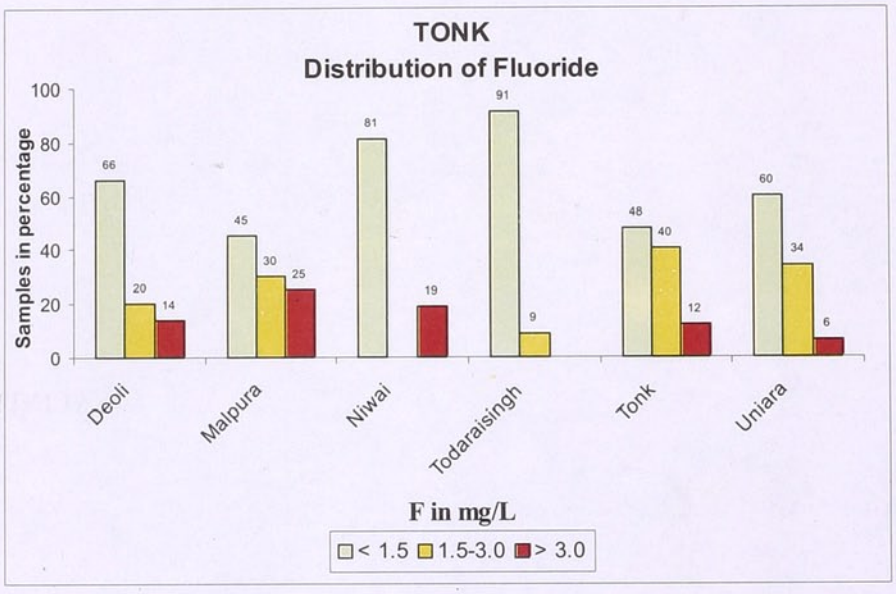
TONK DISTRICT

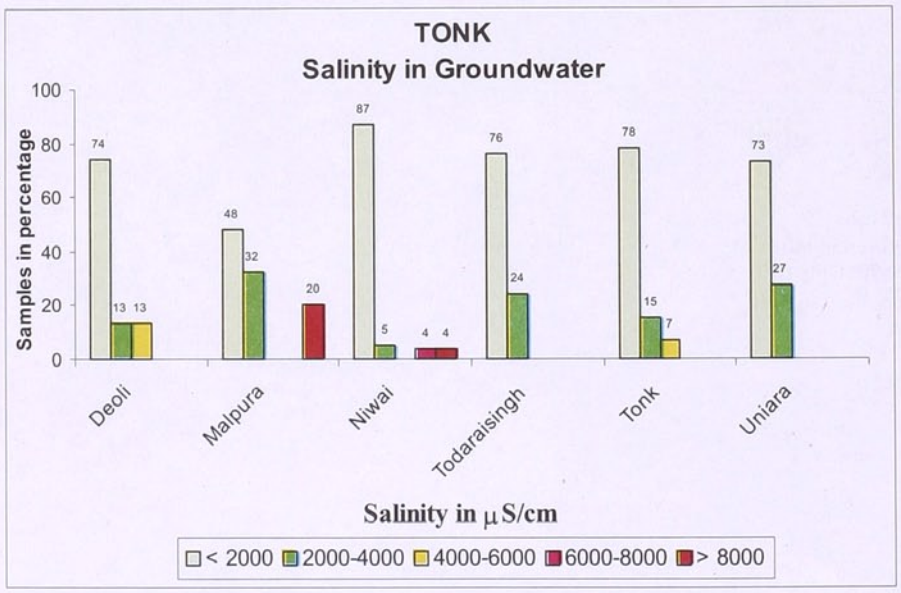


SALINITY



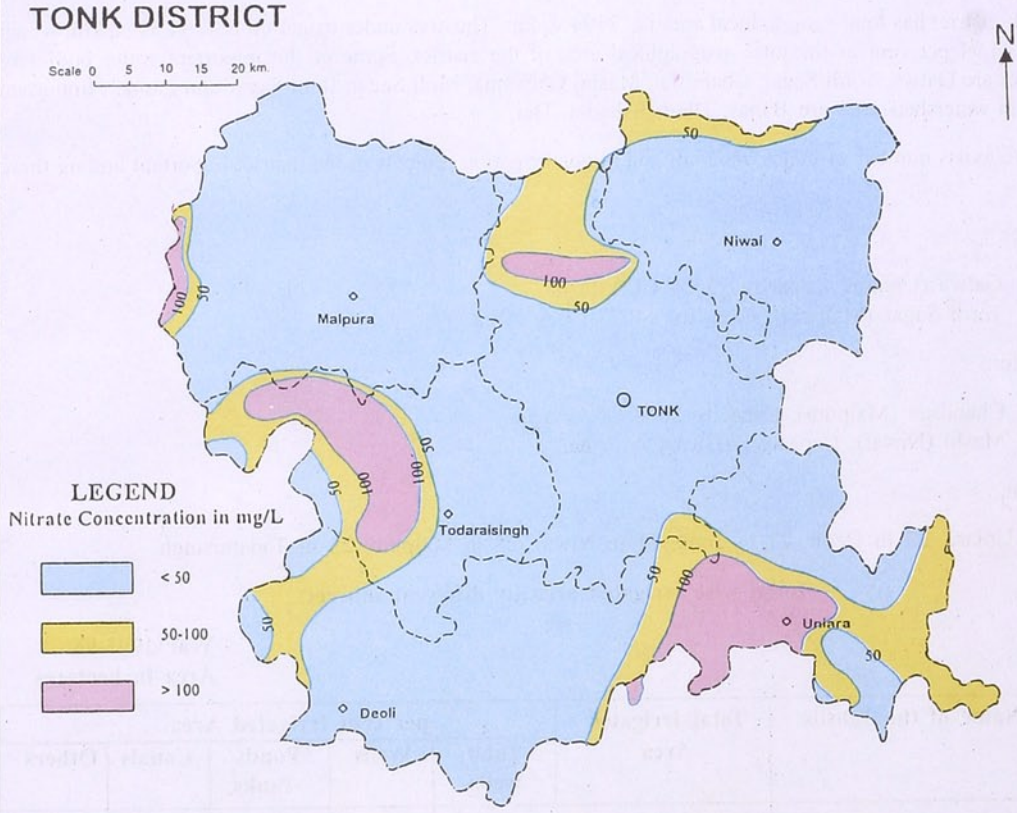

TONK
Distribution of Nitrate
Samples in percentage
100
80
60
40
20
0
87
13
81
13
6
77
5
18
41
12
47
65
26
9
59
21
20
Deoli
Malpura
Niwai
Todaraisingh
Tonk
Uniara
NO3 in mg/L
< 50
50-100
> 100


TONK
Distribution of Fluoride
Samples in percentage
100
80
60
40
20
0
66
20
14
45
30
25
81
19
91
9
48
40
12
60
34
6
Deoli
Malpura
Niwai
Todaraisingh
Tonk
Uniara
F in mg/L
< 1.5
1.5-3.0
> 3.0


TONK
Salinity in Groundwater
Samples in percentage
100
80
60
40
20
0
74
13
13
48
32
20
87
5
4
4
76
24
78
15
7
73
27
Deoli
Malpura
Niwai
Todaraisingh
Tonk
Uniara
Salinity in μS/cm
< 2000
2000-4000
4000-6000
6000-8000
> 8000

NITRATE DISTRIBUTION

TONK DISTRICT



FLUORIDE DISTRIBUTION