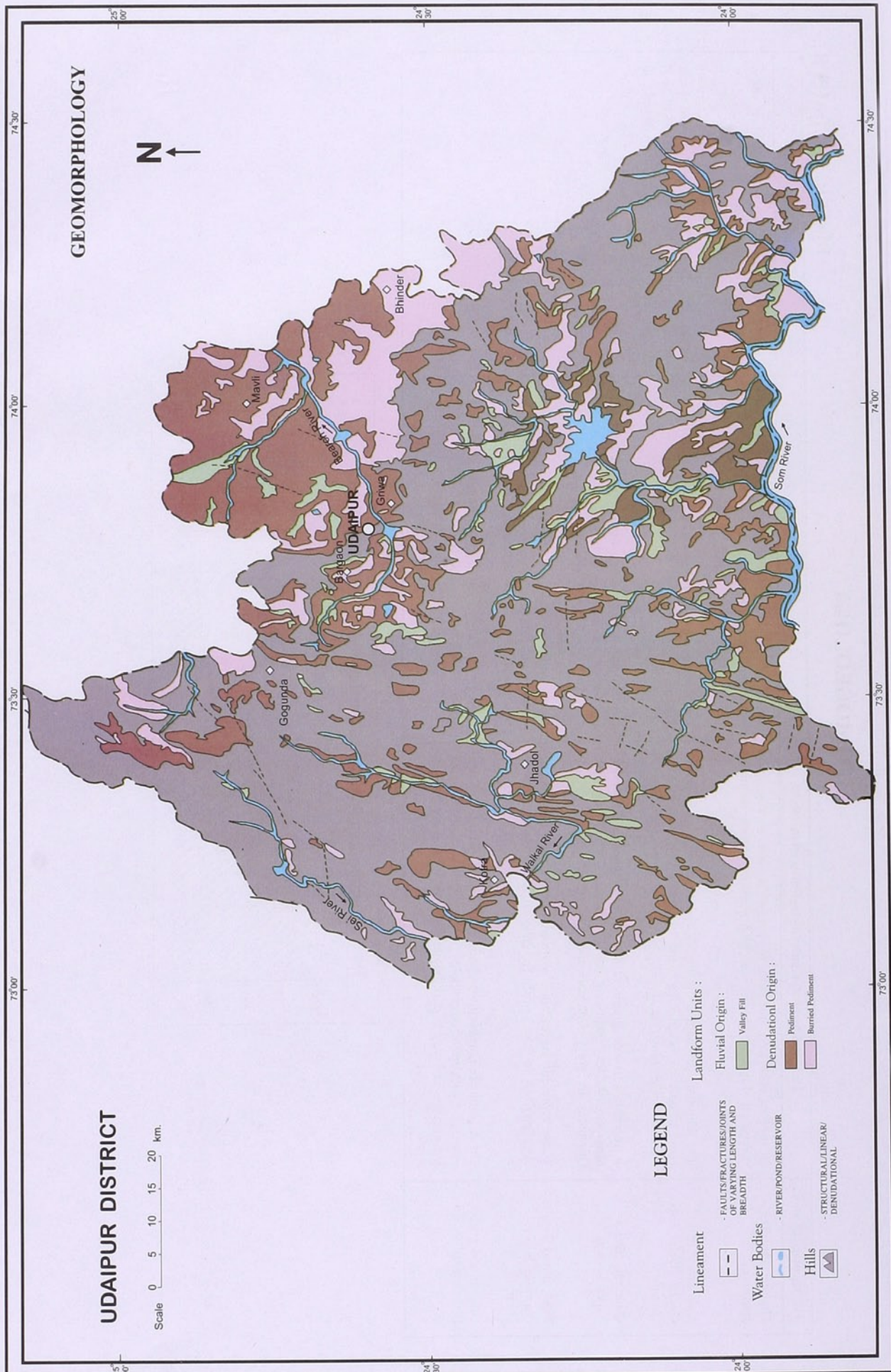


## GEOMORPHOLOGY

### DISTRICT—UDAIPUR

| Landform Units                         | Symbol | Lithology / Material / Description  | Occurrence in district   | Land use/Land cover   |
|--|--------|---|--|---|
| <b>Fluvial Origin</b><br>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. | Scattered in entire district in between structural hill.               | Double crop, single crop (Rabi).                                |
| <b>Denudational Origin</b><br>Pediment | P      | Broad gently sloping rock flooring, erosional surface of low relief between hill and plain, comprised of varied lithology, criss crossed by fractures & faults.                         | Main concentration in north east and scattered in the entire district. | Marginal double crop, single crop (Kharif), open scrub, fallow. |
| Burried Pediment                       | BP     | Pediment covered essentially with relatively thicker alluvial, colluvial or weathered materials.  | Main concentration in east and scattered in entire district.           | Double crop, single crop (Rabi / Kharif), fallow, open scrub.   |
| <b>Hill</b><br>Structural Hill         | SH     | Linear to arcuate hills showing definite trend-lines with varying lithology associated with folding, faulting etc.  | Covers entire district except north east.                              | Forest, mining.   |



**GEOMORPHOLOGY**

**UDAIPUR DISTRICT**

Scale 0 5 10 15 20 km.



**LEGEND**

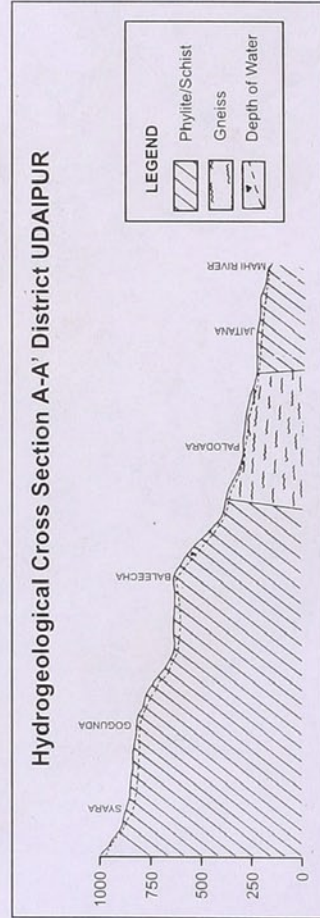
- Lineament**
  - FAULTS/FRACTURES/JOINTS OF VARYING LENGTH AND BREADTH
- Water Bodies**
  - [Blue wavy lines] RIVER/POND/RESERVOIR
- Hills**
  - [Brown triangle symbol] STRUCTURAL/LINEAR/DENUDATIONAL
- Landform Units :**
  - [Green box] Fluvial Origin : Valley Fill
  - [Brown box] Denudational Origin : Pediment
  - [Pink box] Burried Pediment



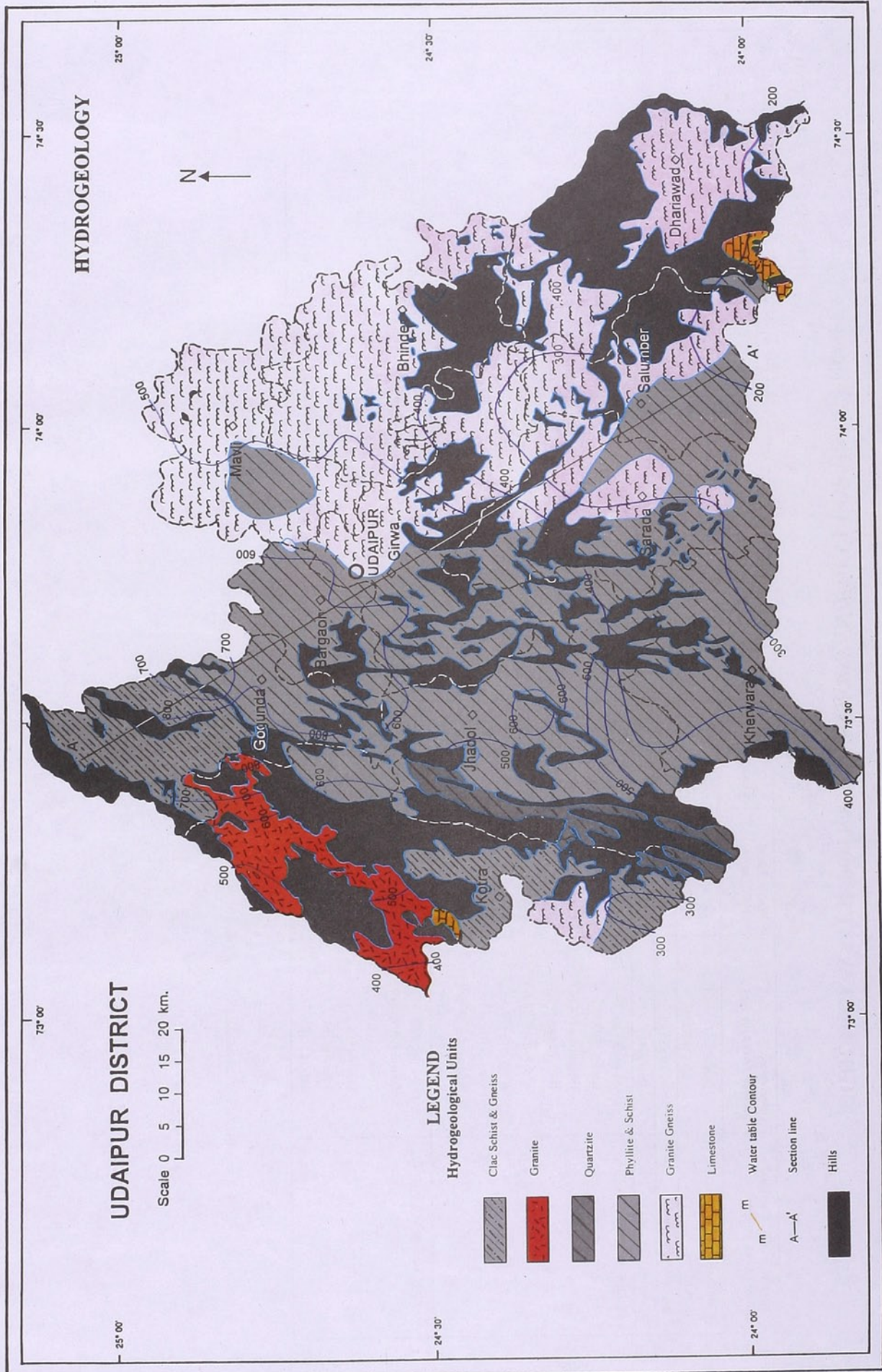
# HYDROGEOLOGY

## DISTRICT—UDAIPUR

| Hydrogeological units                       | Description of the unit/Geological section   | Occurrence   | Ground Water flow  |
|---|--|--|--|
| Granite (Post Delhi Intrusives)             | It is grey coloured, medium to coarse grained rock mainly composed of quartz, feldspar with biotite and hornblende as minor constituents.  | The litho unit encompasses western peripheral part within the limit of Kotra block.  | General direction of ground water flow varies considerably. In Mavli and Bhinder blocks, flow direction varies from NW to SE or W to E, or N to S, in Sarada, Salumber and Kherwara blocks, SE to NW or E to W, in Dhariawad block, while in other remaining blocks NE to SW or N to S. Hydraulic gradient varies from 5.00 to 11.40 m/km. |
| Calc schist and Gneiss (Delhi Super Group)  | The litho units are hard and compact, fine to medium grained and characterised by alternating bands of light and dark colour ferromagnesian minerals.  | These cover small area in parts of Gogunda and Kotra blocks.   |  |
| Quartzite (Delhi Super Group)               | It represents Alwar group of sediments and characterised by arenaceous facies comprising mainly quartzites of varied colour. Quartzites are grey, pink, pale and light green.                                | The litho unit occupies south western part of the district and confined to Jhadol block.   |  |
| Phyllite and Schists (Aravalli Super Group) | These represent argillaceous sediments and grades from shale, slate, phyllite, to mica schist. The litho units are soft and friable.   | These formations are most wide spread and cover western half of the district. A localised pocket occupied by the aquifer has been demarcated near Mavli. |  |
| Granite and gneiss (Pre Aravalli)           | These comprise porphyritic and non porphyritic gneissic complex associated with aplite, amphibolite, schist and augen gneiss. Schist and gneisses are grey to dark coloured, medium to coarse grained rocks. | These rocks occupy eastern part in Bhinder, Dhariawad, Girwa, Mavli, Salumber & Sarada blocks.   |  |









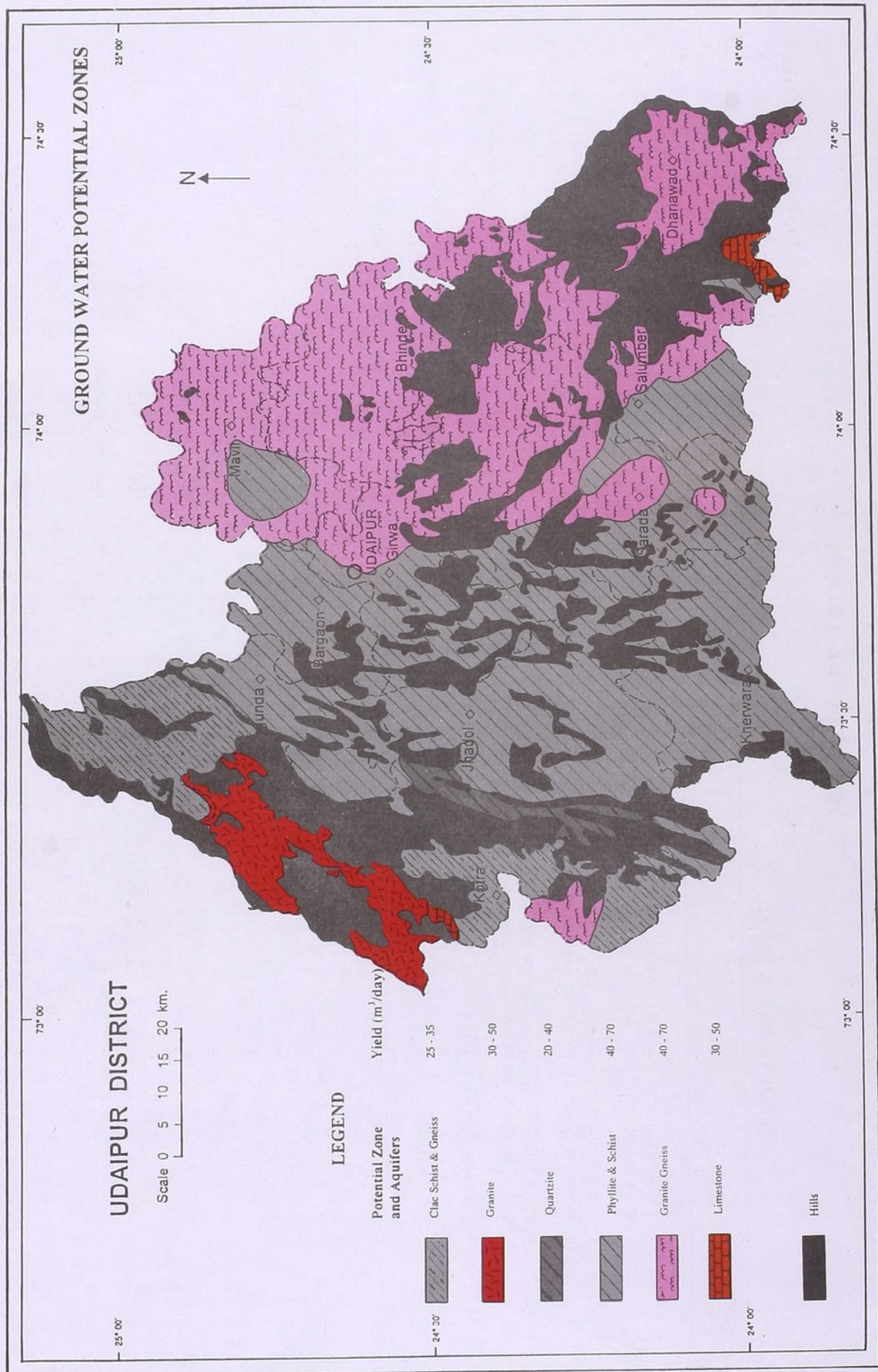
# GROUND WATER POTENTIAL ZONES AND DEVELOPMENT PROSPECTS

## DISTRICT - UDAIPUR

| Aquifer in the Potential Zone (Area in Km <sup>2</sup> ) | Occurrence<br>* Block (Area in Km <sup>2</sup> ) | Water Level (1997) in m. | Well Parameters |                     | E.C. X10 <sup>3</sup> µ siem/cm | Development Prospects |               |
|--|--|--------------------------|-----------------|---------------------|---------------------------------|-----------------------|---------------|
|  |  |                          | Type            | Proposed depth in m |                                 |                       |               |
| Calc Shist & Calc Gneiss (825.83)                        | * Gogunda (451.14)                               | <15                      | DW              | 15-20               | 40-60                           | Safe                  |               |
|  | * Kotra (374.69)                                 | <15                      | DW              | 15-20               | 40-50                           | Safe                  |               |
| Granite (253.11)   | * Kotra (253.11)                                 | <15                      | DW              | 20-25               | 35-50                           | Safe                  |               |
|  | * Jhadol (151.67)                                | <20                      | DW              | 20-25               | 25-35                           | Safe                  |               |
| Phyllite & Schist (3729.11)                              | * Bargaon (262.84)                               | <20                      | DW              | 15-20               | 40-60                           | Safe                  |               |
|  | * Girwa (695.98)                                 | <25                      | DW              | 25-30               | 50-80                           | Safe                  |               |
|  | * Gogunda (176.62)                               | <20                      | DW              | 20-25               | 50-80                           | Safe                  |               |
|  | * Jhadol (604.76)                                | <25                      | DW              | 25-30               | 40-60                           | Safe                  |               |
|  | * Kherwara (807.12)                              | <15                      | DW              | 20-25               | 40-60                           | Safe                  |               |
|  | * Kotra (84.87)                                  | <15                      | DW              | 20-25               | 40-60                           | Safe                  |               |
|  | * Mavli (168.10)                                 | <20                      | DW              | 25-30               | 40-60                           | Semi Critical         |               |
|  | * Salumber (307.89)                              | <10                      | DW              | 15-20               | 40-60                           | Safe                  |               |
|  | * Sarada (620.93)                                | <10                      | DW              | 15-20               | 40-60                           | Safe                  |               |
|  | Granite & Gneiss (3300.82)                       | * Bhinder (906.15)       | <25             | DW                  | 15-20                           | 35-50                 | Semi Critical |
|  |  | * Dhariawad (806.70)     | <20             | DW                  | 15-20                           | 50-80                 | Safe          |
|  |  | * Girwa (311.82)         | <15             | DW                  | 20-25                           | 35-45                 | Safe          |
| * Mavli (615.47)   |  | <25                      | DW              | 20-30               | 35-45                           | Safe                  |               |
| * Salumber (452.98)                                      |  | <15                      | DW              | 20-25               | 35-45                           | Safe                  |               |
| * Sarada (207.70)  |  | <10                      | DW              | 15-20               | 35-45                           | Safe                  |               |

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







## WATER LEVEL TRENDS

DISTRICT : UDAIPUR

### DEPTH TO WATER LEVEL

| Range<br>in m | Area  |
|---------------|---|
| < 5           | Part of Sarada, Salumber and Kherwara blocks has shallow water level. These region generally have depth to water level less than 5 m.             |
| 5 to 10       | Major part of the district, leaving aside, Mavli, Girwa, Sarada, Salumber and Kherwara blocks, has depth to water level between 5 to 10.          |
| 10 to 15      | Mavli and Girwa blocks in northeastern part Kotra and Gogunda blocks in western part of the district have depth to water level between the range. |
| > 15          | Small pockets in Mavli and Girwa have deep water level more than 15m.   |

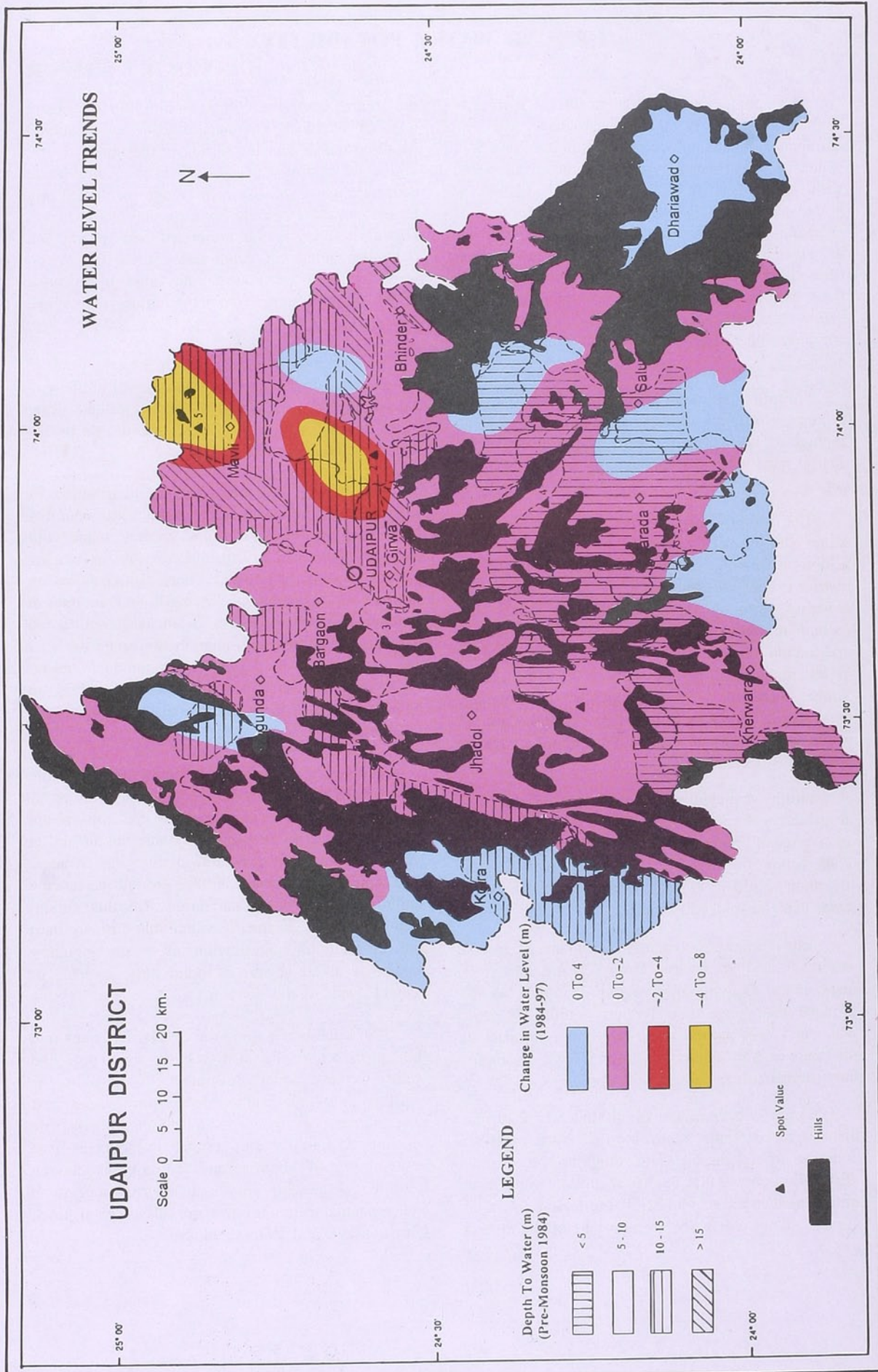
### CHANGE IN WATER LEVEL (1984-1997)

| Range<br>in m | Area   |
|---------------|--|
| 0 to 4        | Kotra, Dhariawad blocks and pockets scattered in Kherwara, Salumber, Bhinder and Gogunda blocks exhibit rise in water level upto 4 m.                        |
| 0 to -2       | Major part of the district, excluding Kotra, Dhariawad blocks and scattered pocket in different parts, show marginal depletion in water level less than 2 m. |
| -2 to -4      | Small pockets in Girwa and Mavli blocks exhibit depletion in water level between 2 to 4 m.   |
| -4 to -8      | Area around Mavli and east of Girwa show steep depletion in water level between the range.   |

### DETAILS OF THE SPOT

| Spot<br>code | Village (Block)    | Change in<br>water level in m<br>(1984-97) |
|--------------|--------------------|--|
| 1.           | Goran (Jhadol)     | (-) 6.00                                   |
| 2.           | Gupdi (Bhinder)    | (-) 7.59                                   |
| 3.           | Merta (Mavli)      | (-) 7.43                                   |
| 4.           | Nova (Girwa)       | (-) 10.40                                  |
| 5.           | Peeladhar (Sarada) | (-) 6.67                                   |





**WATER LEVEL TRENDS**

**UDAIPUR DISTRICT**

Scale 0 5 10 15 20 km.

**LEGEND**

- Depth To Water (m) (Pre-Monsoon 1984)**
- < 5
  - 5 - 10
  - 10 - 15
  - > 15
- Change in Water Level (m) (1984-97)**
- 0 To 4
  - 0 To -2
  - 2 To -4
  - 4 To -8

- ▲ Spot Value
- Hills



## GROUND WATER POTABILITY

### DISTRICT UDAIPUR

The ground water in Udaipur district is fresh to slightly saline. It is mostly bicarbonate type with dominance of calcium and magnesium ions. 68.9% of water has bicarbonate type of character associated with either Ca+Mg (51.8%) or Na (12.1%) as dominant cation. 23% well water show mix type of character which are transitional in nature and lies in between bicarbonate and chloride type of water. Rest 12.9% waters are of chloride type. The fresh bicarbonate type water generally have TDS below 1000 mg/L whereas the chloride type of water are more mineralised and have TDS more than 1500 mg/L.

Salinity depicted as electrical conductivity expressed in  $\mu\text{S/cm}$  varies from 370 to 7800 with an average of 1240  $\mu\text{S/cm}$ . 79.1% ground water of the district have electrical conductivity within 1500  $\mu\text{S/cm}$ .

The salinity map depicts that 88.8% ground water with electrical conductivity value within 2000  $\mu\text{S/cm}$  is found occurring in almost whole of the district except two big patches one in eastern part covering parts of Mavli and Bhinder blocks and second in southern part covering parts of Salumber and Sarada blocks. These patches have ground water in the range of 2000-4000 and 4000-6000  $\mu\text{S/cm}$ . Some localised scattered patches in Badgaon, Dhariawad, Girwa and Jhadol blocks have ground water with electrical conductivity in the range of 2000-4000  $\mu\text{S/cm}$ .

Salinity depicted as total dissolved solids (TDS) in ground water varies from 228 to 4480 mg/L with an average of 730 mg/L. 39.8% of ground water have TDS within 500 mg/L, whereas 54.2% have TDS in the range of 500-1500 mg/L. Only 60% ground water have TDS beyond 1500 mg/L.

Total hardness as calcium carbonate in ground water of the district varies from 120 mg/L to 1605 mg/L as  $\text{CaCO}_3$  with an average of 363 mg/L. 45.8% ground water have total hardness within 300 mg/L whereas 45.4% ground water have total hardness\* in the range of 300-600 mg/L. Only 8.8% water samples have total hardness above 600 mg/L.

Nitrate concentration in ground water of the district varies from traces to 472 mg/L with an average of 51 mg/L. The diagram for nitrate distribution shows that 68.7% of ground water have nitrate concentration within 50 mg/L and found in almost all the blocks. In western half of the district

the ground water have nitrate within 50 mg/L except a patch in block Gogunda and a few scattered localised patches having nitrate in the range 50-100 mg/L. In eastern half of the district, the nitrate concentration is mostly in the range of 50-100 mg/L and above, covering parts of the block Mavli, Girwa, Bhinder in the north-east and Sarada and Salumber blocks in south-east. 21.3% of ground water in the district have nitrate value in the range of 50-100 mg/L and 10.0% have nitrate value above 100 mg/L.

The fluoride concentration in ground water of the district varies from 0.24 mg/L to 4.9 mg/L with an average of 1.01 mg/L. 84.7% of ground water have fluoride within 1.5 mg/L mainly in blocks Bhinder, Salumber and Sarada.

On viewing the map showing distribution of fluoride in ground water of the district, it is seen that most part of the district has ground water with fluoride values within 1.5 mg/L except the two big patches, one in eastern part (block Bhinder) having fluoride in the range of 3.0 mg/L and another in southern part covering parts of blocks Salumber and Sarada having fluoride values in the range of 1.5 - 3.0 mg/L and above 3.0 mg/L. Around 11% ground water in blocks Mavli, Kotra, Dhariawad and 3% in block Girwa also have fluoride in the range of 1.5 - 3.0 mg/L.

96.8% of the ground water having EC within the limit of 4000  $\mu\text{S/cm}$  is suitable for irrigation as far as salinity criteria is concerned to the soils of the district. Of course, the depth to water should not be below 1.5 metres at any time of the year. Water is free from sodium hazard as 98% ground water have sodium within 70% of total cations. Residual sodium carbonate above 2.0 meq/L which may turn soil hard and difficult for germination of seeds popularly known as alkali hazard is found only in 9.2% of ground water of the district.

The potability map of the district indicates that the most part of the district have potable ground water. Ground water unsuitable for drinking is observed in two big patches, one in north-eastern part covering part of Mavli and Bhinder blocks, on account of salinity and another in southern part covering part of Salumber and Sarada blocks having high fluoride content. Small patches showing ground water unsuitable for drinking are also seen in block Girwa, Mavli and Bhinder blocks.



# GROUND WATER POTABILITY

## UDAIPUR DISTRICT

Scale 0 5 10 15 20 km.

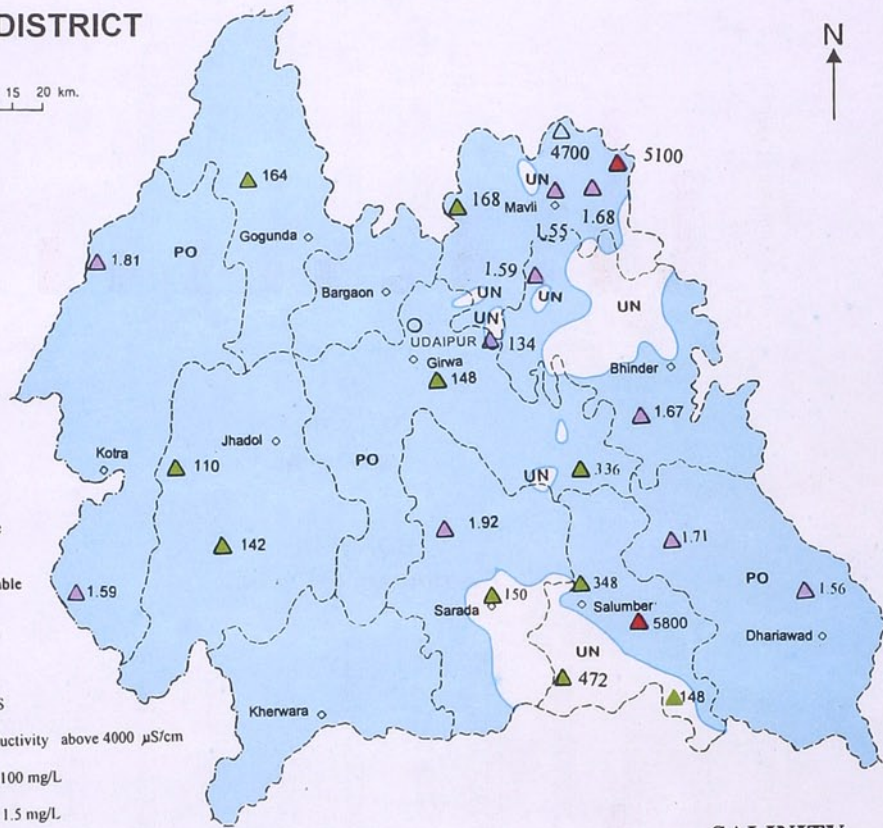


### LEGEND

- PO Potable
- UN Unpotable

### SPOT VALUES

- ▲ Electrical Conductivity above 4000  $\mu\text{S/cm}$
- ▲ Nitrate above 100 mg/L
- ▲ Fluoride above 1.5 mg/L



## SALINITY

### LEGEND

Salinity measured in terms of Electrical Conductivity (EC) in  $\mu\text{S/cm}$  at 25° C

- < 2000
- 2000 - 4000
- 4000 - 6000

