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# Hydrogeological Analysis of Groundwater Variation Katthiwada Study Area, Alirajpur District, Madhya Pradesh, India

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**Abstract:**
*The present paper deals with hydrogeological setting of the Katthiwada Study Area, Alirajpur District, Madhya Pradesh, India.The natural hydrogeological survey has been carried out covering an study area of 161.42 sq .km. The well inventory of 60 open dug wells helped in the identification of 33 observation wells. The measurements of observation well data point out a diameter range from 2 to 7 m., total depth of wells vary from 4 to 11 m.b.g.l., and static water levels range from 1.5 to 10 m.b.g.l. The seasonal monitoring of water levels indicate a fluctuation range of 1.5 to 4 m.b.g.l. Ground water levels contour maps of the post-monsoon and pre-monsoon periods indicate thate in general, the ground water movement is towards the Walwai River. In the Katthiwada Study Area, Alirajpur District, Madhya Pradesh, at Want, Golamba, Keory, Koliary, Sanada, Wadoi (B), Mithali, Ghodiyadara, Dhyana, Col, Bhokria, Katthiwada, Kotharmahura and Wagalwara is characterized by fairly good yield of water in dug wells during even pre-monsoon period. A few number of wells become dry during pre-monsoon period at villages of Kusumba, Bar (C), Lakhawat, Bej, Nimbriwat and Ghodiyadara. In general, movement of groundwater is towards the Walwai River.*

**Keywords:** *Hydrogeological Analysis, Well Inventory, Direction and Movement, Fluctuation, Static water levels, Groundwater, Katthiwada Area, Alirajpur District, Madhya Pradesh.*

## 1. INTRODUCTION

'Hydrogeology' is a term, which has been a resultant of combination of three Greek words, *Hydro* = water, *Geo* = Earth and *Logos* = discourse or science i.e. referring to science of water of earth. Hydrogeology has been been considered by Mead (1919) as study of laws of occurrence, and movement of sub-terrainean water. Term "Geo-hydrology" was coined by Meinzer (1942) as the "Father of modern Groundwater Hydrology". This term has been followed by several workers including Todd (1959, 1980). Hydrogeology deals with evaluation of hydraulic properties of aquifers of any groundwater resource. Fetter (1988, 1990) has defined term Hydrogeology as a study of occurrence, distribution and movement of the groundwater, as well as its interrelationship with rock types, geological structures, land forms and surface recharge conditions, chemistry and relation of groundwater to geologic environment.

Hydrogeology is a division of earth sciences dialing with flow of water throughout aquifers and shallow permeable medium (generally less than 450 m) below surface of earth. General

movement of fluids (hydrocarbon, geothermal fluids water etc) in deeper formation is also a apprehension of geologists, geophysicists and petroleum geologists (Todd 1980, 2010, Raghunath 1985, Fetter 1988, Karanth 1994). Water occurs beneath land surface is called sub-surface water, underground water, or subterranean water. Water that occurs in zone of saturation, from which springs and wells are supplied, is commonly called groundwater. But Greek term "pheratic water" has been suggested for it. Water, which occurs between land surface and the zone of saturation, has been called suspended water. Greek term "Kremastic water" has been recommended for it as a companion to term pleratic water (Karanth 2003). The groundwater is a slow-moving, viscous fluid and its movement has been studied independently from surface water hydrology, climatology, chemical and microbiologic aspects of Hydrogeology. Hydrogeology concerns with the relations of groundwater with surface water, water chemistry, soil moisture and climate. Hence, occurrence and movement of groundwater are dependent on geohydrological characteristics of sub- surface formations.

### 1.1 LOCATION AND GEOLOGICAL OF STUDY AREA

The present study area of Katthiwada, which is a small village N-E of Alirajpur District, Madhya Pradesh, is confined to the Latitude 22° 25' to 22°30' N and Longitude 74°5' to 74°15' E (Survey of India Toposheet no. 46 J/3 ) Figure 1.

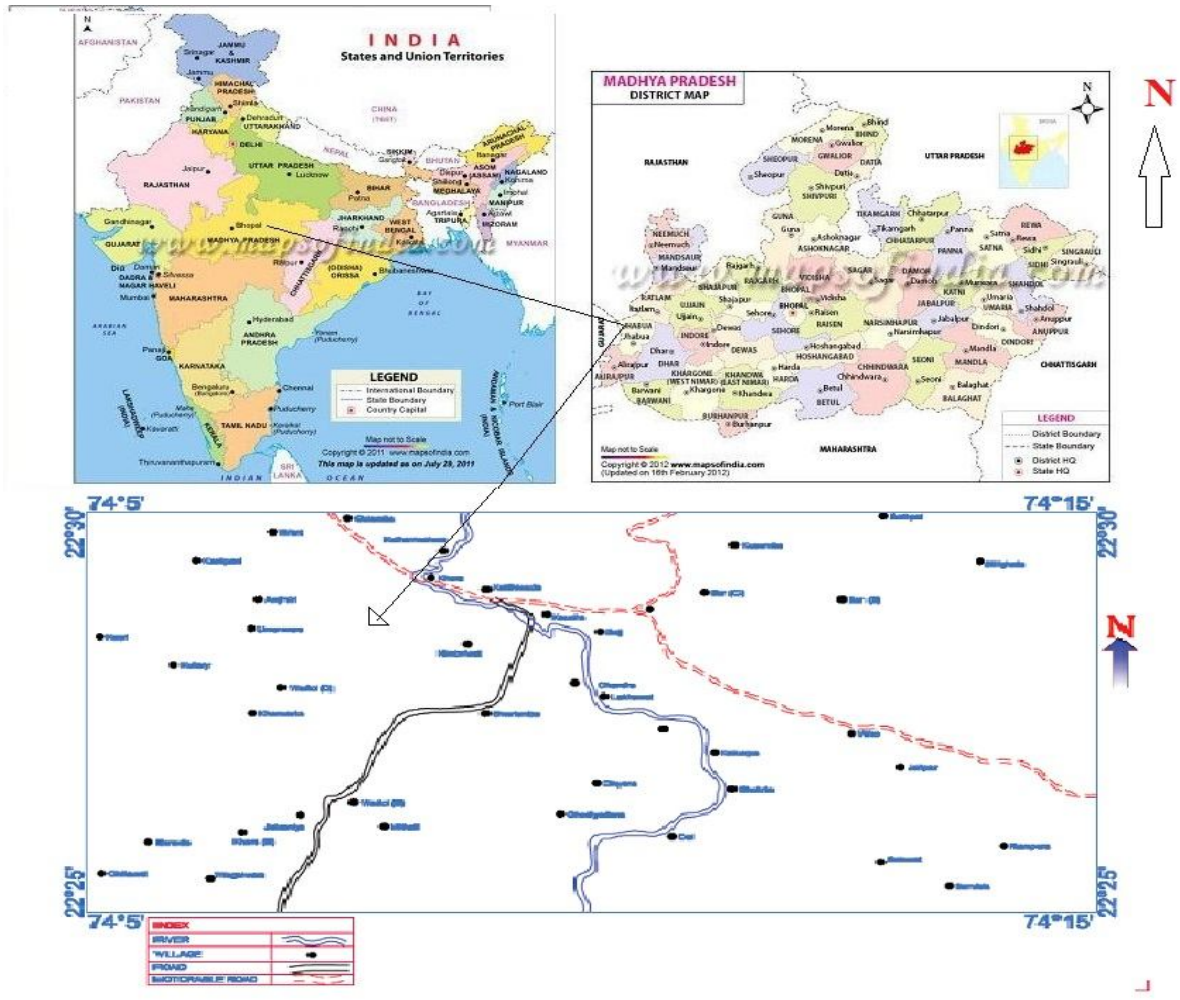


**Figure 1:** Showing Location Map of the Katthiwada study area, Alirajpur District, Madhya Pradesh.

## 1.2 GEOLOGICAL SETTING OF KATTHIWADA STUDY AREA

| System | Lithostratigraphic Unit | Lithology |
|---|---|---|
| Recent | - | Alluvial soil and Laterites |
| Cretaceous to Eocene | Deccan traps | Basal lava flows with intertrapean clay and calcareous beds |
| Unconformity | | |
| Upper cretaceous | Lametas and Bagh beds | Limestone, Sandstone, Coralline Limestone, Nodular Limestone, Nimar Sandstone |
| | Intrusive | Pigmatites, Quartz veins and Phyllite |
| Unconformity | | |
| Archaeans | Aravalli super group | Granite gneiss, Dolomitic Limestone, Quartzite and Phyllites |
| | Banded gneissic complex | Gneisses schist, Dolomite marble, Ultra basic rock, Conglomerate, Mica schist etc. |

**(Modified after- Panday, 2000 and Tiwari et al., 2003)**

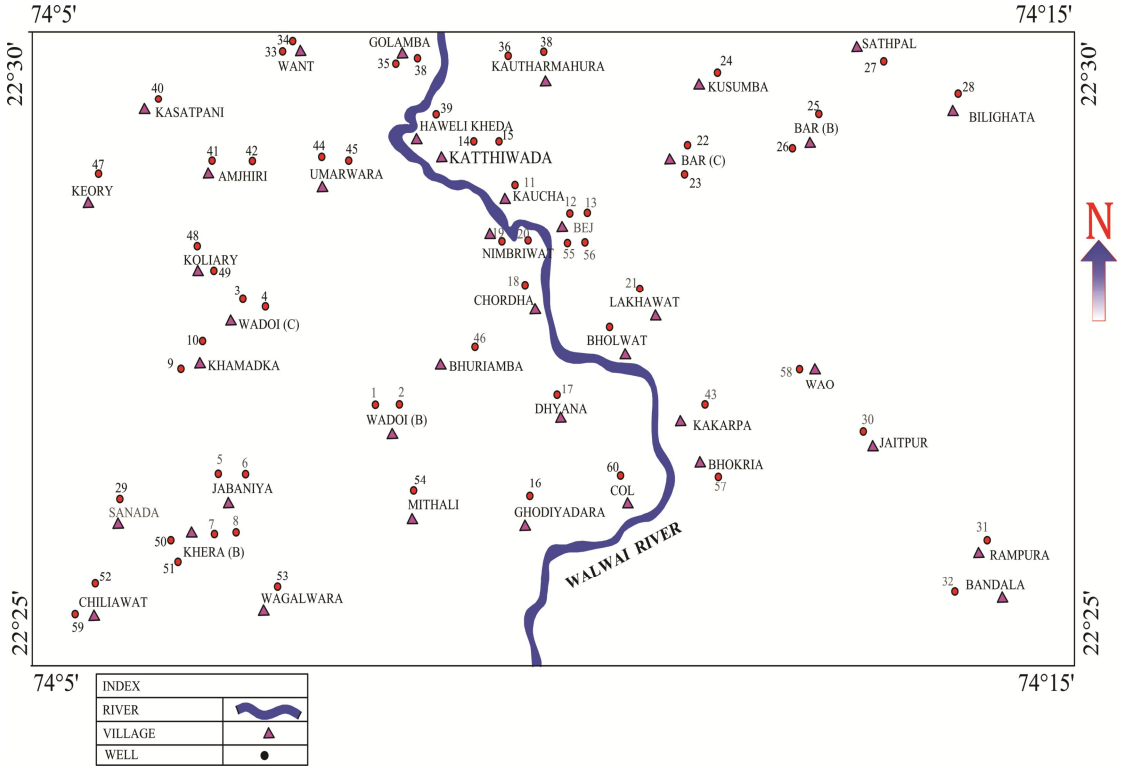


**Figure 2:** Displaying location of well inventory of the Katthiwada study area.

**Table 1:** Details of well inventory and water level fluctuation in dug well of study area of Katthiwada, Alirajpur District (M.P.).

| S. No. | Name of village | Name of owner | Total depth of well B.G.L. | Diameter of well (M) | Static water level in meter | |
|---|---|---|---|---|---|---|
| | | | | | Post-monsoon (M.B.G.L) | Pre-monsoon (M.B.G.L.) |
| 1 | Wadoi (B) | Shankar Singh | 4 | 4 | 1.5 | 3 |
| 2 | Wadoi (B) | Maliya Ji | 5 | 5 | 2 | 5 |
| 3 | Wadoi (C) | Jandudiya | 7 | 4 | 3 | 5 |
| 4 | Wadoi (C) | Ramla | 5 | 4 | 3 | 6 |
| 5 | Jabaniya | Mal Singh | 8 | 4 | 3 | 6 |
| 6 | Jabaniya | Kishan | 8 | 3 | 5 | 7.5 |
| 7 | Bada kheda | Ditliya | 7 | 6 | 3.50 | 6 |
| 8 | Bada kheda | Chamayda | 4 | 5 | 2.5 | 5 |
| 9 | Kamadka | Samdu | 10 | 7 | 5 | 8 |
| 10 | Kamadka | Thavariya | 9 | 5 | 6 | 8 |
| 11 | Kaucha | Tersingh tomar | 9 | 2 | 6 | 9 |
| 12 | Bej | Musa Dawar | 4 | 6 | 7 | 10 |
| 13 | Bej | Lakhan Singh | 9 | 4 | 4 | 8 |
| 14 | Katthiwada | Bhagwan Singh | 8 | 5 | 4 | 7 |
| 15 | Katthiwada | Mustak Khan | 9 | 5 | 4 | 6 |
| 16 | Ghodiyadara | Kalu | 11 | 5 | 5 | 9 |
| 17 | Dhyana | Meera Sarpanch | 11 | 4 | 6 | 8 |
| 18 | Chaordha | Rakesh Dawar | 8 | 4 | 5 | 7 |
| 19 | Nimbriwat | Nathu kanesh | 7 | 4 | 6 | 7 |
| 20 | Nimbriwat | Somliya | 9 | 5 | 6 | 8 |
| 21 | Lakhawat | Dhansingh | 8 | 4 | 5 | 8 |
| 22 | Bar (C) | Ramesh | 6 | 7 | 4 | 6 |
| 23 | Bar (C) | Om Prakash | 8 | 6 | 5 | 8 |
| 24 | Kusumba | Anil | 6 | 4 | 3 | 5 |
| 25 | Bar (B) | Kamlesh | 8 | 5 | 5 | 9 |
| 26 | Bar (B) | Gopal | 7 | 6 | 5 | 8 |
| 27 | Sathpal | Nankiya | 7 | 6 | 4.5 | 7 |
| 28 | Bilighata | Kalsing | 6 | 4 | 3 | 5 |
| 29 | Sanada | Jitendra | 7 | 6 | 6 | 8 |
| 30 | Jetpur | Bheru | 6 | 7 | 3 | 6 |
| 31 | Rampura | Dinesh | 9 | 6 | 5 | 8 |
| 32 | Bandla | Sursing | 6 | 5 | 5 | 8.5 |
| 33 | Want | Bhariya | 8 | 6 | 5 | 8 |
| 34 | Want | Khurban | 7 | 5 | 5 | 8 |
| 35 | Golamba | Shankar | 6 | 4 | 4 | 8 |
| 36 | Kautharmhura | Kesarsingh | 9 | 6 | 6 | 8.5 |

| | | | | | | |
|---|---|---|---|---|---|---|
| 37 | Kautharmhura | Roshan | 8 | 4 | 4 | 6 |
| 38 | Golamba | Habusingh | 11 | 7 | 6 | 9 |
| 39 | Haweli Kheda | Sunil Sarpanch | 10 | 5 | 6 | 8 |
| 40 | Kast Pani | Jhetusingh | 9 | 4 | 4 | 7 |
| 41 | Amjheri | Juwansing | 8 | 5 | 5 | 8 |
| 42 | Amjheri | Kadarsingh | 7 | 4 | 5 | 6 |
| 43 | Kakarpa | Indusingh | 6 | 4 | 6 | 8 |
| 44 | Umarwara | Maganiya | 6 | 4 | 5 | 7 |
| 45 | Umarwara | Dhediya | 8 | 4 | 4 | 7 |
| 46 | Bhuriamba | Ditla | 6 | 5 | 4 | 6 |
| 47 | Keori | Jamula | 6 | 4 | 5 | 8 |
| 48 | Koliary | Ramsingh | 9 | 5 | 5 | 8 |
| 49 | Koliary | Idla | 10 | 7 | 6 | 8 |
| 50 | Khera (B) | Gohayda | 11 | 5 | 8 | 9.5 |
| 51 | Khera (B) | Nanla | 10 | 7 | 5 | 8 |
| 52 | Chiliyawat | Vinkar | 10 | 6 | 5 | 8 |
| 53 | Wagalwara | Jamsingh | 9 | 5 | 4 | 7 |
| 54 | Mithali | Ankur | 10 | 5 | 7 | 9 |
| 55 | Bej | Bhimsingh | 11 | 6 | 7 | 10 |
| 56 | Bej | Musa Dawar | 7 | 5 | 6 | 8 |
| 57 | Bhokria | Chiman | 8 | 4 | 6 | 8 |
| 58 | Wao | Chamariya | 9 | 4 | 5 | 8 |
| 59 | Chiliawat | Chamdu | 8 | 5 | 6 | 9 |
| 60 | Col | Duyla | 8 | 5 | 6 | 8.5 |

**Table 2:** Showing measurements of water levels in observation wells of study area.

| No. | Well No. | Location | Bench Mark (M) | Post- monsoon | | Pre- monsoon | | Water level fluctuation (M) |
|---|---|---|---|---|---|---|---|---|
| | | | | Static water level (M.B.G.L.) | Reduced water level (M.B.G.L.) | Static water level (M.B.G.L) | Reduced water level (M.B.G.L) | |
| 1 | 1 | Want | 380 | 5 | 375 | 8 | 372 | 3 |
| 2 | 2 | Keori | 362 | 4 | 358 | 6.5 | 355 | 2.5 |
| 3 | 3 | Umarwara | 378 | 4 | 374 | 7 | 371 | 3 |
| 4 | 4 | Koliary | 367 | 5 | 362 | 8 | 359 | 3 |
| 5 | 5 | Khamarka | 370 | 6 | 364 | 8 | 362 | 2 |
| 6 | 6 | Jubaniya | 318 | 5 | 313 | 7.5 | 310.5 | 2.5 |
| 7 | 7 | Wadoi (B) | 289 | 1.5 | 287.5 | 3 | 286 | 1.5 |
| 8 | 8 | Mithali | 286 | 7 | 279 | 9 | 277 | 2 |
| 9 | 9 | Samada | 344 | 6 | 338 | 9 | 335 | 3 |
| 10 | 10 | Chiliawat | 341 | 5 | 336 | 8 | 333 | 3 |
| 11 | 11 | Wagalwara | 310 | 4 | 306 | 7 | 303 | 3 |
| 12 | 12 | Golamba | 384 | 4 | 380 | 8 | 376 | 4 |
| 13 | 13 | Katharmahura | 340 | 6 | 334 | 8.5 | 331.5 | 2.5 |
| 14 | 14 | Kathiwada | 318 | 4 | 314 | 7 | 311 | 3 |
| 15 | 15 | Nimbriwat | 254 | 6 | 248 | 8 | 246 | 2 |
| 16 | 16 | Bej | 253 | 7 | 246 | 10 | 243 | 3 |
| 17 | 17 | Lakhawat | 274 | 5 | 269 | 8 | 266 | 3 |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 18 | 18 | Bhokria | 222 | 6 | 216 | 8 | 214 | 2 |
| 19 | 19 | Bholwat | 227 | 3 | 224 | 5.5 | 221.5 | 2.5 |
| 20 | 20 | Sathpal | 646 | 4.5 | 641.5 | 7 | 639 | 2.5 |
| 21 | 21 | Kusumba | 388 | 6 | 382 | 8 | 374 | 2 |
| 22 | 22 | Bar © | 321 | 6 | 315 | 8 | 313 | 2 |
| 23 | 23 | Bar (B) | 521 | 5 | 516 | 9 | 512 | 4 |
| 24 | 24 | Bilighata | 653 | 3 | 650 | 5 | 648 | 2 |
| 25 | 25 | Wao | 487 | 4 | 483 | 8 | 479 | 4 |
| 26 | 26 | Jaitpur | 487 | 3 | 484 | 6 | 481 | 3 |
| 27 | 27 | Rampura | 503 | 4 | 499 | 6.5 | 496.5 | 2.5 |
| 28 | 28 | Balwat | 372 | 5 | 367 | 8 | 364 | 3 |
| 29 | 29 | Bandala | 449 | 5 | 444 | 8.5 | 440.5 | 3.5 |
| 30 | 30 | COL | 225 | 6 | 219 | 8.5 | 216.5 | 2.5 |
| 31 | 31 | Dhyana | 249 | 6 | 243 | 8 | 241 | 2 |
| 32 | 32 | Ghodiyadara | 262 | 5 | 257 | 9 | 253 | 4 |
| 33 | 33 | Kakarpa | 335 | 6 | 329 | 8 | 327 | 2 |

## 2. SYSTEMATIC HYDROGEOLOGICAL SURVEY

Systematic hydrogeological survey is generally followed conventional method of studying nature of groundwater resource. Technique of systematic hydrogeology survey involves examination and compilation of available data pertaining to existing procedure of tapping groundwater resources. First step of hydrogeological survey is the investigation survey of study area. Based on base map of Katthiwada study area prepared by using Toposheet no. 46 J/3 on 1: 50, 000 scales, and well inventory has been conducted. Recorded location of dug wells and marked the sane on base map (Figure 2). The measurements of data such as location of well, type of well, bench mark, diameter, total depth of well, static water levels, mode of lifting water and use of wells have been recorded and analyzed in the laboratory by using both tabular and graphic methods of representation. Based on seasonal occurrence of water, 33 dug wells, out of 60 examined dug wells (Table 1) have been selected as observation wells (Table 2), for monitoring of the static water level fluctuation during post and pre- monsoon periods. Prepared the post and pre-monsoon groundwater level contours map and fluctuation map.

### 2.1 WELL DATA ANALYSIS

Study area covers 161.42 sq.km in vicinity of Katthiwada study area of Alirajpur district. Examined 60 dug wells for the duration of the post- monsoon and pre- monsoon periods, have been analyzed to observe trends of variation in well parameters. The details have been recorded in following lines.

### 2.2 DIAMETER OF WELL

Analyzed data reveal that diameters of wells indicate a fairly good variation range. Diameters of wells range from 2 m to 7 m (Table 3, Figure 3). Diameter of dug wells mainly depends on the water bearing properties of weathered vesicular and fractured zone and others. Minimum diameter well is observed at Kaucha and maximum diameter well is observed at villages of Khera (B), Keory, Golamba, Jetpur, and Nakti. Majority of dug wells in present area reveal diameter range from 3 to 4 m.

**Table 3:** Analysis of Diameter range of dug wells of Katthiwada study area.

| S. No. | Diameter range (M) | No. of well | Percentage (%) |
|---|---|---|---|
| 1 | 1-2 | 1 | 1.66 |
| 2 | 2-3 | 2 | 3.33 |
| 3 | 3-4 | 21 | 35.0 |
| 4 | 4-5 | 20 | 33.3 |
| 5 | 5-6 | 11 | 18.3 |
| 6 | 6-7 | 5 | 8.33 |
| | **Total** | **60** | **99.95** |

**Figure 3:** A view of Large diameter dug well at Khera (B) village, study area.

### 2.3 TOTAL DEPTH OF DUG WELL

Analysis of the total depth of wells has been displayed (Table 4, Figure 4). Total depth of dug wells ranges from 3 m to 11m.b.g.l. Minimum numbers of wells are within variation range of 3 to 4 m.b.g.l. (Wadoi, Bada kheda). Maximum number of wells (Jabaniya, Katthiwada, Chordha, Bar (b), Lakhawat, Want, Koutharmahura, Amjheri, Umarwara, Bokria, Chiliyawat, and Col. are within the depth of 7 to 8. Deepest dug wells of Bada Khera, Bej, Golamba, Ghodiyadara, and Dhyana) are within range of 10 to 11 meters in present investigation.

**Table 4:** Analysis of total depth of dug wells of Katthiwada area, Alirajpur District.

| S. No. | Depth Range of Dug well (m.b.g.l.) | No. of dug well | Percentage (%) |
|---|---|---|---|
| 1 | 3-4 | 2 | 3.33 |
| 2 | 4-5 | 3 | 5.0 |
| 3 | 5-6 | 10 | 16.66 |
| 4 | 6-7 | 8 | 13.33 |
| 5 | 7-8 | 14 | 23.33 |
| 6 | 8-9 | 12 | 20.0 |
| 7 | 9-10 | 6 | 10.0 |
| 8 | 10-11 | 5 | 8.3 |
| | **Total** | **60** | **99.5** |

**Figure 4:** A view of dug well at Katthiwada area showing depth of well.

### 2.4 STATIC WATER LEVEL

Measurements of static water level have been recorded on 60 open dug wells located in Katthiwada area during post-monsoon period having a water level range from 1 to 8 m. b.g.l. Only 1 well is having a range of 7 to 8 m.b.g.l. at Khera (B) village during post monsoon. Maximum 22 dug wells are within the range of 4 to 5 m.b.g.l. (Table 5).

**Table 5:** Analysis of Static water level in dug wells of Katthiwada study area.

| S. No. | Depth range of static water level (m.b.g.l.) | Post- monsoon No. of wells | Percentage | Pre- monsoon No. of wells | Percentage (%) |
|---|---|---|---|---|---|
| 1 | 1-2 | 2 | 3.33 | 0 | - |
| 2 | 2-3 | 8 | 13.33 | 1 | 1.66 |
| 3 | 3-4 | 10 | 16.66 | - | - |
| 4 | 4-5 | 22 | 36.66 | 5 | 8.33 |
| 5 | 5-6 | 14 | 23.33 | 9 | 15.0 |
| 6 | 6-7 | 2 | 3.33 | 8 | 13.33 |
| 7 | 7-8 | 1 | 1.66 | 25 | 41.66 |
| 8 | 8-9 | - | - | 9 | 15.0 |
| 9 | 9-10 | - | - | 3 | 5.0 |
| | **Total** | **60** | **98.3** | **60** | **99.98** |

Static water level during the pre-monsoon reveals a range of variation from 2 to10 m. b. g. l. (Table 5). Only one well shows variation in water level within 2 to 3 m.b.g.l at Wadoi (B). Maximum 25 wells exhibit a range of static water levels from 7 to 8 m.b.g.l.

### 2.5 GROUNDWATER LEVEL VARIATION

Variations of groundwater levels in Katthiwada area of Alirajpur district have been measured on basis of data collected from 33 dug wells during period of post- monsoon and pre-monsoon. Determined variation values of groundwater levels are recorded (Table 6, Figure 5).

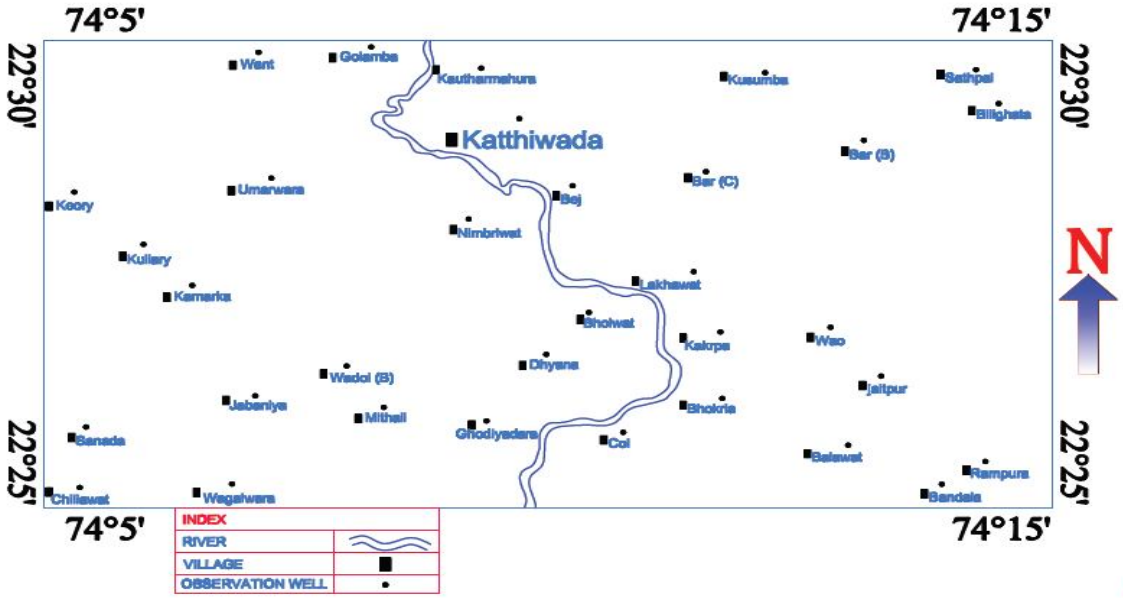


**Figure 5:** Showing observation wells location map of Katthiwada study area.

**Table 6:** Fluctuation range of water level in the Katthiwada study area, Alirajpur District (M. P.).

| S. No. | Fluctuation Range | Number of Well | Percentage (%) |
|---|---|---|---|
| 1 | 1-2 | 10 | 30.30 |
| 2 | 2-3 | 18 | 54.54 |
| 3 | 3-4 | 5 | 15.15 |
| | **Total** | **33** | **99.99** |

## 3. SEASONAL GROUNDWATER LEVEL CONTOUR MAPS

Seasonal groundwater level contour maps for post - monsoon and pre – monsoon periods were prepared on basis of determination of reduced groundwater levels determined by subtracting static water levels from Bench mark values, i.e., Bench mark- static groundwater levels = reduced water levels). Salient features of seasonal groundwater level contour maps of research area have been elaborated herein following text-

### 3.1 POST-MONSOON GROUNDWATER LEVEL CONTOUR MAP

Post - monsoon groundwater level contour map has been prepared on the basis of determined values of reduced groundwater level contours (Figure 6). Map indicates pattern of groundwater level contours in Katthiwada study area. It has been noted that there are contrasting variation in trend of contour levels. The widely spaced contour have been observed in vicinities of villages of Golamba, Want, Koutharmahura, Umarwara, Keori, Koliary, Sanada, Chiliawat, Mithali, Wadoi (B), Ghodiyadara, Dhyana, Nimbriwat, e.g. indicating good prospects of groundwater availability. Narrowly spaced contour levels point out poor conditions of groundwater occurrence. Fairly closed contour levels indicate very poor or devoid of groundwater. Sites are located at Bej, Lakhawat, Kusumba, Bandala, Bar (c), Col, Balawat, and Katthiwada villages. Finely closed contours have no yield of groundwater at Jaitpur, Sathpal, Bilighata, Rampura Wao, and Bar (B).

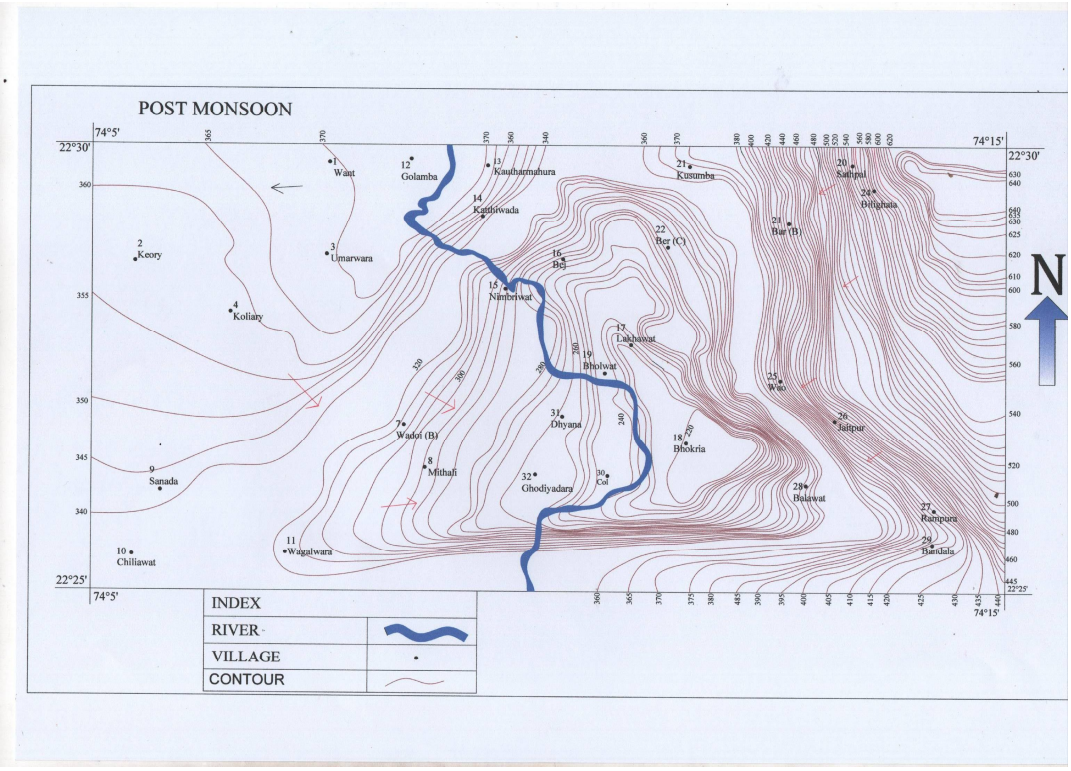


**Figure 6:** Displaying the groundwater level contour map of Katthiwada area during post-monsoon period.

### 3.2 PRE-MONSOON GROUNDWATER LEVEL CONTOUR MAP

Pre- monsoon groundwater level contour map has been prepared on basis of method as used in construction of post-monsoon groundwater level map. It has been examined that there is more or less similarities in nature of groundwater level contours except trends of pre-monsoon groundwater level contours (Figure 7) due to variation of static water levels. Pre-monsoon groundwater level contour map indicates favourable groundwater potential sites at the villages of Want, Golamba, Keory, Koliary, Sanada, Wadoi (B), Mithali, Ghodiyadara, Dhyana, Col, Bhokria, Katthiwada, Kotharmahura and Wagalwara. Groundwater level contours trend reflects that the locations such at villages of Kusumba, Bar (C), Lakhawat, Bej, Nimbriwat and Ghodiyadara have very poor or almost devoid of groundwater in Katthiwada area. There are no prospects of groundwater, where the contours are finely closed such as at Sathpal, Bilighata, Bar (B), Wao, Jaitpur, Bandala and Rampura.

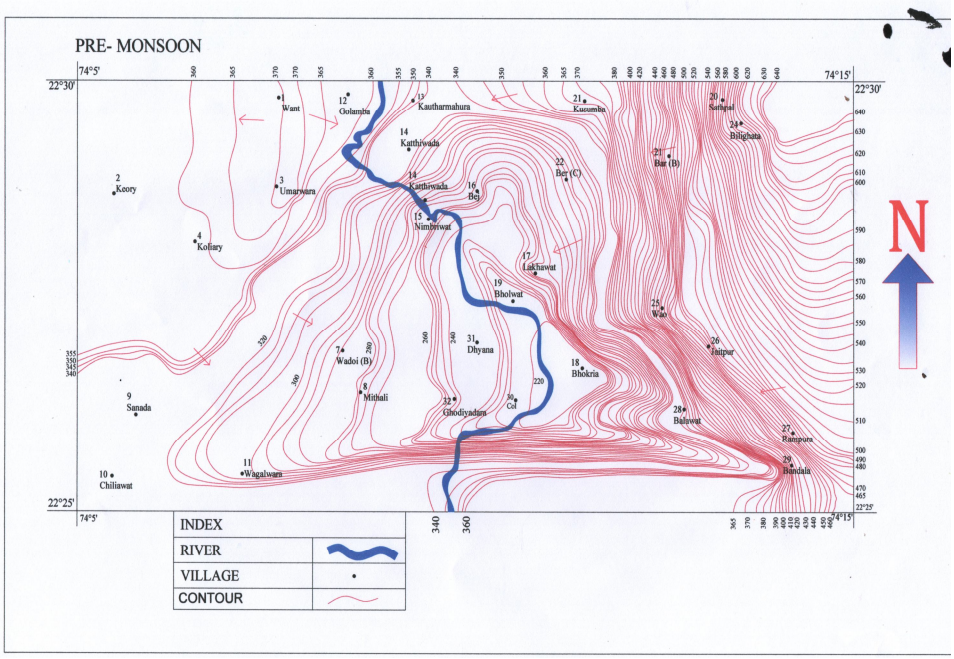


**Figure 7:** Displaying the groundwater level contour map of Katthiwada area during pre -monsoon period.

## 4. SEASONAL GROUNDWATER LEVEL FLUCTUATION

Monitoring of static groundwater levels during post-monsoon and pre-monsoon periods indicate a well-marked depletion in trend of seasonal groundwater levels. Seasonal variation trend reflects a groundwater levels range of 1.5 to 4 m.b.g.l in the Katthiwada area (Table 2, Figure 8)**.**

The good prospect of groundwater aviability is in village of Wadoi (B) (1.5 m.b.g.l fluctuation). Trends of fluctuation indicate elevated values of 4 m.b.g.l in areas of Wao, Ghodiyadara, Bar B, Golamba indicating shortage of groundwater for extraction. Groundwater level fluctuation indicates that reasons of variations may be assigned to climatic changes, amount and intensity of rainfall, and rising demand of inhabitants of Katthiwada.

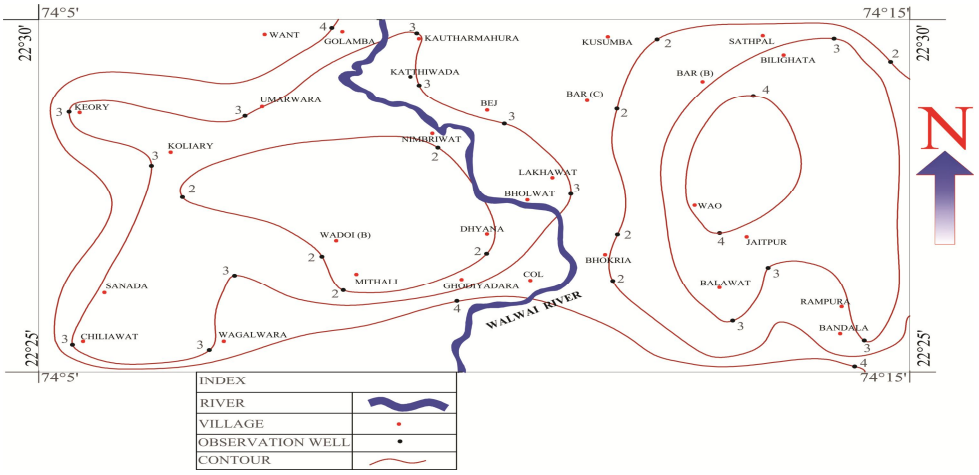


**Figure 8:** Displaying Fluctuation map of the Katthiwada study area.

## 5. GROUNDWATER MOVEMENT

Determination of trends of groundwater movement in Katthiwada area of investigation, have been attempted based on seasonal sub-surface water level contour maps by drawing perpendicular lines from higher level contours to lower level contours and are marked on the maps by the arrows (Figure 6, 7 ). The directions of groundwater movement point out that groundwater moves towards the Walwai River.

## 6. CONCLUSION

The paper highlights Hydrogeological analysis of Katthiwada groundwater structure of study area by management of 33 observation dug wells to Hydrogeological analysis adopting standard method of water analysis. The Katthiwada study area reveals that conservative dug well inventory method is of very help occupied for demarcations of groundwater potential sites. The Katthiwada study area of Alirajpur district of Madhya Pradesh is facing crisis of sensitive scarcity of water provide mainly during the period from January to June. The Hydrogeological data investigation reflects the characteristics of the groundwwater system.

## 7. ACKNOWLEDGEMENT

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