CENTRAL GROUND WATER BOARD
MINISTRY OF WATER RESOURCES, RIVER DEVELOPMENT AND GANGA REJUVENATION
GOVERNMENT OF INDIA

GROUND WATER YEAR BOOK
OF
PUNJAB STATE AND CHANDIGARH (UT)

2013-2014

North Western Region
CHANDIGARH
November 2014

CENTRAL GROUND WATER BOARD

Principal Contributors

ITI GUPTA
Scientist- 'B'

B. P. SINGH
Scientist- 'C'

M. L. Angurala
Scientist- 'C'

Supervision by

Dr. S. K. Jain
Regional Director

FOREWORD

Central Ground Water Board has been regularly monitoring ground water levels and ground water quality of the country since 1968 to depict the spatial and temporal variation of ground water regime. The changes in water levels and quality are attributed to the development patterns of the ground water resources for irrigation and drinking water needs. Analyses of water level fluctuations are aimed at observing seasonal, annual, and decadal variations. Therefore, the accurate monitoring of the ground water levels and its quality, both in space and time, are the main pre-requisites for assessment, scientific development and planning of this vital resource.

Central Ground Water Board, North Western Region, Chandigarh has established numerous Ground Water Observation Wells in Punjab State and the Union Territory of Chandigarh for monitoring the water levels and water quality. As on 31.03.2013, there were 330 Ground Water Observation Wells which included 142 dug wells and 212 piezometers for monitoring phreatic aquifers in Punjab and 17 Ground Water Observation Wells which included 1 dug well and 16 piezometers in Chandigarh (UT). In addition to these, deeper aquifers are also being monitored by way of 38 piezometers in Punjab and 10 piezometers in Chandigarh. These observation wells are being monitored four times a year during May, August, November and January. This activity is simultaneously undertaken throughout the country. However, with integration of ground water observation wells presently being monitored by Ground Water Cell, Department of Agriculture, Government of Punjab, into monitoring network of CGWB Chandigarh, the total number of ground water observation wells as on 31-03-2014 has reached 755 which included 169 dugwells and 586 piezometers for monitoring phreatic aquifers and 38 piezometers for monitoring deeper aquifers in Punjab. This report presents the observations and findings for the period May 2013 to January 2014.

Shri M. L. Angurala, Scientist 'C' and Ms. Iti Gupta, Scientist-'B' have put concerted efforts to compile and analyse the data and prepare the report in its present form. Chapter on Chemical Quality of ground water has been compiled by Mrs. B. P. Singh, Scientist 'C'. The editing and processing of the report has been carried out by Dr. P.K. Naik, Superintending Hydrogeologist and Sh. Tejdeep Singh, Scientist C.

I sincerely hope that this report presenting various analysis and data on ground water level behaviour and quality will be of immense use to the user agencies and other stakeholders.

(Dr. S. K. Jain)
Regional Director

Ground Water Year Book
Punjab State and Chandigarh (UT)
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GROUND WATER YEAR BOOK
PUNJAB STATE AND CHANDIGARH (UT)
(2013– 2014)

1.0 INTRODUCTION

The Punjab State is located between North latitudes 29^{o} 32' and 32^{o} 28' and East longitudes 73 ^{o} 50' and 77 ^{o} 00'. The total geographical area of the state is 50362 sq. km. It is surrounded by the states of Himachal Pradesh in the northeast, Jammu and Kashmir in the north and Haryana and Rajasthan in the south and southwest respectively.

The State has a flat alluvial plain except a narrow belt along the southwestern parts where stable sand dunes are seen dotting the landscape. The area occupied by the mountains (Himalayan foothills) in northeast, is about 1243 sq km. Perennial Rivers Sutlej, Beas, Ravi and ephemeral river Ghaggar drain the state. It has a vast network of canal system. With the inception of canals, the fertile land of the State started converting into green fields and experienced spectacular achievement in agricultural production with emphasis on cultivation of paddy and high yielding varieties of crops, as a consequence demand for water increased manifold resulting in over exploitation of ground water resources.

The State has been divided into four main divisions viz. Jalandhar, Patiala, Ferozpur and Faridkot, which are further sub-divided into 22 districts, which are further divided into 77 sub-divisions /tehsils, 76 Sub- tehsils and 141 community development blocks.

1.1 PHYSIOGARPHY

The State forms a part of vast Indo-Gangetic alluvial plain. Physiographically, the State can be divided into seven distinct units, which run parallel to each other.

i. Hilly area: Siwalik hills on the north and northeastern part .
ii. Eroded hills with flat land (Plateau): forms top of hills.
iii. Intermontane valleys
iv. Piedmont area: (Kandi zone) immediately southwest of hills.

v. Sirowal zone: lies further southwest of kandi area which merges with the alluvium of Ravi, Beas, Sutlej and Ghaggar rivers.

vi. Alluvial plains:

a) Active/recent flood plains include meanders and present flood plains.

b) Abandoned flood plains include terraces of rivers, abandoned during Recent Age.

c) Bar upland areas: Higher elevated land which remained beyond the reach of rivers but are composed of ancient river channels deposits (older alluvium) plains.

vii. Sand Dunes: Covering southwest part.

The physiographic units are described individually as follows.

i) **Hilly area :**

The outermost low lying Siwalik hills of the Himalayas occupy the NE part. These are the deposits of rivers of Indus system and comprised of alluvial, derived from the higher mountains, which were swept down by their numerous rivers systems and part of Siwalik rock formations have been involved in the latest Himalayan tectonic movements by which they have been folded, faulted and elevated into their outermost foothills. These occupy northern and northeastern part of Gurdaspur, Hoshiarpur, Nawanshehar and Rupnagar (Roopnagar) districts. These hills traverse NW – SE direction and forms the boundary with neighboring State of Himachal Pradesh. In Gurdaspur district, the hills extend from Ravi river on northwest to Beas river on the southeast. In Hoshiarpur and Nawanshehar districts, the hills cover northeast parts and extend from Beas to Satluj rivers. These foot hills separate the main Himalayan ranges form the vast Indo-Gangetic alluvial plains. The hilly region is intersected with numerous streams which remain dry during major part of the year except during rainy season when these carry flood water. The highest peak in the area is 900 m above M.S.L. The hills present uneven topography and at places are highly eroded. The gradient is varying in the hilly areas.

ii) **Eroded hills with flat land**:

These areas lie within Upper Siwalik formations and locally known as `Beet' meaning waterless. The flat surface lands (plate or table lands) occur in Hoshiarpur

district and these are fertile land composed of sandy clay and support irrigational activities.

iii) **Intermontane valleys:**

An intermontane Satluj valley extends from Nangal to Roper along the Satluj River. It is a longitudinal valley and about 40 Km. in length having an average width of 5 Km. High land river terraces are seem on the north east and eastern part of the area which have been deeply eroded and furrowed to form “bad land” topography. The thickness of valley fill is very limited and here an average of 50 m below ground level. Another valley known as “Sohan nadi valley” is an intermontane valley in the outer Himalayas extending from Daulatpur in Himachal Preadesh to Hajipur (Punjab). It runs in southeast-northwest direction and follows the general strike direction of the mountain ranges. It has a length of 20 Km and width ranges between 1.5 km to 3 km and in Punjab State. This valley portion extend along the left bank of Sohan nadi and along its right bank, Siwalik Hills are exposed.

iv) **Piedmont areas:**

The transitional area between the alluvial plains and mountainous range of the Himalayan foot hills forms the Piedmont area. These consist of alluvial fans which have been dissected by hill torrents and small perennial streams, much of the detrital material has been reworked separately by sheet flooding. The lower southeast slopes of the piedmont forms ‘Sirowal zone’. In Punjab State, piedmont area is know as “Kandi”, and occupy Southwest part of lower Siwalik hills. The gradient is steeper near the hills and gentler towards plains. The width of ‘Kandi belt’ varies from 6-10 km. having rolling type of the topography. In Gurdaspur district, the spring line runs parallel to the southwestern boundary with ‘Sirowal zone’. But in Hoshiarpur, and Rupnagar districts, the spring line (auto flow) do not exist hence boundary between kandi and Sirowal could not be precisely demarcated.

v) **Sirowal Zone**

It lies further southwest of Kandi belt. The topographic gradient is gentler as compared to kandi and presents very low relief. In Gurdaspur district, the Sirowal zones occupy immediately SW of spring line and have an undulating topography.

vi) **Alluvial Plains**

These form a dominant physiographic unit and consist of alluvium of the Indus River with its present and ancestral tributaries. The alluvium was deposited by Ravi, Satluj, Beas and Ghaggar rivers. The plains have altitude of less than 300 m above M.S.L. The master slope is towards southwest and matches with the course of the rivers. The alluvial plains have been further divided into three sub-physiographic units based on the present relationship of the surface features to the rivers. These are as follows:

Recent Flood Plains

These include the meandering zone and present flood plains of the rivers. The meanders, scars, sandbars, natural levees and back water swamps are the conspicuous features of the flood plains. Along the major rivers, there are low flood plains locally called 'Bet'. The recent flood plains are often separated from the upland plains by steep slopes. The water levels are shallow in 'Bet' area.

Abandoned Flood Plains

These are parallel to the rivers and are a few meters higher than the recent flood plains. They represent flood plains that have been abandoned in recent times by the major rivers.

Bar Upland Areas

These are large areas of relatively older alluvium and found in the Upper Bari Doab area and are elevated lands above the bordering flood plains. These remain beyond the reach of flood waters of the present river systems and are termed as "Bar Uplands" These are the most significant physiographic features of the alluvial plain. Typically, the bar uplands rise abruptly from the abandoned flood plains and are bordered by steep scarps. In Gurdaspur district, Bar upland areas are characterised by undulating topography, dendritic drainage pattern and predominance of nodular "kankar".

vii) **Sand Dunes:**

These occupy southwestern part of the state which experiences semiarid type of climate and constitute about 28% of the area. These are spread over about 10-15 percent of the area and cover parts of Firozepur, Mansa, Bathinda, Muktsar,

Kapurthala, Sangrur, Faridkot and Patiala districts. The area is bounded by 29º 33' and 30º 36' north latitudes and 74º 18' & 76º 12' east longitudes. These dunes are mostly isolated type and vary in size and height. The sand dunes form a thin layer over the alluvium.

1.2 DRAINAGE

The Ravi, Beas, Satluj and Ghaggar rivers along with West and East Beins and the non-perennial choes and Khads drain the Punjab State. The Ravi flows along the northwestern boundary and forms the international boundary with the Pakistan. The Satluj forms the international boundary with Pakistan in the south-western part of the State. Ghaggar river flows along the southeast boundary of the State and forms the boundary with Haryana State except at a few places where villages of Punjab lies on the left bank of Ghaggar river and Haryana villages occupy right bank of the river. All rivers flow in the southwest direction expects the Satluj River which roughly flow from east to west up to Harike and from Harike it assumes southwesterly trend upto Fazilka. The Satluj and Beas rivers have been damed by construction of Bhakra dam and Pong dam respectively. After the construction of Rupnagar headworks barrage, the Satluj river has water only during the rainy season on downstream of Rupnagar. At Harike Pattan, it carries the flow regenerated by ground water effluent seepages. Soan nadi originates near Daulatpur (H.P) and all the choes from the Western slopes of Chint Purni range (H.P.) flow into it. The Soan nadi joins the Satluj near village Bhalan. All the rivers rise from Himalayas and after traversing long courses, they debouch into the plains. Apart from the perennial rivers, there are other important seasonal streams, choes and drains. The sub-montainous zone is traversed by a number of choes. Some of them contribute to the rivers while other terminates without merging into any river. These 'choes' remains dry for most of the year. Their discharge is irregular and runoff during the monsoon period.

In Upper Bari Doab tract, Chakki Khad a perennial tributary of the Beas drains mainly the 'kandi' belt. The Naumuni and Kiran are two tributaries of the Ravi and drain north western parts of this tract. The Patti nala drains the southwestern part of the area and joins the Satluj River. The Kiran nadi originates in north of village Isarampur in the close vicinity of Keshopur Chhamb. It is fed by ground water seepage and the excess

water of Upper Bari Doab canal is also diverted into it. In addition to these tributaries, there are several khads traversing 'Kandi' belt which remain dry except during rainy season. Some of the major Khads like 'Pungotri Khad' traverse even beyond the spring line. Such Khads gain water through ground water effluent seepage. The Bist Doab tract is traversed by about 85 hill torrents known as choes, which debouch into plains. There are two main drainage patterns in this tract and both are perennial.

i) Eastern or White Bein.

ii) The Western or Black Bein.

The eastern or White Bein originates near Garshankar village of Hoshiarpur district and joins Satluj River near Lohian after traversing the Bist Doab tract. The Nasrala, Mehlan wali, Rajni devi, Mehandpur, Jaijon choes join the east Bein at different places. The Western or Black Bein rises at Chhamb near Dasuya in Hoshiarpur district and joins the Beas river near Durgapur which is located upstream of its confluence with Satluj at Harike. Janauri, Mehngerwala and Kingranwala join the West Bein. In Rupnagar district Budki Nadi, Haripur nala, Sugh Rao, Siswan Nadi, Jainti Devi Ki Rao and Patiali Ki Rao forms the major drainage system. These all meets Satluj River except Patiali Ki Rao and Jainti Devi Ki Rao which gives water to Ghaggar River. The third zone forming the southeastern part of the State is drained by Ghaggar River which is perennial. Tangri nadi, Budha nala and Lissara nala are the main seasonal streams in the area. In south western part, some of the important drains are the Phidda drain, Chand Bhan drain and Jallalabad drain etc.

1.3 SOILS

The soils of Punjab have largely developed on alluvium- the material laid by the rivers, under the dominant influence of climate followed by topography and time. The details of the soils found in the state are as follows:

1.3.1 REDDISH CHESTNUT SOILS

These soils occur on stable terraces in the north and north eastern Parts of the state and are found in Pathankot tehsil of Gurdaspur district, parts of Hoshiarpur, Dasua and Garh shankar Tehsil of Hoshiarpur district, Balachaur Tehsil of Nawashahar district and Rupnagar, Anandpur Sahib and Kharar Tehsils of Rupnagar district. These soils are loamy to clay –loamy in nature and are decalcified. Erosion of of soils due to water

is a very serious problem. The soils are mildly acidic to neutral in reaction. These soils are found in areas having normal rainfall of 800 to 1000mm.

1.3.2 TROPICAL ARID BROWN SOILS

These soils are found in remaining areas of Gurdaspur, Hoshiarpur, Nawashahar and Rupnagar districts and most parts of Jalandhar, Kapurthala, Patiala, and whole of Ludhiana, Fatehgarh Sahib districts and in parts of Amritsar and Sangrur districts. These soils are found in areas having normal annual rainfall of 750 to 1000mm.

1.3.3 ARID BROWN SOILS, (SOLONISED)

These soils are found in lower parts of Amritsar, Kapurthala, Jalandhar, Patiala, Sangrur, Ferozepur districts and entire Moga district where the normal rainfall varies from 500 to 700mm. Salinity and alkalinity are the serious problem in these soils. These soils are calcareous in nature and in most cases Kankar layer occurs at 1.0 to 1.5m depth.

1.3.4 SIEROZEM SOILS

These soils are found in Bathinda, Faridkot, Ferozpur, Mansa and Muktsar districts, where normal rainfall varies 300 500mm. Salinity and alkalinity are the serious problems particularly in the canal irrigated areas. Wind erosion is also a common feature in this soil. These soils are calcareous in nature and usually have a massive Kankar layer at a depth of 0.75 to 1.25m.

1.3.5 DESERT SOILS

These soils are found in southern parts of Ferozpur and Muktsar districts where the normal annual rain fall is less than 300mm. Wind erosion is a serious problem here.

2.0 GENERAL GEOLOGY

The great Indo-Gangetic plain with an area of about 8,50,00 sq. km lies between the Peninsular India and the Himalayas. On the basis of seismic and borehole data, Rao (1973) divided the Indo-Gangetic Plain into five parts, which from west to east are (i) The Indus Basin in Pakistan, (ii) the Punjab Basin in Punjab and Haryana, (iii) The Ganga Basin in Uttar Pradesh and Bihar, (iv) The Brahamputra Basin in Assam, and (v) The Ganga- Brahamputra Basin in West Bengal and Bangladesh. These basins have been delineated on the basis of subsurface ridges or high. A brief review of the subsurface features of the Punjab Basin of which the Punjab State forms a part, is

presented below. In the Punjab Basin the Quaternary alluvium has been deposited at places on semi-consolidated Tertiary rocks (Siwalik Group) or on a basement of metamorphic and igneous rocks of Precambrian age. The alluvial sediments were laid down by the rivers since Pleistocene in the “fore deep” or a down warp formed in front of the rising Himalayan ranges and thus represents the younger geological formation.

2.1 GEOLOGICAL SET UP

The rock formations ranging in age from middle Miocene to Recent are exposed. They are represented by Siwaliks and Alluvium deposits. The Siwaliks (Middle Miocene to Pleistocene) form hilly tract running in northern and northeastern part of the State. The alluvium deposits (Pleistocene to Recent) constitute the plains of Punjab. The Siwaliks are divided into three lower, middle and upper on the basis of lithology and vertebrate fossils. The Siwalik formations have been folded and faulted due to tectonic activities. The various stratigraphical units exposed in the state are given in table as under:

2.1.1 AEOLIAN SAND (WIND BLOWN SAND)

These are medium to fine grained and buff coloured sand. They occur in the form of dunes, which are formed as the disintegrated product of the older rocks and found in the southwestern part of the State. The dunes are elongated in shape and are blown sand forming fixed dunes and sandy flats. The dunes are oriented in N-S direction forms ridges which rise from a meter to about ten meters above the surrounding land surface. These sands are brought from the Rajasthan desert and ultimately deposited and shaped by the southwesterly winds which blow across the area from April to June. Generally, the sand dunes contain loose and unconsolidated sand and at places where vegetation has come up these have been fixed. The sand grains are generally well rounded in shape and mainly consist of quartz and ferromagnesian minerals with flakes of mica.

2.1.2 ALLUVIUM

The greater part of Punjab is occupied by alluvial plains, which are very fertile. The Quaternary alluvial sediments were deposited on semi-consolidated Tertiary rocks and conceals underneath the fringes of Peninsular and extra- Peninsular rocks. Out of the total area of 50362 Sq Km. of the State, alluvial cover about 38500 sq.km.

spreading over about 76% of the area. This vast expanse of plains is constituted by fluvial sediments of Indus river system. Beneath thick alluvium cover, there are southwestern extensions of Siwalik, which are exposed only in northeastern hilly tract of the State. The Siwalik rocks are expected to extend Bathinda which in fact separates the northeastern Punjab basin form Southwestern Rajasthan basin. Based on O.N.G.C. data, the contact between the plains and the Siwalik Hills is believed to be normal in Gurdaspur district and is faulted in Hoshiarpur and Rupnagar district areas. The thickness of alluvium varies from place to places due to irregularities and undulations .The maximum thickness of 4500 m has been reported near Dasuya in Hoshiarpur district. The thickness of alluvium increases towards northeast. It is comparatively less in the southwestern parts where the rocks of Pre- Cambrian age occur as burried ridges. In the intermontane valleys in north east part, the valley fill is estimated to be around 200 m thick underlain by rocks of Siwalik system. The alluvium comprising sand, gravel and clay is deposited by the Indus river system. In accordance with their mode of deposition by large constantly shifting river, the alluvial deposits are heterogeneous in nature and individual strata have limited horizontal and vertical continuity. The alluvial complex of Pleistocene and Recent age represents the latest phase of sedimentation. It consists principally of fine to medium sand, silt and clay. Beds of gravel and coarse sand are uncommon. It is also associated with fine grained strata, concretionary zones or nodules of kankar.

The sand gravel or sand bodies embodied in the clay- silt mixture in the alluvial deposits are usually either small or big lensoid bodies with longitudinal part either normal or nearly normal to the Himalayan and Siwalik strike i.e. NW-SE. Sheet like bodies of sand, sand and gravel had been deposited in the central part of the State and are regionally extensive. In southwestern and southern parts of the State, ground water is brackish to saline. The rivers have deposited their coarser material in higher reaches, so the flood plain deposits developed in southwestern parts were richer in finer sediments. The alluvium is normally divided in two groups viz:

(a) Newer Alluvium and (b) Older Alluvium.It is not possible to clearly indicate any distinct /demarcation line of separation between the two units.

(a) Newer Alluvium (Khadar)

It occurs in the active flood plains of present day river courses and is generally confined to the neighborhood of river channels. Along the major rivers in plain areas, there exist low flood plain areas which are locally called khadar of 'bet'. These flood plain are often separated from upland plains by a steep slope of the order of 1m to 2m per km. The Newer alluvium is light coloured and poor in calcareous matter. It consists of coarse gravel near the foot hills and lenticular beds of sand and clay along the old river course and silt and clay in the flatter parts of the river plains. It is of Upper Pleistocene to Recent age. The aquifers comprised of medium to coarse sand and gravel. The clays serve as aquitards. The various aquifers are interconnected. However, the deeper horizons show confined to semi- confined conditions. There is wide variation of the hydraulic conductivity and Transmissivity of the aquifers due to rapid changes in their texture and thickness.

(b) Older Alluvium (Bhangar):

It is confined to the abandoned flood plains and bar upland regions. It consists of sandy clay, clay-silt and fine to medium sand. It consists of pale reddish brown coloured beds of clay. Kankar is found disseminated more or less throughout the beds of sand and clays. The kankar bands are generally more in the older alluvium. At places extensive and massive beds of kankar also exist. It is of middle to Upper Pleistocene in age. Older alluvium forms good ground water reservoir/aquifer.

2.1.3 UPPER SIWALIKS

These formations are exposed throughout the hilly tract starting right from northwest of Pathankot through Hoshiarpur, Rupnagar to Chandigarh. They are composed of soft grey medium to coarse-grained sandstones, yellowish brown and brown clays. The sandstones are poorly lithified, soft and friable. They are brownish grey in colour and contain a large proportion of mica flakes and concretions of clay. They also consist of conglomerates, boulders and pebbles of quartzite and yellowish clays. The conglomerates consist mainly of cobbles and pebbles of quartzites. The pebbles of granite limestone, sandstone and lumps of claystones are also present. The conglomerate beds do not show clear stratification and occur as wedge shaped or lenticular bands. The formations of Upper Siwaliks are prone to easy weathering and

there is considerable collection of sand as talus cones. These formations yield good to moderate supplies of water.

2.1.4 MIDDLE SIWALIKS

These are exposed in Dhar and Dunera area of Pathankot tehsil of Gurdaspur district, north and northeast of Kiratpur in Rupnagar district. These are comprised of grey micaceous, medium grained soft sandstones interbedded with red, orange and yellowish (buff coloured) clays. The sandstones occasionally contain pebbles of calcareous clay, shale and quartzite. The Middle Siwaliks are poor in yields of ground water due to poor permeability.

2.1.5 LOWER SIWALIKS

These are exposed in Dhar and Dunera area of Pathankot tehsil of Gurdaspur district, constitute massive grey to light grey, micaceous sandstones interbedded with dark red to maroon clays grading upward in to micaceous sandstone with thick beds of red clays. The rocks of Lower Siwaliks have poor yields of ground water. However small springs of low discharge occur on the hill slopes they confine their position at the bedding contacts where the argillaceous bed is underlain by arenaceous bed.

2.2 BASEMENT CONFIGURATION

The Punjab Wedge i.e. the Archaean basement rocks either outcropping or occurring under moderate thickness of alluvium in Lahore- Sargodha area in Pakistan separates the Indus basin in the west, from the Punjab depression in the east. The Punjab depression follows a NW-SE ESE and WNW direction in conformity with the trends of the Siwalik hills. The seismic surveys by the Oil and Natural Gas Commission, (Datta et al., 1964) have indicated that the basement rocks as well as the sediments of the alluvium, dip gently towards the Himalayan foothills. The basement, however, becomes deeper as the foothills are approached with a corresponding increase in the thickness of the sediments. The maximum depth of this depression, about 4500 m was at Dasuya in Punjab State. Furthermore, the Punjab Basin which is fairly deep and wide in the northwestern portions becomes narrower to the southwest and the basement topography rises gradually in that direction. A basement high occurs in the subsurface corresponding to the present water divide between the rivers of the Punjab and the

Yamuna belonging to the Ganga system. According to Rao (1973), it has been long assumed that two ridges extending from Delhi, one to the northwest towards Lahore, and the other to north towards Dehradun are concealed under the alluvium of the plains. These isolated outcrops of Archaean rocks seen at Kirana hills, and Sargodha extending in WNW direction from Lahore has been taken to indicate that a subsurface ridge extends under alluvium from Delhi in India to Lahore in Pakistan About 5km north of Jagadhari (near Ambala in Haryana State), the basement was encountered at a depth of 2800 m and it remains fairly flat at that level till the foothills (Nath, 1964, Rao, 1973). This basement high, often referred to as Delhi- Lahore- Sargodha Buried Ridge based on the inference that it represents the northwesterly extension of the Aravalli Mountain system, trending NW - SE . As shown by the contours, the northwestern flank of the ridge dips steeply and the depth to the bedrock increased sharply in that direction. The contours also indicate that the slopes to the southwest are less steep and the average depth of the bedrock over the crest of the ridge is about 400-500 m. The basement in Punjab basin is known to slope from south to north,and it is rather irregular and must locally contain hills and valleys. The basement seems to have a shape of asymmetrical basin. Both longitudinal and transverse faults are present in the basement, which forms a monocline with gentle northeasterly dip and no major structural feature were noticed. Based on seismic surveys carried out by O.N.G.C. indicated that the thickness of unconsolidated sediments in the southern part of the State is 15400 m and near Jalandhar it is about 3000m and increases towards north. Near Dasuya it is about 4500 m, being the maximum. The basement rocks have been encountered in number of boreholes drilled by CGWB.The basin is shallowest in the southern part, in Bathinda district and the bed rock was encountered at a depth of 333 m below ground level at Kumharwala. At 333 m depth hard clay top of Palana series was encountered and 416 m claystone of Nagaur series was encountered during drilling of borehole down to 422 depth m. At Kheliwala, the bed rock comprised of Delhi quartzite was encountered at a depth of 533 m below ground level and the borehole was drilled down to 545 m. The thickness of unconsolidated material is maximum in the northeastern part.

3.0 GROUND WATER REGIME MONITORING

Central Ground Water Board, North Western Region, Chandigarh has established numerous Ground Water Observation Wells in Punjab State and the Union Territory of Chandigarh for monitoring the water levels and water quality. As on 31.03.2013, there were 330 Ground Water Observation Wells which included 142 dug wells and 212 piezometers for monitoring phreatic aquifers in Punjab and 17 Ground Water Observation Wells which included 1 dug well and 16 piezometers in Chandigarh (UT). In addition to these, deeper aquifers are also being monitored by way of 38 piezometers in Punjab and 10 piezometers in Chandigarh. These observation wells are being monitored four times a year during May, August, November and January. This activity is simultaneously undertaken throughout the country.

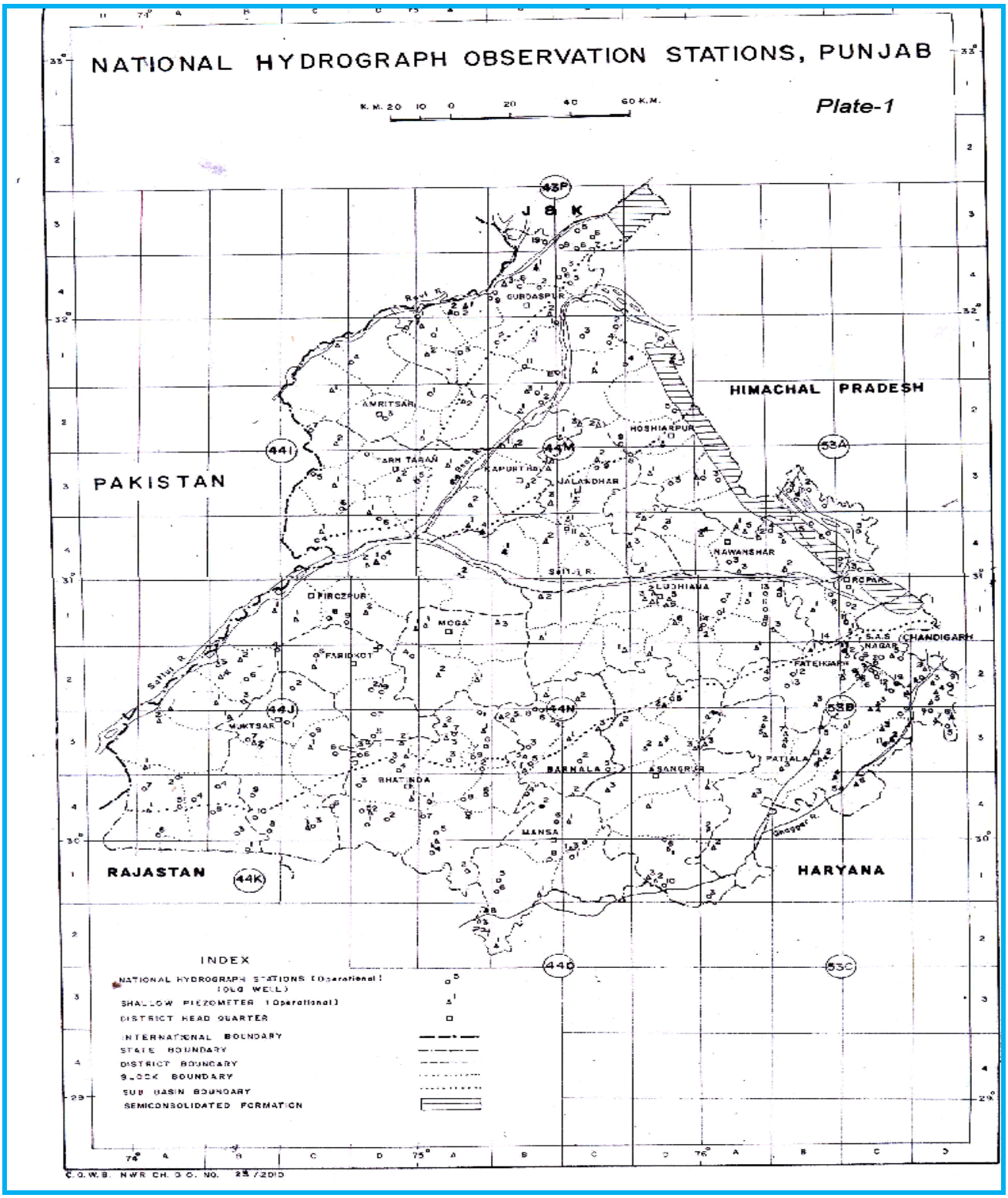
However, with integration of ground water observation wells presently being monitored by Ground Water Cell, Department of Agriculture, Government of Punjab, into monitoring network of CGWB Chandigarh, the total number of ground water observation wells as on 31-03-2014 has reached 755 which included 169 dug wells and 586 piezometers for monitoring phreatic aquifers and 38 piezometers for monitoring deeper aquifers in Punjab. This report presents the observations and findings for the period May 2013 to January 2014.

About 80% of the Ground water observation wells fall in the command areas of various canal systems, the areas falling out of the major command is major part of Hoshiarpur and Ropar districts, parts of Gurdaspur, Jalandhar and Ludhiana districts. The district wise details of Ground water observation wells are given in Table 1 and shown in Plate 1.

Table- 1 District wise ground water observation wells, Punjab State and Chandigarh (UT).

S. No.	Districts	No. of Ground water observation wells as on 31.3.2013			No. of Ground water observation wells establised as on 31.3.2014			Total no. of Ground water observation wells operational as on 31.3.2014
		Dug wells	Pz's	Total	Dug wells	Pz's	Total	
1	Amritsar	4	4	8	2	22	24	32
2	Bathinda	20	10	30	9	8	17	47
3	Barnala	0	6	6	0	20	20	26
4	Faridkot	7	2	9	1	15	16	25
5	Fatehgarh	5	5	10	0	15	15	25
6	Fazilka	10	8	18	0	1	1	19
7	Ferozpur	3	4	7	4	44	48	55
8	Gurdaspur	12	7	19	7	34	41	60
9	Hoshiarpur	9	9	18	2	25	27	45
10	Jalandhar	3	31	34	0	7	7	41
11	Kapurthala	1	13	14	0	24	24	38
12	Ludhiana	8	17	25	1	16	17	42
13	Mansa	6	6	12	0	21	21	33
14	Moga	1	7	8	0	22	22	30
15	Mohali	10	9	19	0	3	3	22
16	Muktsar	8	3	11	2	26	28	39
17	Nawanshahr	3	6	9	0	14	14	23
18	Pathankot	9	0	9	0	0	0	9
19	Patiala	3	20	23	0	18	18	41
20	Ropar	11	2	13	0	22	22	35
21	Sangrur	3	12	15	0	20	20	35
22	Tarn Taran	5	8	13	0	20	20	33
	Total	141	189	330	28	397	425	755
1	Chandigarh	1	23	24	0	0	0	24
	Total Pun jab & Chandigarh	142	212	354	28	397	425	779

Plate 1: Location of ground water observation wells in Punjab State.

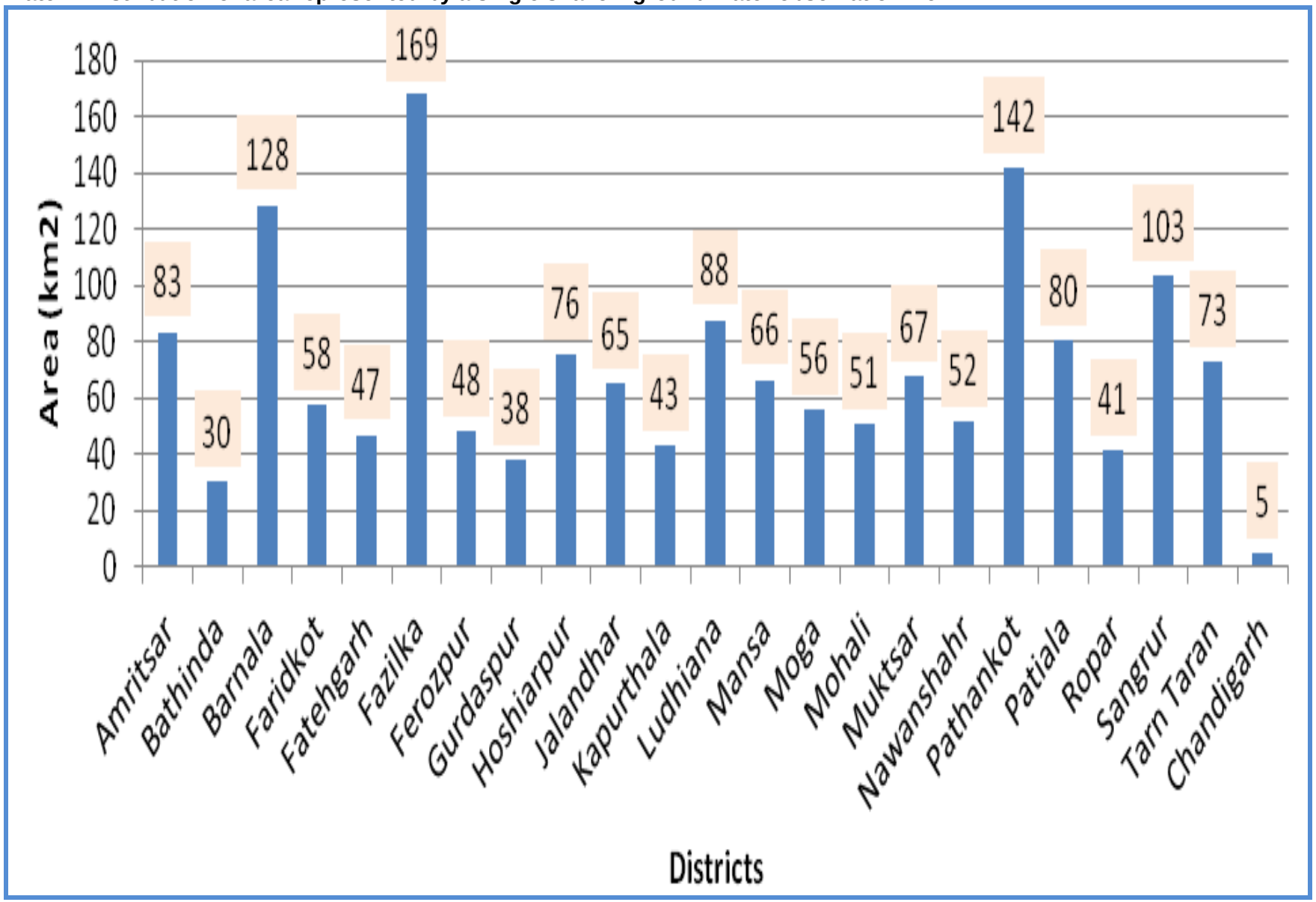


The area represented by single shallow Ground water observation wells being monitored in the state of Punjab and Chandigarh is given in **Table 2** and depicted in Plate **2.**

Table 2. Area represented by single shallow ground water observation well.

S. No.	Districts	Area (km^2)	No. of shallow ground water observation wells as on 31.3.2014	Density: Area in km^2 represented by one ground water observation well
1	Amritsar	2670	32	83
2	Bathinda	1410	47	30
3	Barnala	3340	26	128
4	Faridkot	1440	25	58
5	Fatehgarh	1170	25	47
6	Fazilka	3203	19	169
7	Ferozpur	2647	55	48
8	Gurdaspur	2284	60	38
9	Hoshiarpur	3400	45	76
10	Jalandhar	2660	41	65
11	Kapurthala	1630	38	43
12	Ludhiana	3680	42	88
13	Mansa	2190	33	66
14	Moga	1680	30	56
15	Mohali	1112	22	51
16	Muktsar	2630	39	67
17	Nawanshahr	1190	23	52
18	Pathankot	1276	9	142
19	Patiala	3290	41	80
20	Ropar	1440	35	41
21	Sangrur	3610	35	103
22	Tarn Taran	2410	33	73
	Chandigarh	114	24	5

Plate 2: Distribution of area represented by a single shallow ground water observation well.



3.1 BEHAVIOUR OF WATER LEVEL

In order to assess the quantitative change in ground water resources, water levels were monitored as a routine of four times in a year. The behaviour of water level in May 2013, August 2013, November 2013 and January 2014 is discussed in following paragraphs The maximum and minimum water levels recorded in different season is given below in Table 3.

Table 3. The maximum and minimum water levels during all four seasons

Range	May 2013	August 2013	November 2013	January 2014
Minimum	0.53 m bgl	0.20 m bgl	0.19 m bgl	0.14 m bgl
	(Ferozpur)	(Faridkot)	(Muktsar)	(Muktsar)
Maximum	40.01 m bgl	49.92 m bgl	37.25 m bgl	37.33m bgl
	(Ludhiana)	(Fatehgarh Sahib)	(Rupnagar)	(Patiala)

It is evident from the above table-3 that shallowest water level conditions prevail in southwest parts mainly in Faridkot, Muktsar and Ferozpur districts, while deepest water level conditions exist in the central and north eastern parts of the state covering Fatehgarh Sahib, Ludhiana, Rupnagar and Sangrur districts. The water level data of all four seasons is discussed below and given in Annexure-I:

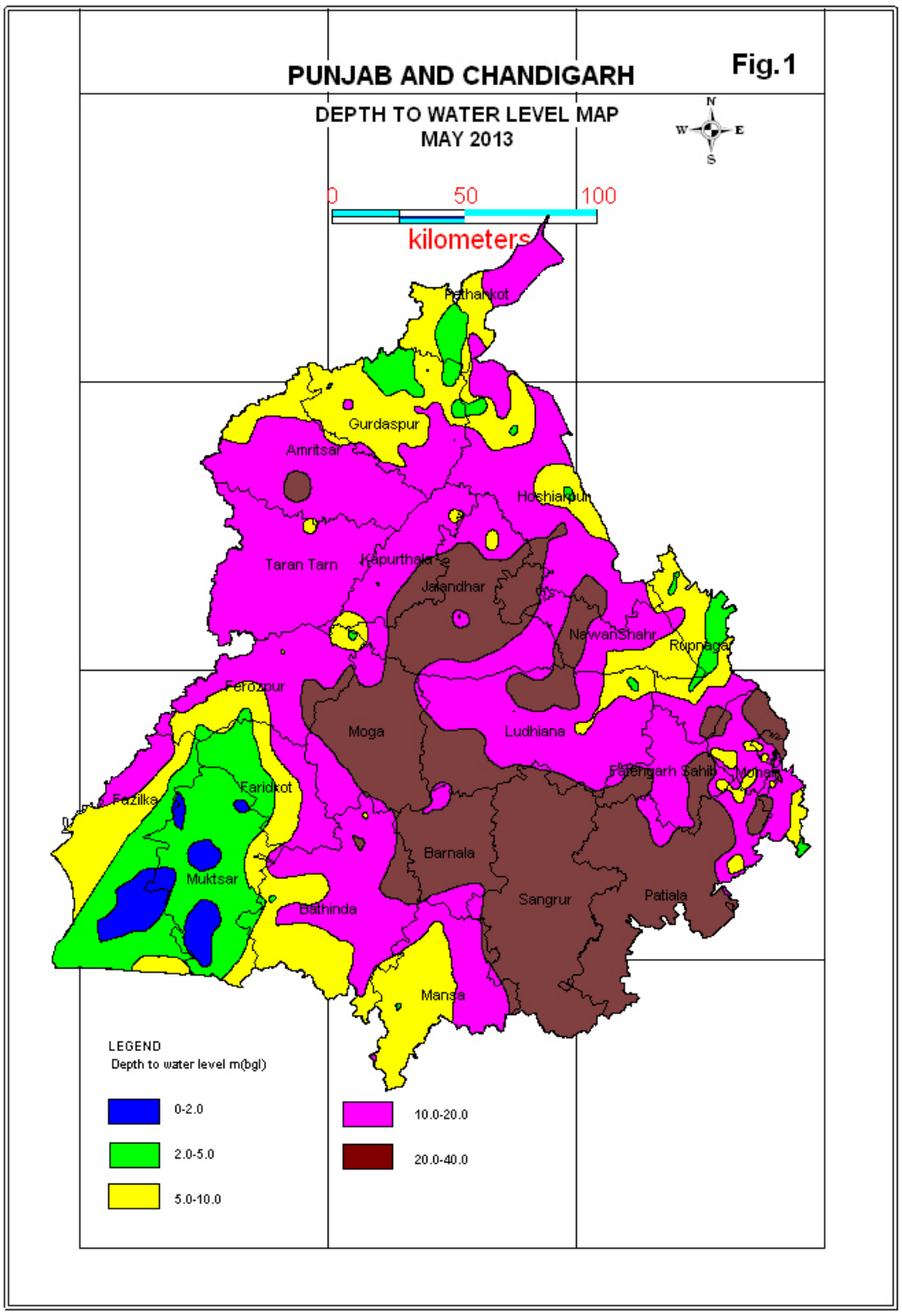
3.1.1 MAY 2013

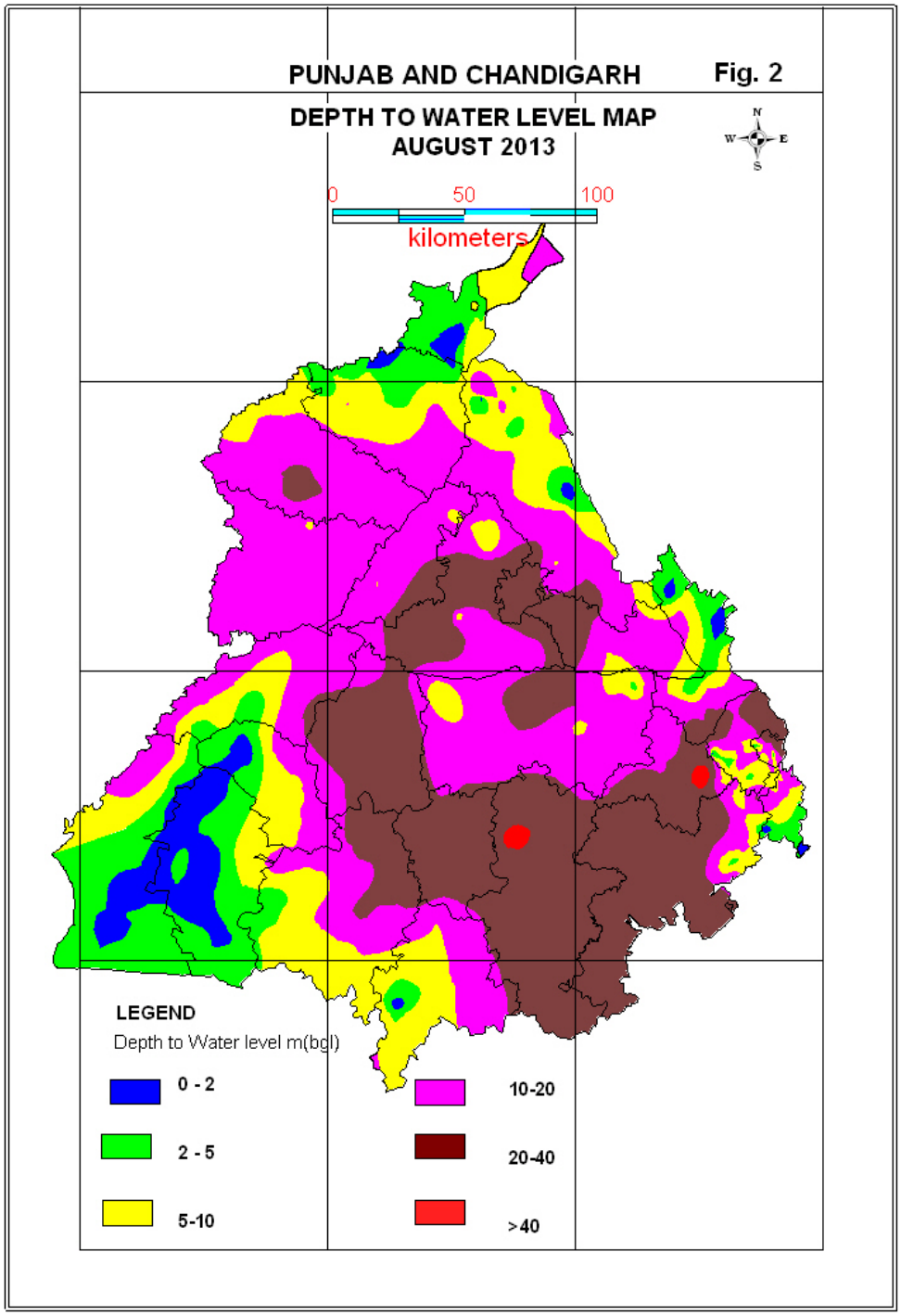
The depth to water level lies between 0.53 m bgl at Kondal in Ferozpur district and 40.01 m bgl at Chhattar Singh Park in Ludhiana district. Very shallow water levels 0-2 m (causing water logging) occur in more than 4% of wells and cover nearly 1% area of the state in south western parts(Muktsar and Fazilka distrcts). Shallow water levels 2-5 m have been observed in 13% of the wells and more than 9% of total area and lies southwestern parts (Bathinda, Muktsar and Fazilka distrcts) and few isolated patches in north and northeastern parts. These are mainly canal command areas and use canal water for their agricultural needs. The water levels between (5-10 m) are observed in about 20% wells and 18% of the area of the state covering the parts of Pathankot, Gurdaspur, Hoshiarpur districts in northern parts, whereas in eastern and southwestern parts the range covers parts of Rupnagar, Mansa, Bathinda, Muktsar, Faridkot, Ferozpur and Fazilka districts. Moderately deep water levels (10-20 m) are predominant and observed in 35% wells covering major part (about 42% area) of the State falling in

parts of Amritsar, Tarntaran, Jalandhar, Kapurthala, Hoshiarpur and Nawanshahr districts in the north. Central and southern parts of the state covering Ferozpur, Moga, Faridkot, Bathinda, Mansa, Ludhiana Fatehgarh Sahib, Patiala and Mohali districts also fall in this range of water level. Very deep water levels (20-40 m) are also observed covering parts of Jalandhar, Moga, Ludhiana, Barnala, Bathinda, Sangrur, Patiala, Fatehgarh, Nawanshahr and Chandigarh districts and observed in 28% wells covering about 29% area of the State. Map depicting water level during May, 2013 is shown in Fig. 1.

3.1.2 AUGUST 2013

The depth to water level lies between 0.2 m bgl at Mehmuana in Ferozpur district and 49.92 m bgl at Badali Ala Singh in Fatehgarh Sahib district. Very shallow water levels 0-2 m (causing water logging) occur in more than 9% of wells and cover nearly 4% total area and water levels are distributed in south western parts of the state falling Muktsar, Faridkot and Fazilka districts. Shallow water levels 2-5 m have been observed in 14% of the wells and more than 11% of total area and in southwestern and northern parts and few other isolated patches. The water level between 5-10 m are observed in the north (Pathankot, Gurdaspur, Hoshiarpur districts), in east (Rupnagar district) and in southwest (Mansa, Bathinda, Muktsar, Faridkot, Ferozpur and Fazilka districts) of the state. About 18% wells and 17% of the area fall in this range. The moderate water levels between 10 to 20 m are predominant and observed in 35% wells covering major part about 38% area of the maximum State covering parts of Gurdaspur, amritsar, tarntaran, Hoshiarpur, jalandhar, kapurthala and nawanshahr districts north and north central parts of the state, whereas water level this range are also found in mansa, Bathinda, Faridkot, Ferozpur, moga, Ludhiana, Fatehgarh sahib, Rupnagar, mohali and Patiala districts in central parts of the state. The deep water levels between 20-40 m are also observed covering parts of central and south east parts of Punjab and covering in parts of Nawanshahr, Jalandhar, Moga, Ludhiana, Barnala, Sangrur, Patiala, Fatehgarh Sahib, Rupnagar and SAS Nagar districts and observed in 23% wells covering about 29% area of the State. The deep water levels >40m the water levels are observed in 1% wells covering a few isolated patches of 2% area in parts of Sangrur and Patiala districts. Map of August, 2013 water level during is shown in Fig.2.


PUNJAB AND CHANDIGARH
Fig.1
DEPTH TO WATER LEVEL MAP
MAY 2013
N
W
E
S
0
50
100
kilometers
Pathankot
Gurdaspur
Amritsar
Hoshiarpur
Taran Tarn
Kapurthala
Jalandhar
NawanShahr
Rupnagar
Ferozpur
Moga
Ludhiana
Fatehgarh Sahib
Mohali
Faridkot
Fazilka
Barnala
Muktsar
Sangrur
Patiala
Bathinda
Mansa
LEGEND
Depth to water level m(bgl)
0-2.0
2.0-5.0
5.0-10.0
10.0-20.0
20.0-40.0


PUNJAB AND CHANDIGARH
Fig. 2
DEPTH TO WATER LEVEL MAP
AUGUST 2013
N
W
E
S
0
50
100
kilometers
LEGEND
Depth to Water level m(bgl)
0 - 2
2 - 5
5-10
10-20
20-40
>40

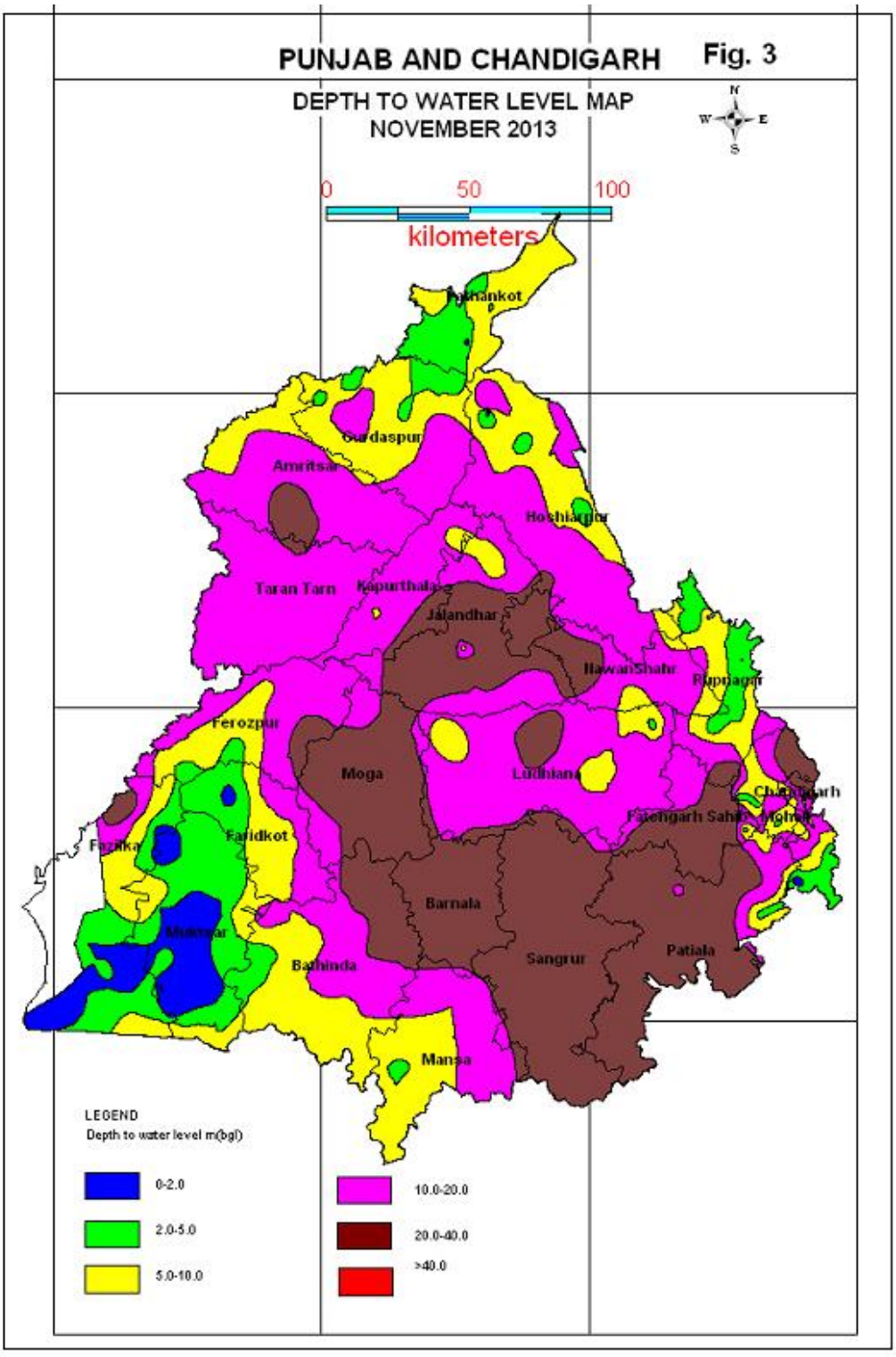
3.1.3 NOVEMBER 2013

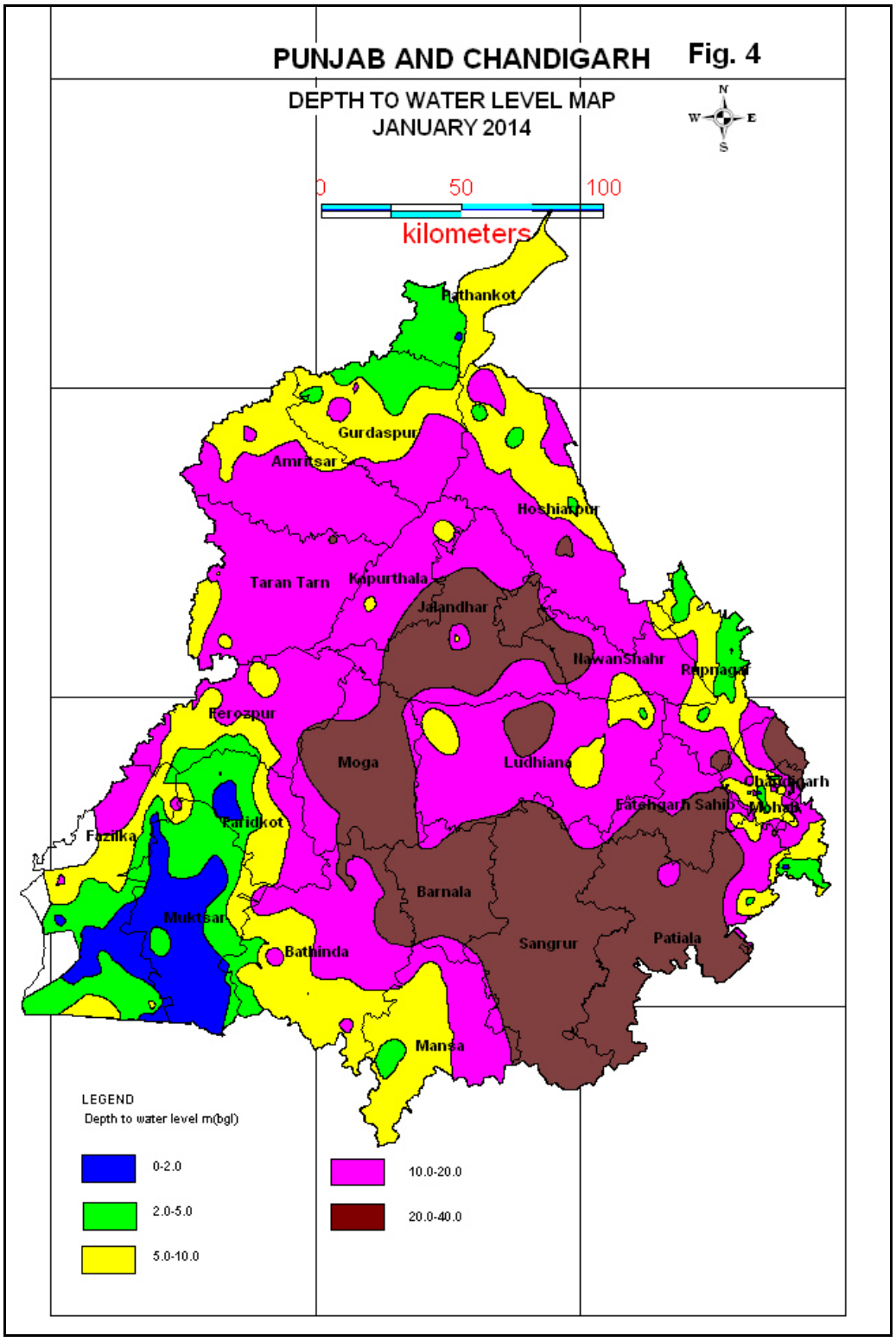
The depth to water level lies between 0.19 m bgl at Kuttianwali, Mukstar district and 37.25 m bgl at Chatamali, Rupnagar district. Very shallow water levels 0-2 m (causing water logging) occur in more than 7% of wells and cover nearly 3% total area and water levels are distributed in south western parts of the state (Muktsar and Fazilka districts). Shallow water levels 2-5 m have been observed in 18% of the wells and more than 9% of total area and lies south western and northern and parts of eastern parts of the state. The water level between 5-10 m are observed in northern parts (Pathankot, Gurdaspur, Amritsar and Hoshiarpur districts), eastern parts (Rupnagar and SAS Nagar districts) southwest parts (Mansa, Bathinda, Faridkot, Ferozpur and Fazilka districts). About 20% wells and 21% of the area fall in this range. The moderate water levels between 10 to 20 m are predominant and observed in 32% wells covering major parts, about 38% area covering parts of Gurdaspur, Amritsar, Tarntaran, Hoshiarpur, Jalandhar, Kapurthala And Nawanshahr districts north and north central parts of the state, whereas water level this range are also found in Mansa, Bathinda, Faridkot, Ferozpur, Moga, Ludhiana, Fatehgarh sahib, Rupnagar, mohali and Patiala districts in central parts of the state.

The deep water levels between 20-40 m are also observed covering parts of central and south east parts of Punjab and covering in parts of Nawanshahr, Jalandhar, Moga, Ludhiana, Barnala, Sangrur, Patiala, Fatehgarh Sahib, Rupnagar and SAS Nagar districts and observed in 23% wells covering about 30% area of the State. The Map of November 2013 water level is shown in Fig. 3.

3.1.4 JANUARY 2014

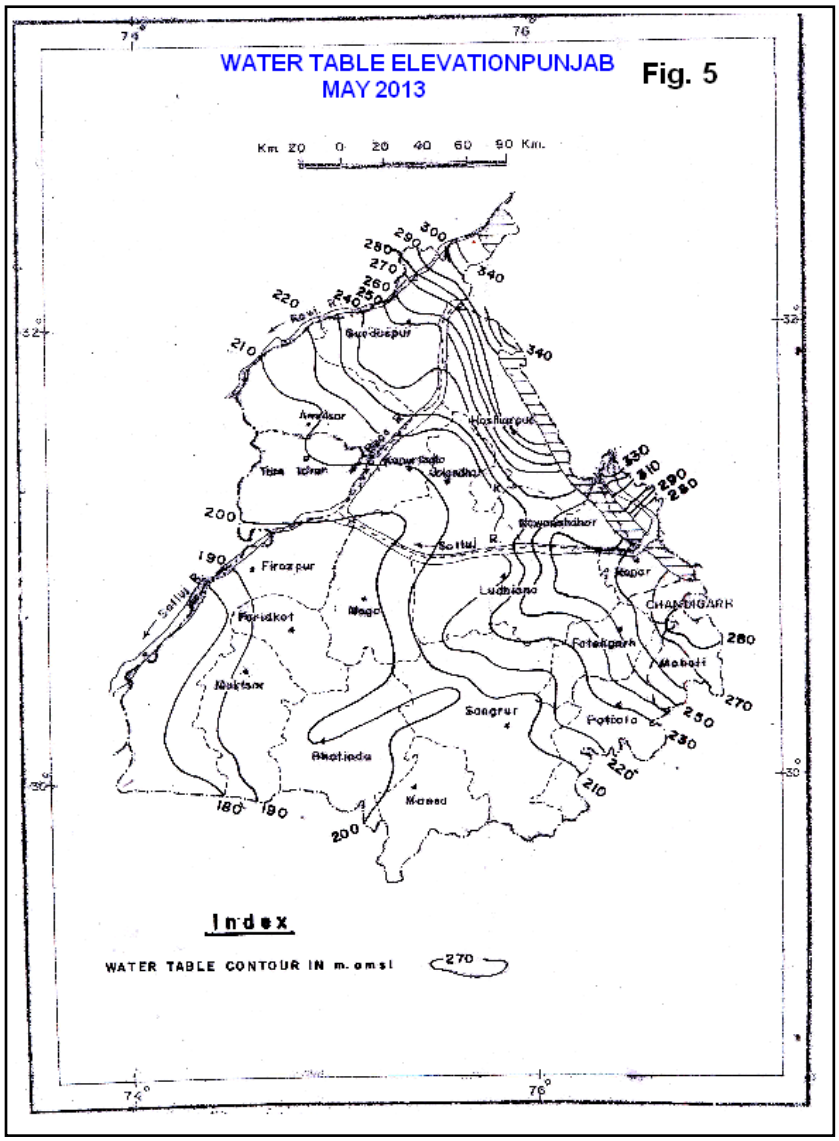
The depth to water level lies between 0.14 m bgl at Kuttianwali in Mukstar district and 37.33 m bgl at Patran in Patiala district. Very shallow water levels 0-2 m (causing water logging) occur in more than 5% of wells and cover nearly 4% total area and water levels are distributed in south western parts (Muktsar and Fazilka districts) of the state. Shallow water levels 2-5 m have been observed in 15% of the wells and more than 9% of total area falling in southwestern, northern and eastern parts of the state. The water level between 5-10 m are observed in the northern, eastern and southwest parts of the state in northern parts (Pathankot, Gurdaspur, Amritsar and Hoshiarpur districts), eastern parts (Rupnagar and SAS Nagar districts) southwest parts (Mansa, Bathinda, Faridkot, Ferozpur and Fazilka districts). About 23% wells and 21% of the area fall in this range. The moderate water levels between 10 to 20 m are predominant and observed in 41% wells covering major part about 40% area of the State. The deep water levels between 20-40 m are also observed covering parts of central and south east parts of Punjab and covering in parts of Nawanshahr, Jalandhar, Moga, Ludhiana, Barnala, Sangrur, Patiala, Fatehgarh Sahib, Rupnagar and SAS Nagar districts and observed in 16% wells covering about 26% area of the State. The Map of depicting water level during January 2014 is shown in Fig.4.


PUNJAB AND CHANDIGARH
Fig. 3
DEPTH TO WATER LEVEL MAP
NOVEMBER 2013
N
W
E
S
0
50
100
kilometers
Pathankot
Gurdaspur
Amritsar
Hoshiarpur
Taran Tarn
Kapurthala
Jalandhar
NawanShahr
Rupnagar
Ferozpur
Moga
Ludhiana
Chandigarh
Fatehgarh Sahib
Mohali
Fazilka
Faridkot
Barnala
Muktsar
Bathinda
Sangrur
Patiala
Mansa
LEGEND
Depth to water level m(bgl)
0-2.0
2.0-5.0
5.0-10.0
10.0-20.0
20.0-40.0
>40.0


PUNJAB AND CHANDIGARH
Fig. 4
DEPTH TO WATER LEVEL MAP
JANUARY 2014
N
W
E
S
0
50
100
kilometers
Pathankot
Gurdaspur
Amritsar
Hoshiarpur
Taran Tarn
Kapurthala
Jalandhar
Nawanshahr
Rupnagar
Ferozpur
Moga
Ludhiana
Chandigarh
Fatehgarh Sahib
Mohali
Faridkot
Fazilka
Barnala
Muktsar
Bathinda
Sangrur
Patiala
Mansa
LEGEND
Depth to water level m(bgl)
0-2.0
2.0-5.0
5.0-10.0
10.0-20.0
20.0-40.0

3.2 WATER TABLE ELEVATION (MAY 2013)

The water table elevation (May, 2013) contours have a maximum value of 352.77 m amsl rising in the northeastern part in Pathankot district along the Himalayas to 175.23 m amsl in southwestern part in the Punjab plains (Fazilka district). The general ground water flow direction follows the natural slope. There is not much change in the ground water flow direction which still remains northeast to southwest, but the ground water gradient between contour level 190 m and 180 m in Muktsar/Fazilka districts has become gentle indicating slowing of ground water movement resulting in spreading of water logged areas to other districts. The water table elevation map for May 2012 is shown in Fig. 5.



3.3 SEASONAL FLUCTUATIONS

In order to know the impact of rainfall and ground water withdrawal during last season, seasonal water level fluctuations are calculated for the period of January 2013 & May 2013, May 2013 & August 2013, May 2013 & November 2013, May 2013 & January 2014. The fluctuations are discussed in the paragraphs below and data is presented in the Annexure II.

3.3.1 JANUARY 2013 - MAY 2013

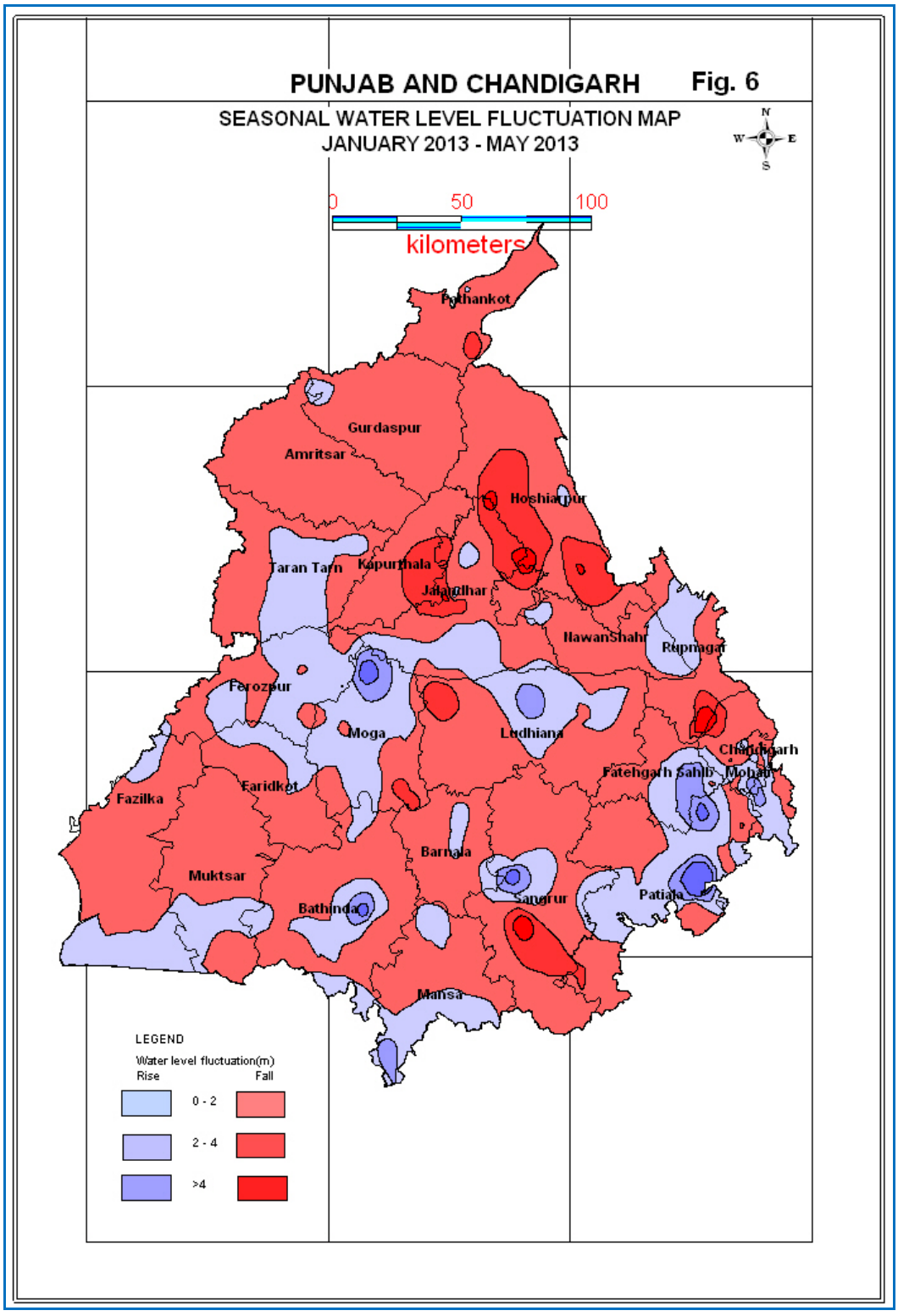
The seasonal fluctuation between January 2013 and May 2013 shows that there is a general decline of water levels in 70% of wells monitored and covering 72% area of the State. The fall has been observed in almost every part of the districts except some parts in south western parts of the state. Water level decline the range of 0-2 m is observed in 64% wells and 66% of area covering all districts in the state. Water level decline the range of decline 2-4 m is observed in 4% wells and 5% of area whereas, Water level decline >4m is observed in 2% wells and <1% of area during the period in isolated patches in north and central parts of the state.

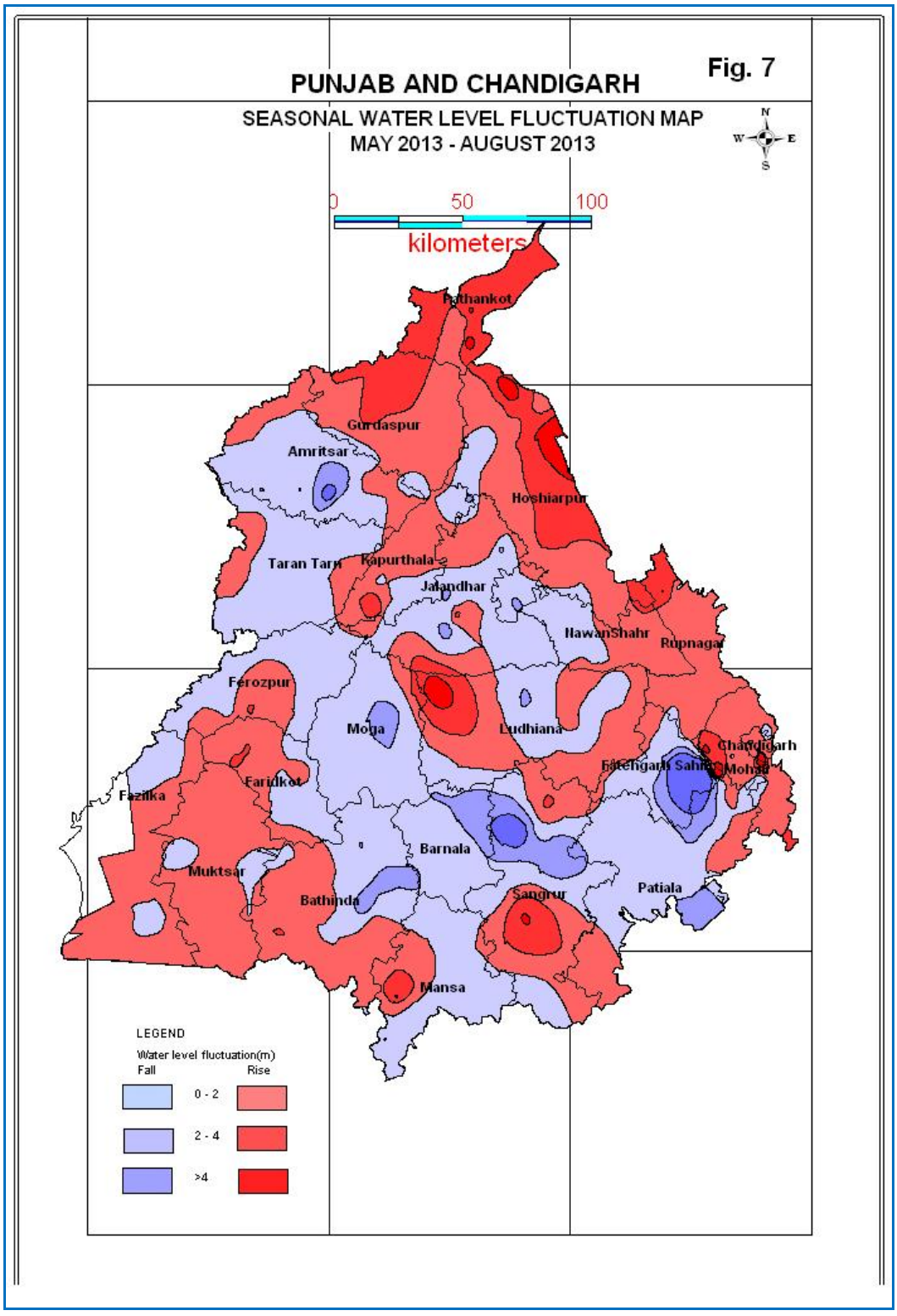
The water level rise has been recorded in 30% of wells monitored and covering 28% area of the State. Water level rise in the range of decline 0-2 m is observed in 25% wells and 25% of area in parts of Patiala, Ludhiana, Moga, Tarntaran, Ferozpur, Muktsar and Fazilka districts. Water level rise the range of 2-4 m is observed in 3% wells and >2% of area whereas, Water level decline >4m is observed in 2% wells and less than 1% of area during the period. The map depicting seasonal water level fluctuation from January 2013 to May 2013 is shown in Fig.6.

3.3.2 MAY 2013 - AUGUST 2013

The seasonal fluctuation between May, 2013 and August, 2013 shows that there is a general decline of water levels in 49% of wells monitored and covering 47% area of the State. The fall has been observed in almost all districts central parts of the state. Water level decline in the range of 0-2 m is observed in 38% wells and 42% of area parts of Patiala, Sangrur, Mansa, Barnala, Bathinda, Moga, Ferozpur, Tarntaran Amritsar, Jalandhar, Ludhiana and Nawanshahr districts. Water level decline in the range of 2-4 m is observed in 9% wells and 4% of area and whereas water level decline >4m is observed in 2% wells and 1% of area during the period in isolated patches in Fatehgarh sahib, Sangrur, moga and Amritsar districts.

The water level rise has been recorded in 51% of wells monitored and covering 53% area of the State. Water level rise in the range of 0-2 m is observed in 38% wells and 43% of area in parts of Pathankot, Gurdaspur, Hoshiarpur, Nawanshahr, Rupnagar fatehabad, Ludhiana, Sangrur, mansa, Bathinda, Muktsar, Fazilka, Faridkot and Ferozpur districts. Water level rise the range of 2-4 m is observed in 9% wells and 9% of area in isolated patches in Sangrur, Ludhiana, urdaspur, Hoshiarpur and Rupnagar districts. Whereas, Water level rise >4m is observed in 4% wells and 1% of area during the period The map depicting seasonal water level fluctuation from May 2013 to August 2013 is shown in Fig. 6.


PUNJAB AND CHANDIGARH
Fig. 6
SEASONAL WATER LEVEL FLUCTUATION MAP
JANUARY 2013 - MAY 2013
N
W
E
S
0
50
100
kilometers
Pathankot
Gurdaspur
Amritsar
Hoshiarpur
Taran Tarn
Kapurthala
Jalandhar
NawanShahr
Rupnagar
Ferozpur
Moga
Ludhiana
Chandigarh
Fatehgarh Sahib
Mohali
Faridkot
Fazilka
Barnala
Muktsar
Sangrur
Patiala
Bathinda
Mansa
LEGEND
Water level fluctuation(m)
Rise
Fall
0 - 2
2 - 4
>4


PUNJAB AND CHANDIGARH
Fig. 7
SEASONAL WATER LEVEL FLUCTUATION MAP
MAY 2013 - AUGUST 2013
N
W
E
S
0
50
100
kilometers
Pathankot
Gurdaspur
Amritsar
Hoshiarpur
Taran Taran
Kapurthala
Jalandhar
NawanShahr
Rupnagar
Ferozpur
Moga
Ludhiana
Chandigarh
Fatehgarh Sahib
Mohali
Faridkot
Fazilka
Barnala
Muktsar
Bathinda
Sangrur
Patiala
Mansa
LEGEND
Water level fluctuation(m)
Fall
Rise
0 - 2
2 - 4
>4

3.3.3 MAY 2013 - NOVEMBER 2013

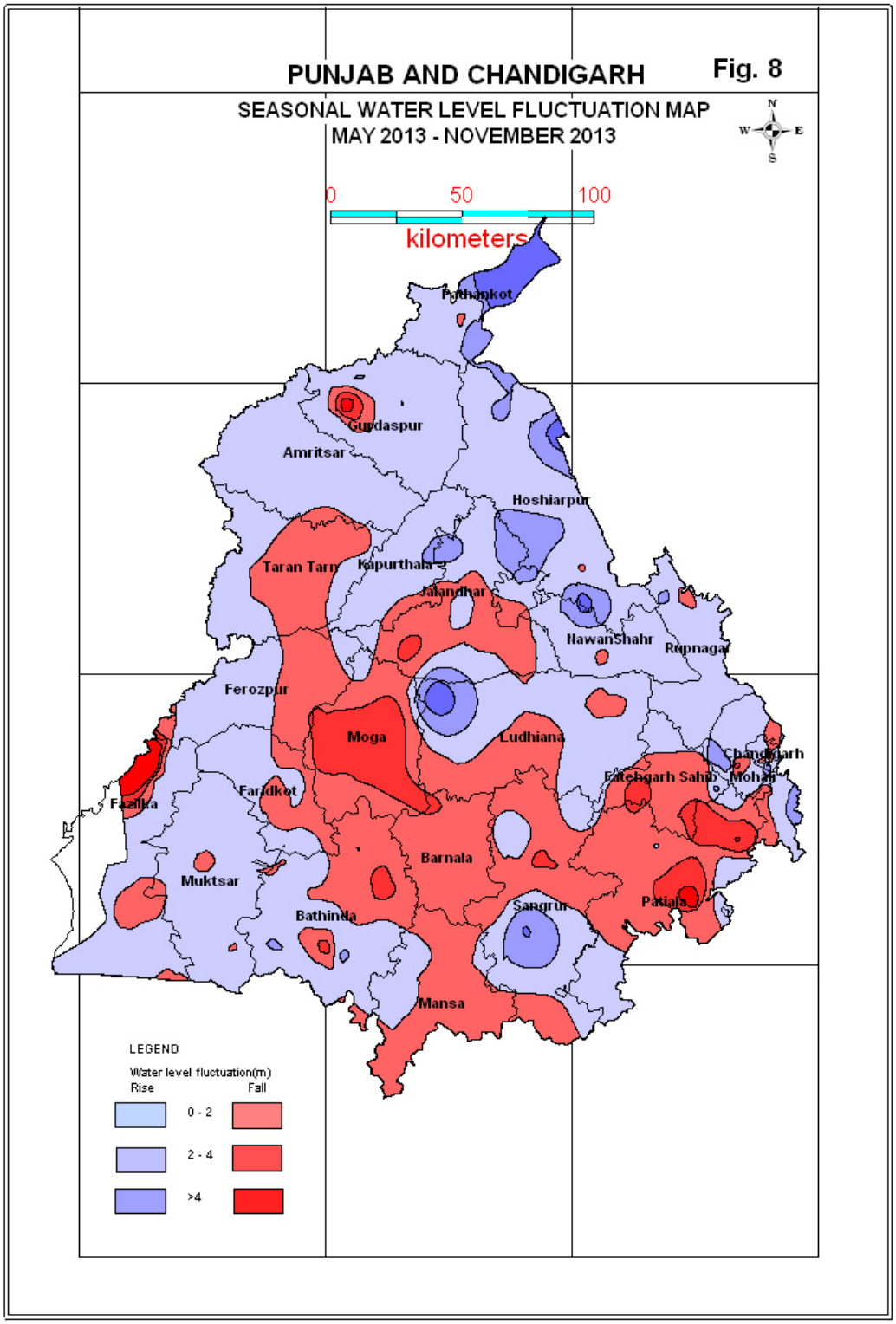
The seasonal fluctuation between May 2013 and November 2013 shows a decline of water levels in 38% of wells monitored and covering 37% area of the State. The decline has been observed in south and and south central parts of the state. Water level decline in the range of 0-2 m is observed in 31% wells and 32% of area covering parts of Patiala, Fatehgarh Sahib, Sangrur, Barnala, Mansa, Bathinda, Moga, Tarntaran, and Jalandhar districts. Water level decline the range of decline 2-4 m is observed in 6% wells and 5% of area in parts of fatehgah sahib, Patiala, moga and Amritsar districts.Whereas Water level decline >4m is observed in 2% wells and <1% of area during the period.

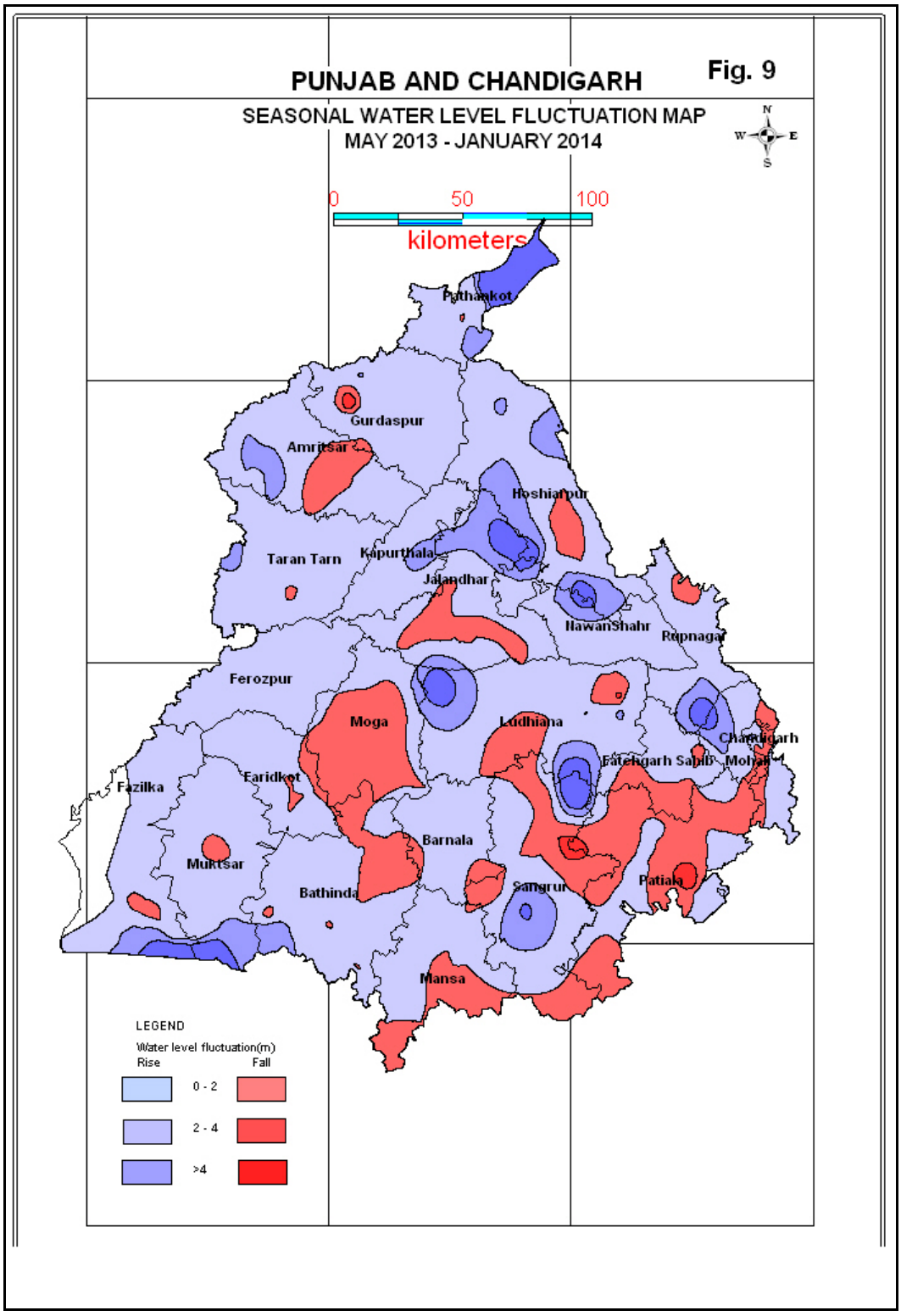
The water level rise has been recorded in 62% of wells monitored and covering 63% area of the State. Water level rise in the range of 0-2 m is observed in 52% wells and 57% of area allover state except central and south central parts. Water level rise the range of 2-4 m is observed in 7% wells and 5% of area whereas, Water level rise >4m is observed in 3% wells and 1% of area in isolated patches during the period. The map depicting seasonal water level fluctuation from May 2013 to November 2013 is shown in Fig.8.

3.3.4 MAY 2013 - JANUARY 2014

The seasonal fluctuation in water level from May 2013 to January 2014 shows a decline of water levels in 28% of wells monitored and covering 19% area of the State. The decline has been observed in isolated patches in central parts of the state. The Water level decline in the range of 0-2 m is observed in 26% wells and 19% of area in parts of Patiala, Sangrur, Ludhiana, Moga, Bathinda, Jalandhar and Amritsar. Water level decline the range of decline >2m is observed in 2% wells and <1% of area.

The water level rise has been recorded in 72% of wells monitored and covering 81% area of the State. Water level rise in the range of 0-2 m is observed in 62% wells and 70% of area covering all districts in the state. Water level rise the range of 2-4 m is observed in 6% wells and 8% of area whereas, Water level rise >4m is observed in 4% wells and 3% of area during the period in isolated patches. The map depicting seasonal water level fluctuation from May 2013 to January 2014 is shown in Fig.9.


PUNJAB AND CHANDIGARH
Fig. 8
SEASONAL WATER LEVEL FLUCTUATION MAP
MAY 2013 - NOVEMBER 2013
N
W
E
S
0
50
100
kilometers
Pathankot
Gurdaspur
Amritsar
Hoshiarpur
Taran Tarn
Kapurthala
Jalandhar
NawanShahr
Rupnagar
Ferozpur
Moga
Ludhiana
Chandigarh
Fatehgarh Sahib
Mohali
Faridkot
Fazilka
Barnala
Muktsar
Sangrur
Patiala
Bathinda
Mansa
LEGEND
Water level fluctuation(m)
Rise
Fall
0 - 2
2 - 4
>4


PUNJAB AND CHANDIGARH
Fig. 9
SEASONAL WATER LEVEL FLUCTUATION MAP
MAY 2013 - JANUARY 2014
N
W
E
S
0
50
100
kilometers
Pathankot
Gurdaspur
Amritsar
Hoshiarpur
Taran Tarn
Kapurthala
Jalandhar
Nawanshahr
Ropnagar
Ferozpur
Moga
Ludhiana
Chandigarh
Fatehgarh Sahib
Mohali
Fazilka
Faridkot
Barnala
Muktsar
Bathinda
Sangrur
Patiala
Mansa
LEGEND
Water level fluctuation(m)
Rise
Fall
0 - 2
2 - 4
>4

3.4 ANNUAL FLUCTUATION

In order to know the impact of rainfall and ground water withdrawal during last one year, annual water level fluctuations are calculated for the period of May 2012 & 2013, August 2012 & 2013, November 2012 & 2013 and January 2013 & 2014. The fluctuations are discussed in the paragraphs below and data is presented in the Annexure III.

3.4.1 MAY 2012 & MAY 2013

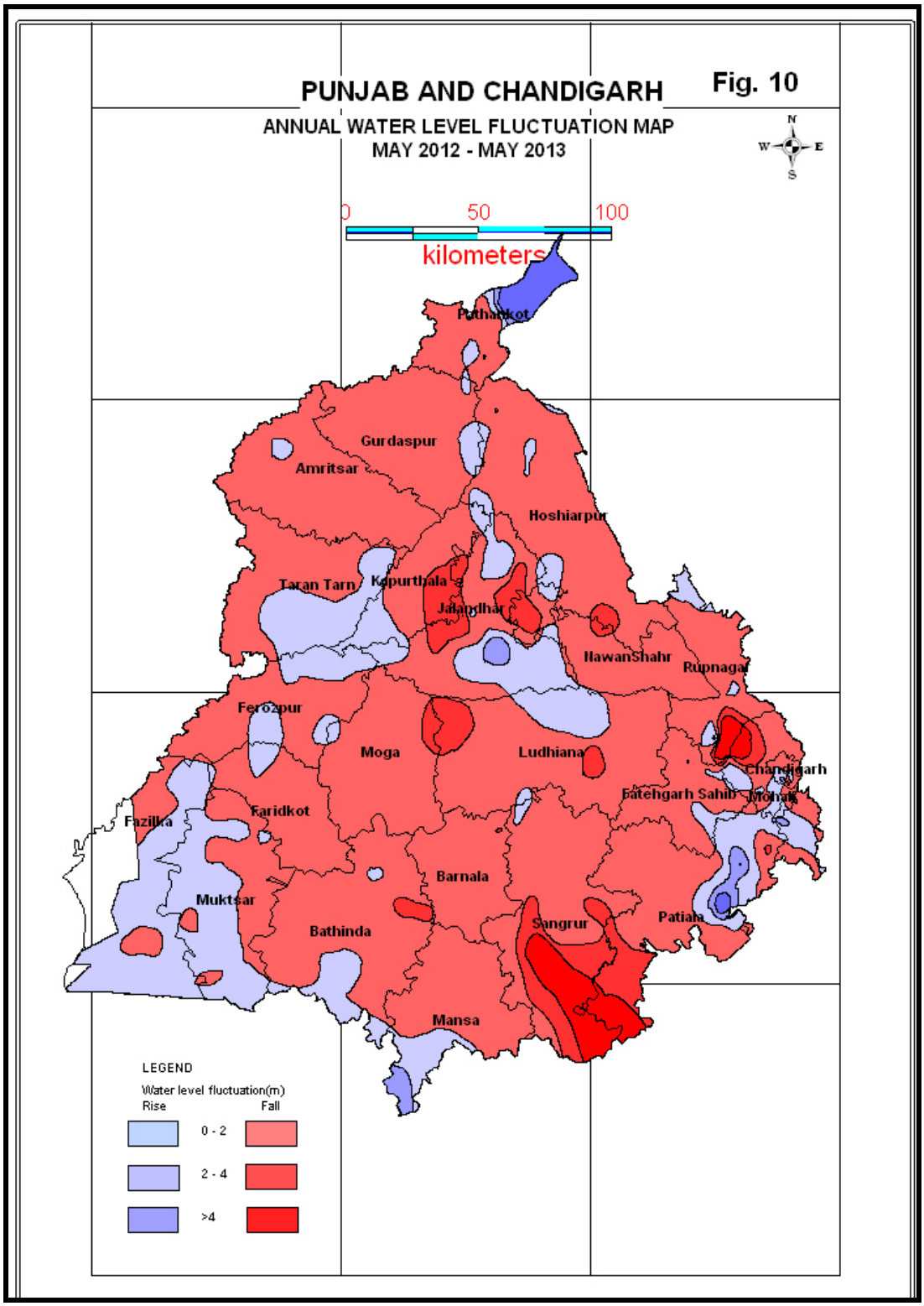
The annual fluctuation from May 2012 to May 2013 shows a decline of water levels in 74% of wells monitored and covering 79% area of the State. Water level decline the range of 0-2 m is observed in 66% wells and 71% of area. The fall has been observed in almost every part except in central and southwestern parts of the state. Water level decline the range of decline 2-4 m is observed in 7% wells and 5% of area whereas, Water level decline >4m is observed in 1% wells and 2% of area in isolated patches during the period.

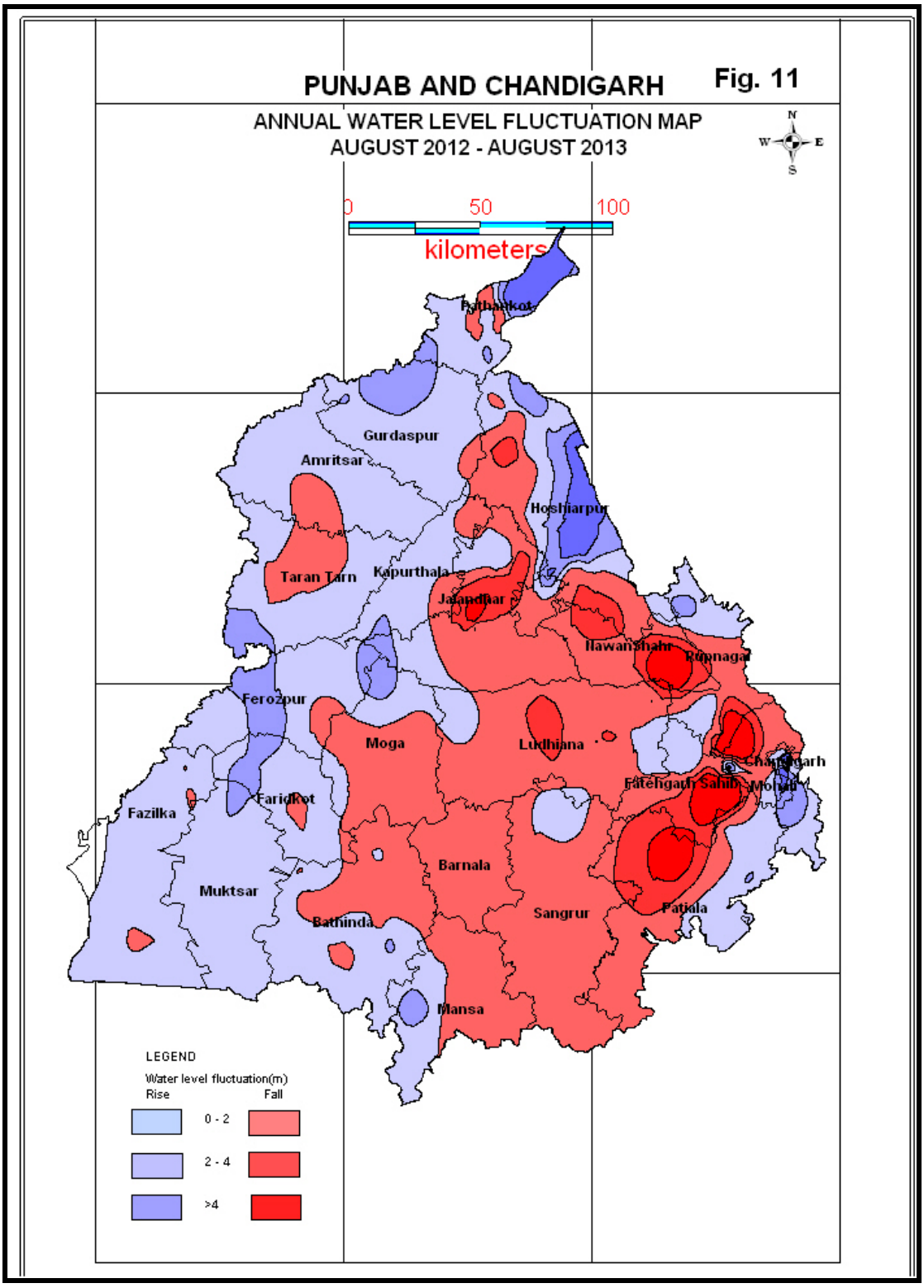
The water level rise has been recorded in 26% of wells monitored and covering 21% area of the State. Water level rise in the range of decline 0-2 m is observed in 22% wells and 19% of area in parts of Tarntaran, Muktsar, Fazilka and Jalandhar districts. Water level rise >2 m is observed in 4% wells and 2% of area. The map depicting annual water level fluctuation from May 2012 to May 2013 is shown in Fig.10.

3.4.2 AUGUST 2012 & AUGUST 2013

The annual fluctuation from August 2012 to August 2013 shows decline of water levels in 40% of wells monitored and covering 48% area of the State. The fall has been observed in maximum part of the east and south eastern parts of the state. Water level decline in the range of 0-2 m is observed in 33% wells and 41% of area in Amritsar, Tarntaran, Hoshiarpur, Jalandhar, Nawanshahr, Ludhiana, Moga, Barnala, Bathinda, Mansa, Sangrur, Patiala and Roopnagar districts. Water level decline in the range of decline 2-4 m is observed in 4% wells and 5% of area whereas, Water level decline of >4m is observed in 3% wells and 2% of area during the period in small patches in Patiala, Fatehgarh shib, SAS Nagar, Nawanshahr and Jalandhar districts.

The water level rise has been recorded in 60% of wells monitored and covering 52% area of the State. The water level rise is reported in Northern, western, and southwestern parts of the state. The Water level rise in the range of 0-2 m is observed in 48% wells and 44% of area. The Water level rise 2-4 m is observed in 7% wells and 6% of area. The Water level rise >4 m is observed in 5% wells and 2% of area. The map depicting annual water level fluctuation during August 2012 –August 2013 is shown in Fig.11.


PUNJAB AND CHANDIGARH
Fig. 10
ANNUAL WATER LEVEL FLUCTUATION MAP
MAY 2012 - MAY 2013
N
W
E
S
0
50
100
kilometers
Pathankot
Gurdaspur
Amritsar
Hoshiarpur
Taran Tarn
Kapurthala
Jalandhar
NawanShahr
Rupnagar
Ferozpur
Moga
Ludhiana
Chandigarh
Fatehgarh Sahib
Mohali
Fazilka
Faridkot
Barnala
Muktsar
Bathinda
Sangrur
Patiala
Mansa
LEGEND
Water level fluctuation(m)
Rise
Fall
0 - 2
2 - 4
>4


PUNJAB AND CHANDIGARH
Fig. 11
ANNUAL WATER LEVEL FLUCTUATION MAP
AUGUST 2012 - AUGUST 2013
N
W
E
S
0
50
100
kilometers
Pathankot
Gurdaspur
Amritsar
Hoshiarpur
Taran Taran
Kapurthala
Jalandhar
Nawanshahr
Ropnagar
Ferozpur
Moga
Ludhiana
Chandigarh
Fatehgarh Sahib
Mohali
Faridkot
Fazilka
Barnala
Muktsar
Sangrur
Patiala
Bathinda
Mansa
LEGEND
Water level fluctuation(m)
Rise
Fall
0 - 2
2 - 4
>4

3.4.3 NOVEMBER 2012 & NOVEMBER 2013

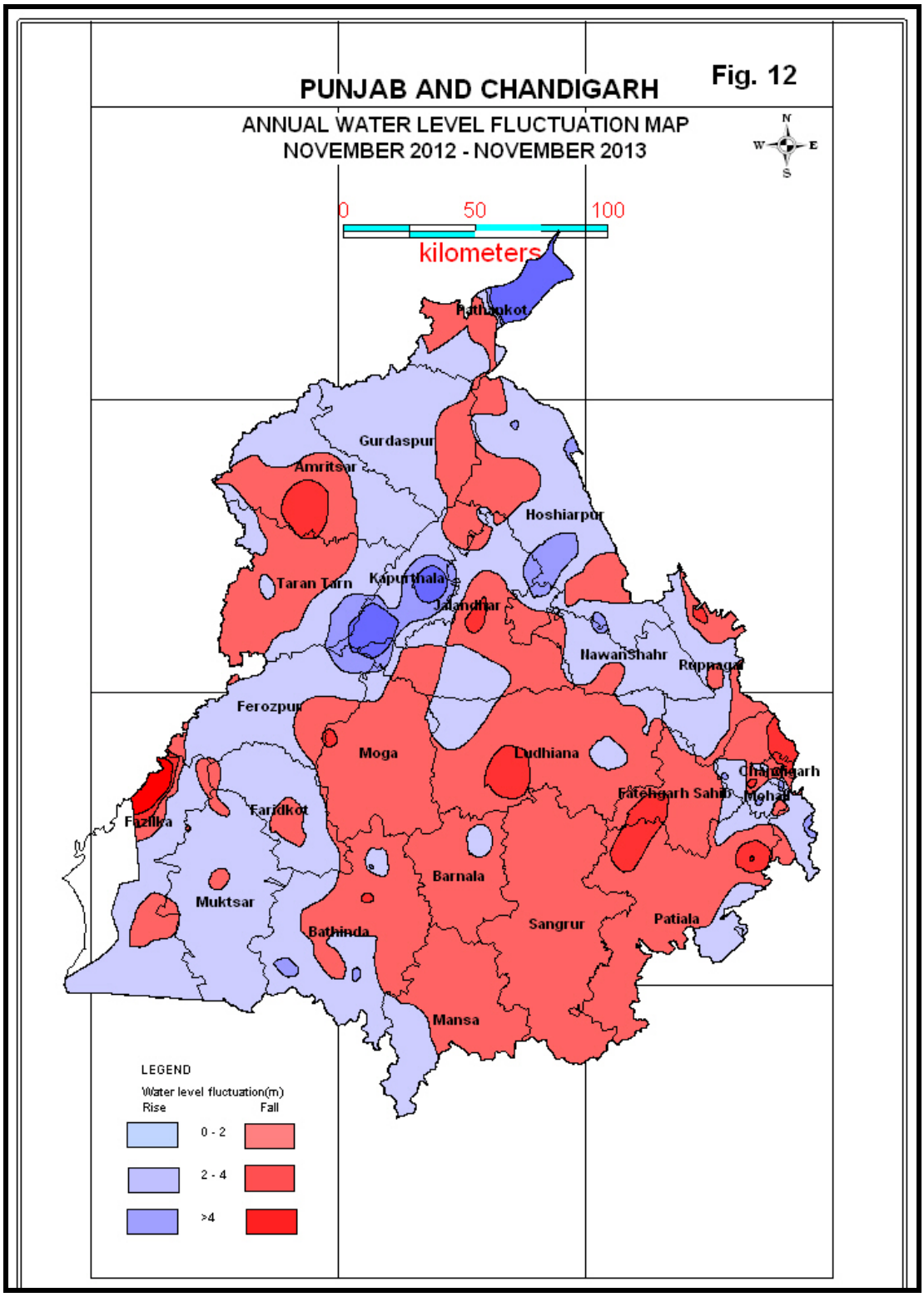
The annual fluctuation from November 2012 to November 2013 shows decline in water levels in 45% of wells monitored and covering 53% area of the State. The fall has been observed in central and south central parts of the state. The Water level decline the range of 0-2 m is observed in 39% wells and 50% of area in Patiala, Sangrur, Mansa, Bathinda, Barnala, Moga, and Ludhiana, Fatehgarh Sahib, Jalandhar, Tarntaran and Hoshiarpur districts. The Water level decline in the range of decline 2-4 m is observed in 5% wells and 3% of area and whereas, water level decline >4m is observed in 1% wells and <1% of area in isolated patches.

The water level rise has been recorded in 55% of wells monitored and covering 47% area of the State. The water level rise is reported in Northern, western, and southwestern parts of the state. The water level rise in the range of decline 0-2 m is observed in 47% wells and 43% of area. The water level rise 2-4 m is observed in 6% wells and 2% of area. The water level rise >4 m is observed in 2% wells and 2% of area in small, isolated patches. The map depicting annual water level fluctuation from November 2012 to November 2013 is shown in Fig.12

3.4.4 JANUARY 2013 - JANUARY 2014

The annual fluctuation between January, 2013 & January, 2014 shows a decline of water levels in 36% of wells monitored and covering 31% area of the State. The Water level decline the range of 0-2 m is observed in 32% wells and 29% of area parts of Patiala, Sangrur, Mansa, Ludhiana, Bathinda and Moga districts. The Water level decline in the range of 2-4 m is observed in 3% wells and 2% of area and in the range of >4m is observed in 1% wells and <1% of the area in small isolated patches.

The water level rise has been recorded in 64% of wells monitored and covering 69% area of the State. The water level rise is recorded in almost all districts in the state. The Water level rise in the range of decline 0-2 m is observed in 57% wells and 62% of area. The Water level rise >2 m is observed in 7% wells and 7% of area. The map depicting annual water level fluctuation from January 2013 to January 2014 is shown in figure 13.


PUNJAB AND CHANDIGARH
Fig. 12
ANNUAL WATER LEVEL FLUCTUATION MAP
NOVEMBER 2012 - NOVEMBER 2013
N
W
E
S
0
50
100
kilometers
Pathankot
Gurdaspur
Amritsar
Hoshiarpur
Taran Tarn
Kapurthala
Jalandhar
Nawanshahr
Rupnagar
Ferozpur
Moga
Ludhiana
Chandigarh
Fatehgarh Sahib
Mohali
Fazilka
Faridkot
Barnala
Muktsar
Sangrur
Patiala
Bathinda
Mansa
LEGEND
Water level fluctuation(m)
Rise
Fall
0 - 2
2 - 4
>4

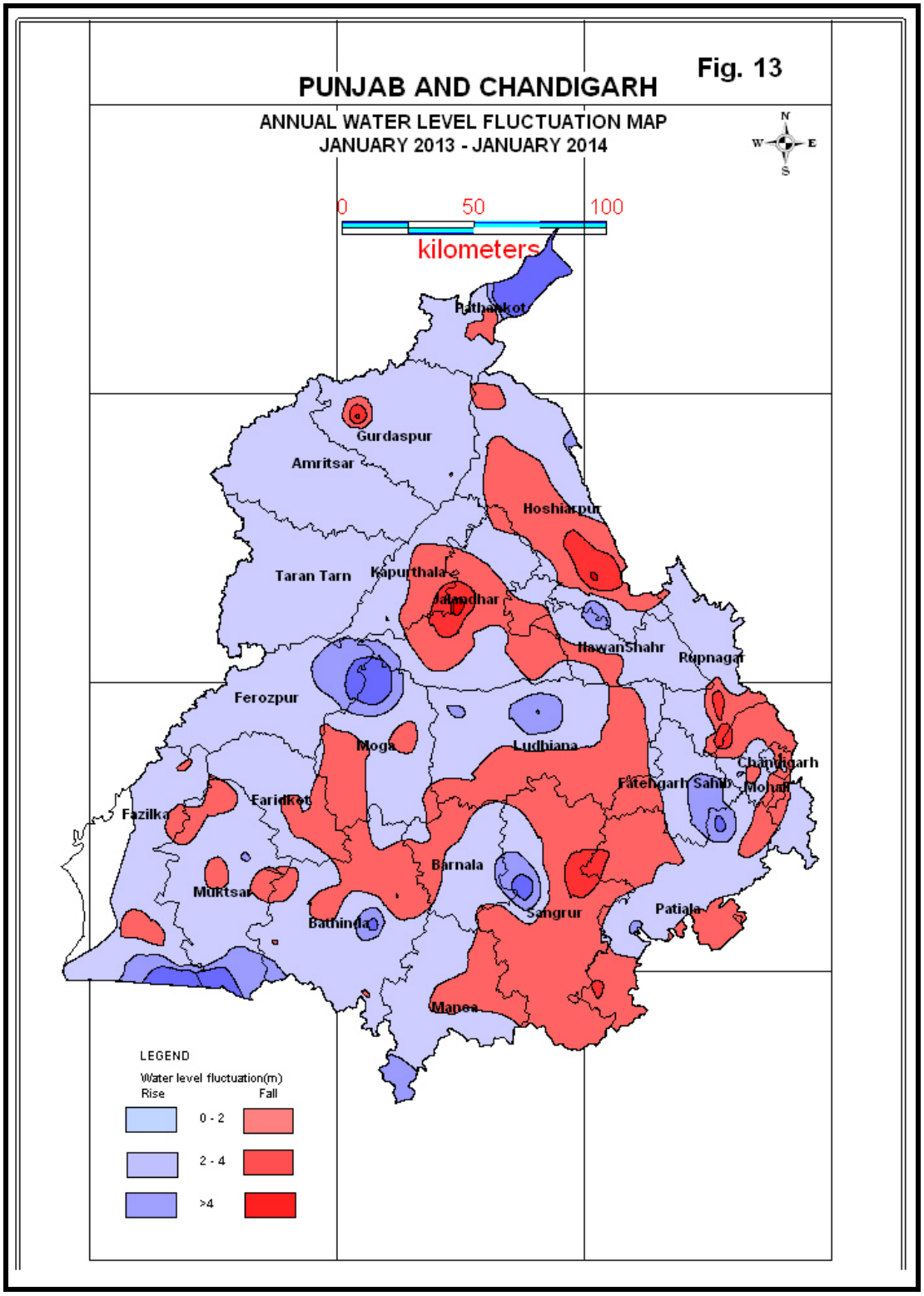


Fig. 13
PUNJAB AND CHANDIGARH
ANNUAL WATER LEVEL FLUCTUATION MAP
JANUARY 2013 - JANUARY 2014
N
W
E
S
0
50
100
kilometers
Pathankot
Gurdaspur
Amritsar
Hoshiarpur
Taran Tarn
Kapurthala
Jalandhar
HawanShahr
Rupnagar
Ferozpur
Moga
Ludhiana
Chandigarh
Fatehgarh Sahib
Mohali
Faridkot
Fazilka
Barnala
Muktsar
Sangrur
Patiala
Bathinda
Mansa
LEGEND
Water level fluctuation(m)
Rise
Fall
0 - 2
2 - 4
>4

3.5 WATER LEVEL FLUCTUATIONS FROM DECADAL MEAN

Changes in water level behavior since last one decadal have been observed using decadal mean water level data. Mean of water levels of past one decadal of each Ground water observation wells are computed and compared with the water level data of May 2013, August 2013, November 2013 & January 2014. The behaviour of water level over the period under reference is discussed in paragraph below along with maps and data is given in Annexure-IV.

3.5.1 MAY (2003-2012) & MAY 2013

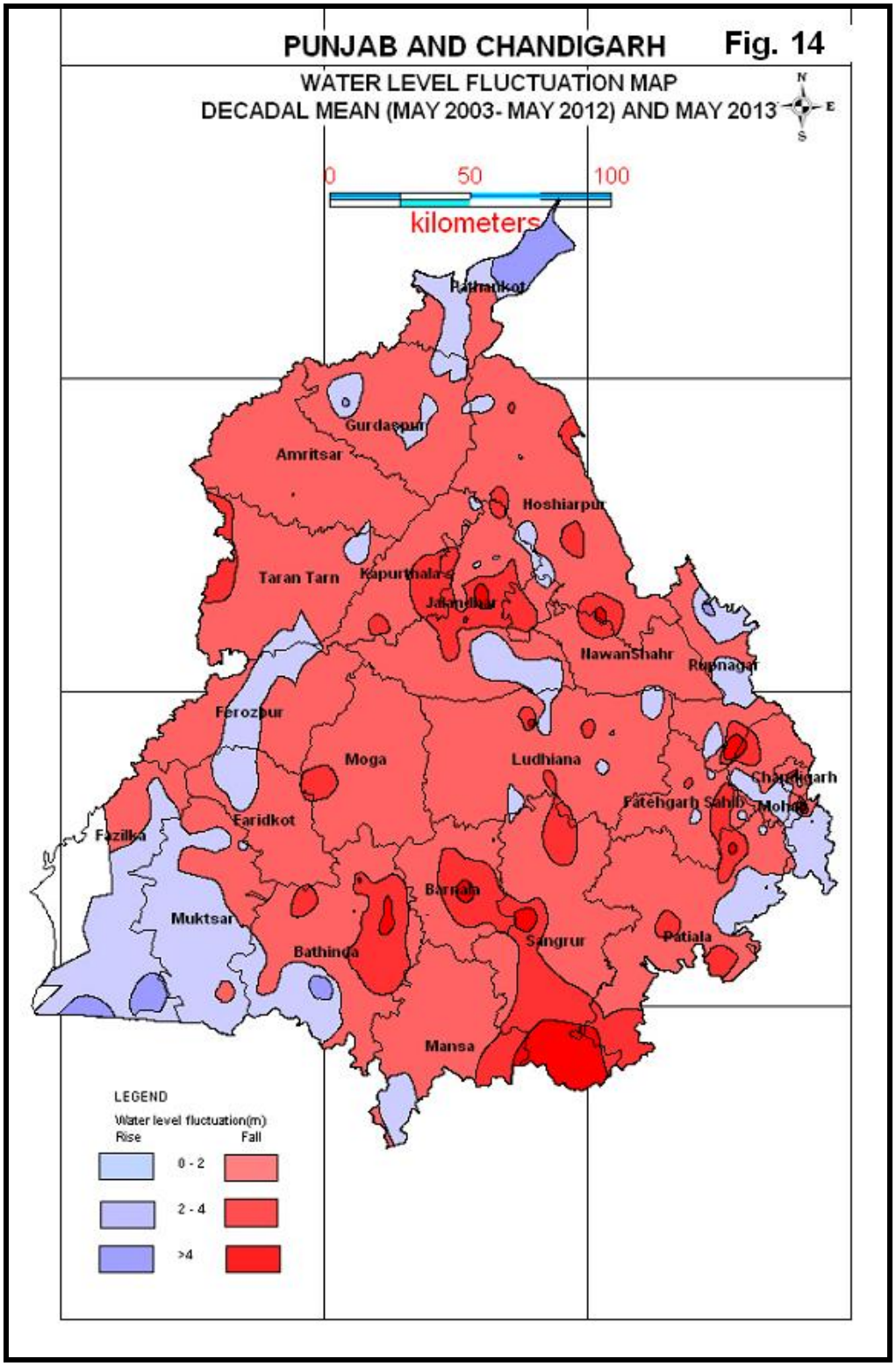
The decadal mean Water levels fluctuation in May 2013 shows a decline in 73% of observation wells monitored covering about 80% area of the state. The ground water level fall (0-2 m) have been observed in about 49% of wells and 68% of area falling in almost all the districts except the parts of Gurdaspur, Pathankot, Muktsar and Fazilka. Water level fall in range of 2-4m in about 18% of the wells and 10% of area is recorded in patches in Sangrur, Mansa, Bathinda, Barnala, Patiala, Jalandhar and Kapurthala. Water level decline of >4 m in about 6% of the wells and 2% of area has been observed in patches in central parts of the state.

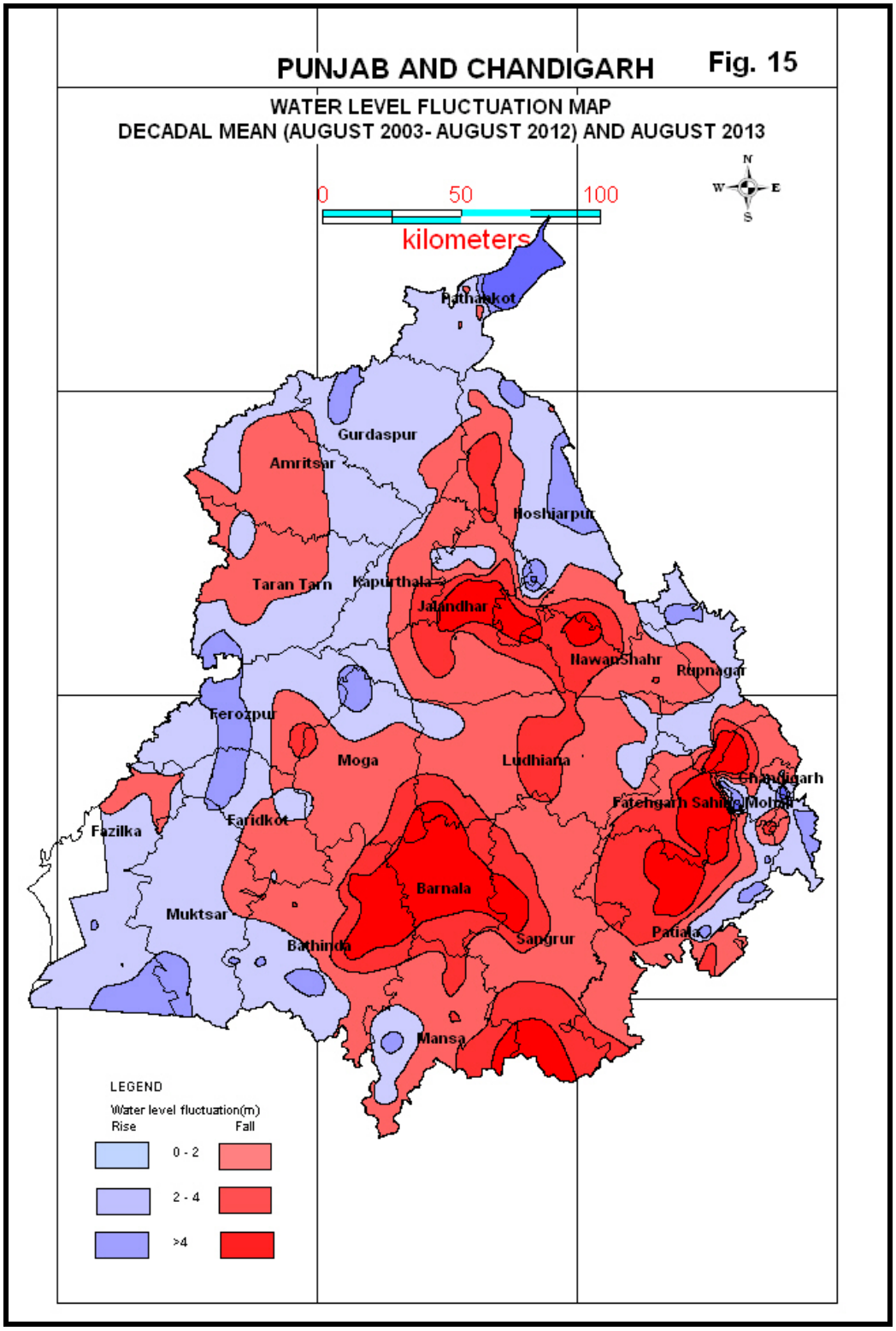
Rise in water levels have been observed in 27% wells and 20% of area. Water level rise in the range of decline 0-2 m is observed in 22% wells and 19% of area in the districts of Pathankot, Gurdaspur in the north, Ferozpur, Fazilka, Muktsar, Bathinda and Faridkot in southwest and Patiala and SAS Nagar in the east. Water level rise of >2 m is observed in 5% wells and 1% of area. The map depicting fluctuation of decadal mean of May (2003-2012) & May 2013 is shown in Fig.14

3.5.2 AUGUST (2003-2012) & AUGUST 2013

Water levels fluctuation shows that a fall in water level in 48% of observation wells monitored covering about 59% area of the state. The decline of 0-2 m in water level have been observed in about 36% of wells and 37% of area occurring in northern, central and south eastern part of the state covering Amritsar, Tarntaran, Hoshiarpur, Kapurthala, Jalandhar, Nawanshahr, Roopnagar, Fatehgarh sahib, Ludhiana, Patiala, Sangrur, Mansa, barnala, Bathinda, faridakot moga districts. Water level decline in range of 2-4 m has been observed in about 10% of the wells and 14% of area is recorded in patches in entire state except in Jalandar, Kapurthala, Barnala, Sangrur and Patiala districts. Water level decline of >4 m in about 2% of the wells and 8% of area has been observed in parts of Patiala, Barnala, Sangrur, Jalandhar, and Fathgarh Sahib districts.

The Rise in water levels have also been observed in 52% wells and 41% of area forming isolated patches in parts of Pathankot, Gurdaspur, Amritsar, Tarntaran, Ferozpur, Faridkot, Fazilka, Muktsar, Bathinda, Hoshiarpur and Roopnagar districts. The Water level rise in the range of 0-2 m is observed in 33% wells and 35% of area. Water level rise of 2-4 m is observed in 11% wells and 5% of area. Water level rise in the range of >4 m is observed in 8% wells and 1% of area The map depicting fluctuation of decadal mean of August 2003-2012 & August 2013 is shown in Fig.15.


PUNJAB AND CHANDIGARH
Fig. 14
WATER LEVEL FLUCTUATION MAP
DECADAL MEAN (MAY 2003- MAY 2012) AND MAY 2013
N
E
S
0
50
100
kilometers
Pathankot
Gurdaspur
Amritsar
Hoshiarpur
Taran Tarn
Kapurthala
Jalandhar
NawanShahr
Rupnagar
Ferozpur
Moga
Ludhiana
Chandigarh
Fatehgarh Sahib
Mohali
Faridkot
Fazilka
Barnala
Muktsar
Sangrur
Patiala
Bathinda
Mansa
LEGEND
Water level fluctuation(m)
Rise
Fall
0 - 2
2 - 4
>4


PUNJAB AND CHANDIGARH
Fig. 15
WATER LEVEL FLUCTUATION MAP
DECADAL MEAN (AUGUST 2003- AUGUST 2012) AND AUGUST 2013
0
50
100
kilometers
N
W
E
S
Pathankot
Gurdaspur
Amritsar
Hoshiarpur
Taran Tarn
Kapurthala
Jalandhar
Nawanshahr
Rupnagar
Ferozpur
Moga
Ludhiana
Chandigarh
Fatehgarh Sahib
Mohali
Faridkot
Fazilka
Barnala
Muktsar
Bathinda
Sangrur
Patiala
Mansa
LEGEND
Water level fluctuation(m)
Rise
Fall
0 - 2
2 - 4
>4

3.5.3 NOVEMBER (2003-2012) & NOVEMBER 2013

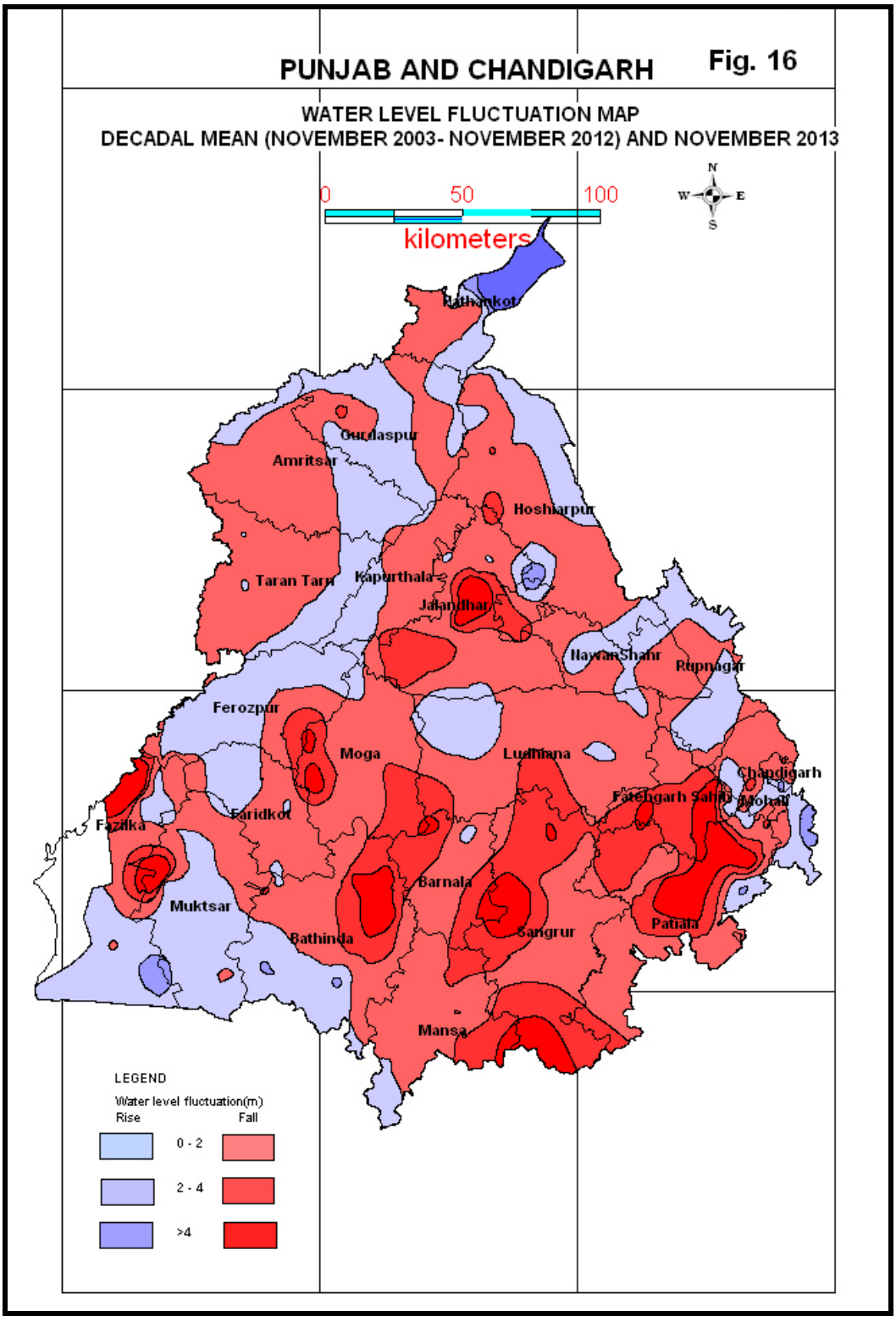
Water levels fluctuations in November 2013 show a decline in 60% of observation wells monitored covering about 71% area of the state. The decline of 0-2 m in water level have been observed in about 41% of wells and 52% of area occurring in maximum falling in maximum central and south eastern, east and western parts of the state and districts covering in Gurdaspur, Amritsar, Tarntaran, Kapurthala, Hoshiarpur, Jalandhar, Nawanshahar, Roopnagar, Fathegarh sahib, Patiala, Sangrur, Barnala, Bathinda, Faridkot and moga districts. The Water level decline 2-4 m in about 10% of the wells and 14% of area is recorded in patches in parts of Jalandhar, Barnala, Bathinda, Sangrur, Fathegarh Sahib and Patiala districts. Water level decline of >4 m in about 9% of the wells and 5% of area has been observed in parts of Jalandhar, Barnala, Sangrur, Fathegarh Sahib and Patiala districts.

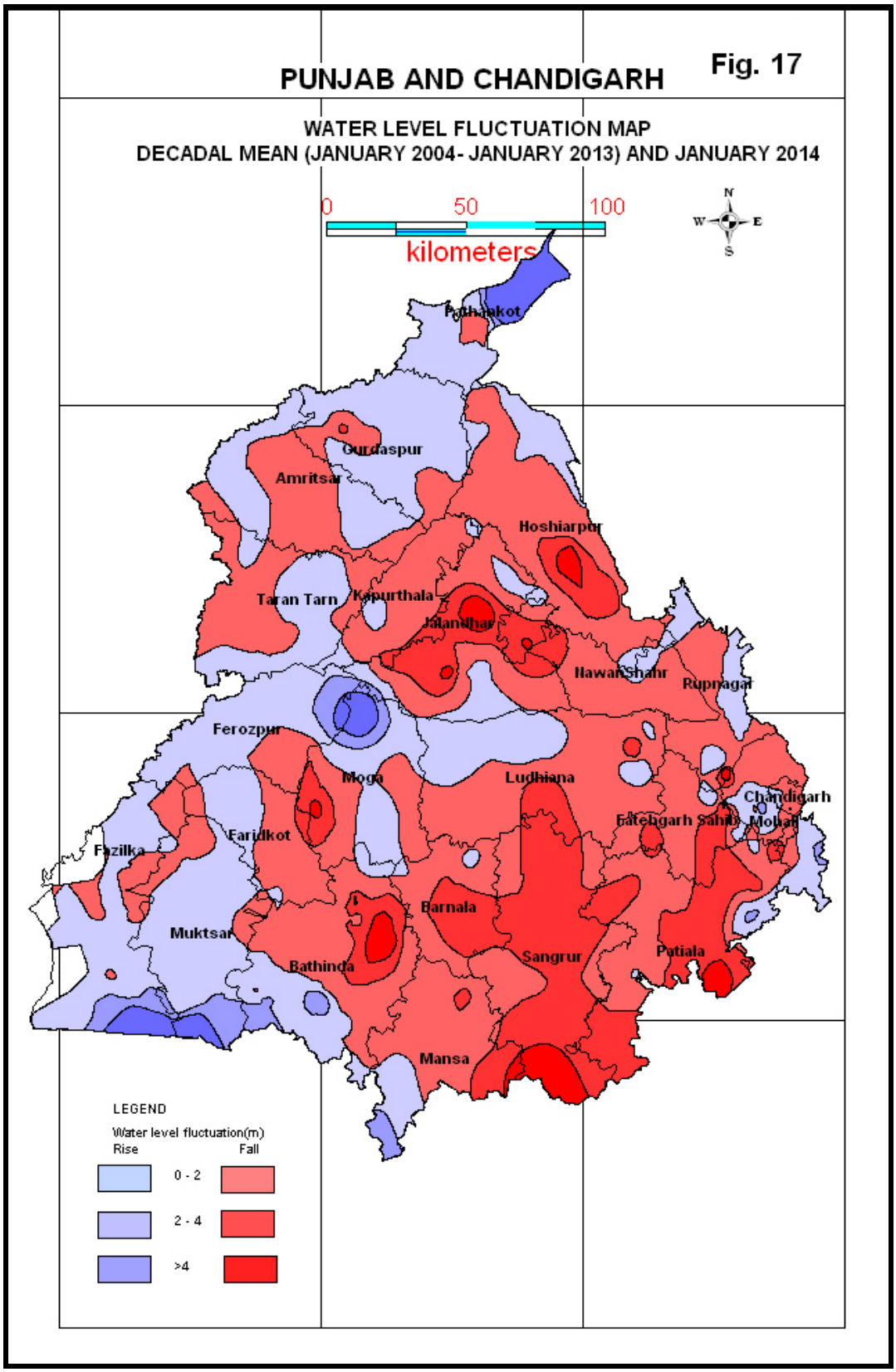
The Rise in water levels have also been observed in 40% wells and 29% of area forming isolated patches in parts of Gurdaspur, Amritsar, Ferozpur, Bathinda, Hoshiarpur, Fazilka, Mukstar and Faridkot districts. The Water level rise in the range of 0-2 m is observed in 36% wells and 28% of area. Water level rise >2 m is observed in 4% wells and 2% of area. The map depicting fluctuation of decadal mean of November 2003-2012 & November 2013 is shown in Fig. 16.

3.5.4 JANUARY (2004-2013) & JANUARY 2014

The Water levels fluctuations show a decline in 59% of observation wells monitored covering about 63% area of the state. The decline of 0-2 m in water level have been observed in about 42% of wells and 46% of area the state covering Amritsar, Tarntaran, Kapurthala, Hoshiarpur, Jalandhar, Nawanshahar, Fatehgarh Sahib, Ludhiana, moga, Ferozpur, Faridkot, Bathinda, Mansa, Sangrur, Patiala and Roopnagar districts. The Water level decline 2-4 m in about 10% of the wells and 15% of area is recorded in patches in parts of Jalandhar, Kapurthala, Hoshiarpur, Fatehgarh Sahib, Patiala, Ludhiana, Barnala, Sangrur, Mansa and Patiala districts. Water level decline of >4 m in about 7% of the wells and 2% of area has been observed in isolated small patches in parts of Jalandhar, Barnala, Sangrur, Fathegarh Sahib and Patiala districts.

The Rise in water levels have also been observed in 41% wells and 37% of area forming isolated patches in parts of Pathankot, Gurdaspur, Hoshiarpur, Amritsar, Tarntaran, Ludhiana, Moga, Ferozpur, Faridkot Fazilka, Bathinda, Mukstar and Mansa districts. The Water level rise in the range of 0-2 m is observed in 37% wells and 33% of area. Water level rise >2 m is observed in 4% wells and 4% of area. The map depicting fluctuation of decadal mean of January 2004-2013 & January 2014 is shown in Fig. 17.


PUNJAB AND CHANDIGARH
Fig. 16
WATER LEVEL FLUCTUATION MAP
DECADAL MEAN (NOVEMBER 2003- NOVEMBER 2012) AND NOVEMBER 2013
0
50
100
kilometers
N
W
E
S
Pathankot
Gurdaspur
Amritsar
Hoshiarpur
Taran Tarn
Kapurthala
Jalandhar
Nawanshahr
Rupnagar
Ferozpur
Moga
Ludhiana
Chandigarh
Fatehgarh Sahib
Mohali
Faridkot
Fazilka
Barnala
Muktsar
Sangrur
Patiala
Bathinda
Mansa
LEGEND
Water level fluctuation(m)
Rise
Fall
0 - 2
2 - 4
>4


PUNJAB AND CHANDIGARH
Fig. 17
WATER LEVEL FLUCTUATION MAP
DECADAL MEAN (JANUARY 2004- JANUARY 2013) AND JANUARY 2014
0
50
100
kilometers
N
W
E
S
Pathankot
Gurdaspur
Amritsar
Hoshiarpur
Taran Tarn
Kapurthala
Jalandhar
Nawanshahr
Rupnagar
Ferozpur
Moga
Ludhiana
Chandigarh
Fatehgarh Sahib
Mohali
Faridkot
Fazilka
Barnala
Muktsar
Sangrur
Patiala
Bathinda
Mansa
LEGEND
Water level fluctuation(m)
Rise
Fall
0 - 2
2 - 4
>4

4.0 GROUND WATER QUALITY IN PUNJAB

Evaluation of ground water quality through concentration of its physical, chemical and biological parameters is essential to determine its suitability for the intended use. It helps not only in finding its suitability; it also helps in taking effective remedial measures for its improvement on scientific lines. In most of rural and semi-urban areas of Punjab State, ground water is a major resource for drinking and irrigation uses especially in areas where surface water is inadequate or unavailable. Acknowledging the importance of this aspect of ground water, C.G.W.B., N.W.R., Chandigarh annually monitors the ground water quality through dedicated Ground Water Monitoring Stations consisting of dug wells and/or hand pumps of shallow depth. During May 2013, 261 no. ground water samples were collected from these structures spread uniformly over 19 districts of Punjab and no specific treatment such as acidification or filtration was applied at the time of sampling. The water samples were analyzed for major cations (Ca, Mg, Na, K) and anions (CO_3, HCO_3, Cl, NO_3, SO_4) in addition to pH, EC, F and TH as $CaCO_3$ in the Regional Chemical Laboratory by following 'Standard analytical procedures' as given in APHA 2012. Resuts of chemical analysis of water samples are given in Annexure V.

4.1 COMPOSITION OF WATER

The district-wise concentration range of various chemical components in ground water is depicted in Table 4. The chemical composition of ground water of Punjab state is discussed below

4.1.1 PH: The ground water is slightly to moderately alkaline in nature. The pH values range from 7.25 at Amloh in Fatehgarh sahib district to 9.10 in Mofar in Mansa district.

4.1.2 SALINITY: salinity of ground water is measured in terms of EC. The ground water is found to have low to very high salt content as the EC of well water ranges from 185 μS/cm. at Nawapind in district Gurdaspur to 8892 μS/cm at Abohar in district Firozepur.

4.1.3 HARDNESS: It is reported in terms of $CaCO_3$. The hardness value of ground water generally ranges from 59 to 1756 mg/l. The lowest hardness value is found at Talwandi Chaudhri, district Kapurthala and highest at Lambi in district Bathinda.

Table 4. Range of chemical constituents in ground water of Punjab State.

Sr. No	DISTRICT	No. of	Conc	pH	EC in µS/cm at 25^{0}C	CO_3	HCO_3	Cl	SO_4	NO_3	F	PO_4	Ca	Mg	Na	K	SiO_2	TH as $CaCO_3$
		Samples	Range			(<---------- mg/l----------)												
1	AMRITSAR	8	Min	7.42	370	0	169	5.3	18	0	0.06	0	15	14	24	5.3	16	96
			Max	8.61	1099	0	447	142	105	65	0.76	0.02	47	31	210	12	25	234
2	BHATHINDA	26	Min	7.3	646	18	134	18	50	7.5	0.08	0.01	0	11	18	4	14	71
			Max	9.04	5605	174	1489	560	1350	264	6.88	0.14	421	171	1165	650	29	1756
3	FARIDKOT	8	Min	8.29	300	18	54	21	64	4.6	0.29	0.01	16	19	19	5.7	11	127
			Max	8.96	5245	106	478	556	1550	138	2.89	0.01	74	91	1148	95	24	421
4	FATEHGARH SAHIB	9	Min	7.25	435	0	154	13	15	0.28	0.06	0.01	16	17	36.0	6.3	18	160
			Max	9.00	2120	101	551	340	345	187	1.03	0.04	92	126	133	610	23	660
5	FIROZEPUR	22	Min	7.68	495	24	84	14	87	1.05	0.08	0.01	16	2.4	31	3.9	14	59
			Max	8.81	8892	94	514	1509	2100	326	3.25	0.24	256	224	1769	212	28	1352
6	GURDASPUR	27	Min	7.9	185	0	79	3.5	3.6	0	0.07	0	11	4.5	3.2	0.7	8.5	75
			Max	8.83	1712	42	495	206	210	172	1.88	0.53	70	93	255	295	33	511
7	HOSHIARPUR	16	Min	7.35	257	0	121	5.3	0	0	0.05	0	11	3.9	10	0.5	15	91
			Max	8.78	727	30	362	85	56	190	0.5	0.07	81	45	62	7.2	33	336
8	JALANDHAR	16	Min	8	394	0	181	7.1	2	0	0.09	0	11	9.1	28	3	19	64
			Max	8.8	1118	65	423	135	74	95	0.95	0.02	41	75	170	16	29	368
9	KAPURTHALA	8	Min	7.8	370	0	145	3.5	6.8	0	0.07	0	11	7.9	39	2.8	12	59
			Max	8.72	1050	24	356	78	130	136	0.31	0.06	79	44	96	13	27	341
10	LUDHIANA	20	Min	7.4	325	0	77	13	5	0.26	0	0	20	17	6.7	3.5	2.85	130
			Max	8.55	1750	63	666	259	210	134	0.75	3.52	176	83	171	79	30	731
11	MANSA	9	Min	8.15	335	0	64	10	33	1.3	0.34	0.01	20	7.3	7.4	1.2	11	80
			Max	9.10	5870	164	564	626	2065	57	3.4	0.02	84	141	960	168	26	751
12	MOGA	8	Min	8.24	412	18	78	21	87	3.8	0.08	0.01	12	17	24	5	16	98
			Max	9.08	2330	106	418	126	580	26	1.38	0.04	51	43	502	75	27	304
12	MUKTSAR	9	Min	7.91	416	12	72	35	50	1	0.05	0.01	12	14	27	4.5	16	88
			Max	8.83	5584	59	407	1025	1250	291	9.87	0.05	282	176	840	402	29	941
14	NAWANSHAHR	8	Min	8.17	346	0	163	5.3	0.4	0	0.02	0	21	18	9.6	2.2	22	139
			Max	8.56	1280	24	308	78	166	180	0.54	0.01	39	60	130	53	36	341
15	PATIALA	17	Min	7.72	265	0	25	6.74	38	0	0.26	0.01	16	9.7	5.7	2	15	130
			Max	9	5770	88	538	957	1100	77	1.6	0.08	68	92	1218	24	28	550

16	ROPAR	13	Min	7.63	279	0	145	7.1	0.4	0	0.16	0	15	0	15	0.5	13	80
			Max	8.58	2290	24	652	266	230	47	2.85	0.09	68	65	350	86	23	336
17	SANGRUR	14	Min	8.3	350	19	90	6.74	21	0	0.3	0.03	16	9.7	11	2.7	14	80
			Max	9	1638	113	615	143	275	73	1.35	0.07	52	58	304	50	27	310
18	SAS NAGAR	11	Min	7.57	368	0	157	14	21	1.3	0.16	0	21	12	17	1.5	12	133
			Max	8.29	1578	0	514	170	128	117	0.69	0.03	119	71	148	22	22	495
19	TARANTARAN	12	Min	8.21	428	0	163	5.3	1	0	0.15	0	11	7.8	5.8	2.7	18	69
			Max	8.81	1588	59	616	92	120	77	2.02	0.02	51	41	305	24	31	256
	TOTAL	261	Min	7.25	185	0	25	3.5	0	0	0	0	0	0	3.2	0.5	2.85	59
			Max	9.1	8892	174	1489	1509	2100	326	9.87	3.52	421	224	1769	650	36	1756

4.1.4 CALCIUM AND MAGNESIUM: The concentration of calcium ranges between nil and 421mg/l. It was not detectablet Gurusar, district Bhatinda whereas highest value is observed at Lambi also in district Bhatinda. It is found to be a dominant cation (>50% of the sum of cations) in 6.9% samples. Magnesium concentration ranges between nil at Dheri, district Ropar and 224 mg/l at Sitogana in district Firozepur. In majority of ground water samples, calcium concentration is less than 100 mg/l (97%). Calcium is very low in some districts, though it is very essential element for drinking and irrigation purposes. However, magnesium is less than the desirable limit of 30 mg/l in 44% samples and less than the maximum permissible limit of 100 mg/l for drinking waters (BIS 1991) in 97% samples. In more than half of well waters examined, Ca + Mg are the dominant cations having their concentration almost 50% of the total cation determined.

4.1.5 SODIUM AND POTASSIUM: Sodium is the dominant cation in majority of ground waters of districts Bhathinda, Faridkot, Ferozepur, Mansa, Moga, Muktsar, Patiala, Sangrur, Jallandhar and Tarantaran. Its concentration varies widely from 3.2 mg/l at Nawapind, district Gurdaspur to 1769 mg/l at Abohar in district Ferozepur. Sodium concentration is less than 100 mg/l in more than half of well waters under consideration. Potassium is found to be present in low concentration. In majority of the samples analyzed, the potassium content is less than 10 mg/l (76%). It ranges from 0.5 mg/l at Talwara, district Hoshiarpur to 650 mg/l at Bhagi Bandar, district Bhatinda. High concentration of potassium (>100mg/l) is found in 3.8% samples. Its higher concentration indicates contamination of ground water from various point (industry, sewage) as well as non-point sources (agriculture).

4.1.6 CARBONATE AND BICARBONATE: Carbonate is found in a few samples and it varies from nil to 174 mg/l at Dialpur Mirza in district Bhatinda. Bicarbonate is the dominant anion and it ranges from 25 mg/l at Dhakraba, district Patiala to 1489 mg/l at Gurusar, district Bhatinda.

4.1.7 CHLORIDE: The chloride concentration in ground water varies broadly between 3.5 mg/l at Bham, district Gurdaspur and 1509 mg/l at Abohar in district Firozepur.

4.1.8 SULPHATE: The sulphate (SO_4) content in ground waters was found to be nil at Garhshankar and Bhamnaur in district Hoshiarpur. The highest value of 2100 mg/l

of sulphate has been observed at Abohar in district Ferozepur. In majority of ground water samples (79%), the concentration of sulphate is below 200 mg/l.

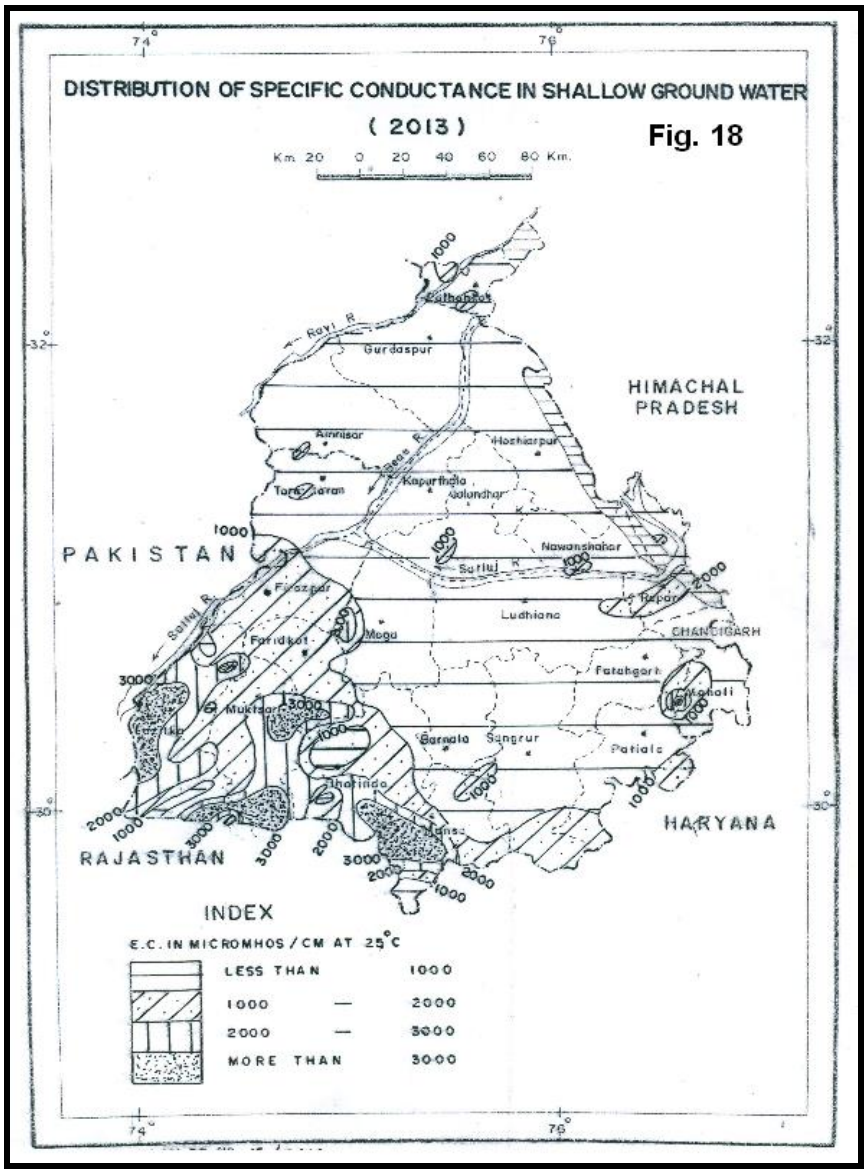
4.1.9 NITRATE: Nitrate, an indicator of domestic, irrigation and industrial contamination, is found in significant number of samples. Its concentration in groundwater ranges from trace at a few places to 326 mg/l at Abohar in district Firozepur.

4.1.10 FLUORIDE: The fluoride (F) content in ground water of the State is generally less than 1.0 mg/l (86.6%). It ranges from nil at Punjeta in district Ludhiana to 9.87 mg/l at Qabarwal, district Muktsar.

4.1.11 PHOSPHATE: It is essential nutrient for plant growth and its concentration varies from nil to 0.15 mg/L in the ground water of the area which is much less than the proposed general index of maximum desirable concentration of 0.2 mg/L. High phosphate has been reported only at three locations, namely, Sahuwala (0.24 mg/l) in district Firozepur, Gharota Kalan (0.53 mg/l) in district Gurdaspur and exceptionally high value of 3.52 mg/l at Muskabad in district Ludhiana. Phosphate has a tendency to get fixed to the soil due to its low mobility, therefore, is rarely found in ground water.

4.2 DISTRIBUTION OF EC

The EC value of ground waters in the State varies from 185 to 8892 µS/cm at 25°C. Grouping water samples based on EC values, it is found that 52.8 % of them have EC less than 750, 39.8 % have between 750 and 3000 and the remaining 7.3% of the samples have EC above 3000µS/cm. The Plate showing aerial distribution of EC with intervals corresponding to limits assigned for desirable, permissible and unsuitable classes of waters indicates that desirable class of waters occur in northern and central area of the State. The ground water occurring in the southern and southwestern parts comprising of Faridkot, Muktsar, Bhatinda, Mansa and Ferozepur districts is mostly saline and not suitable for drinking uses **Fig.18**.

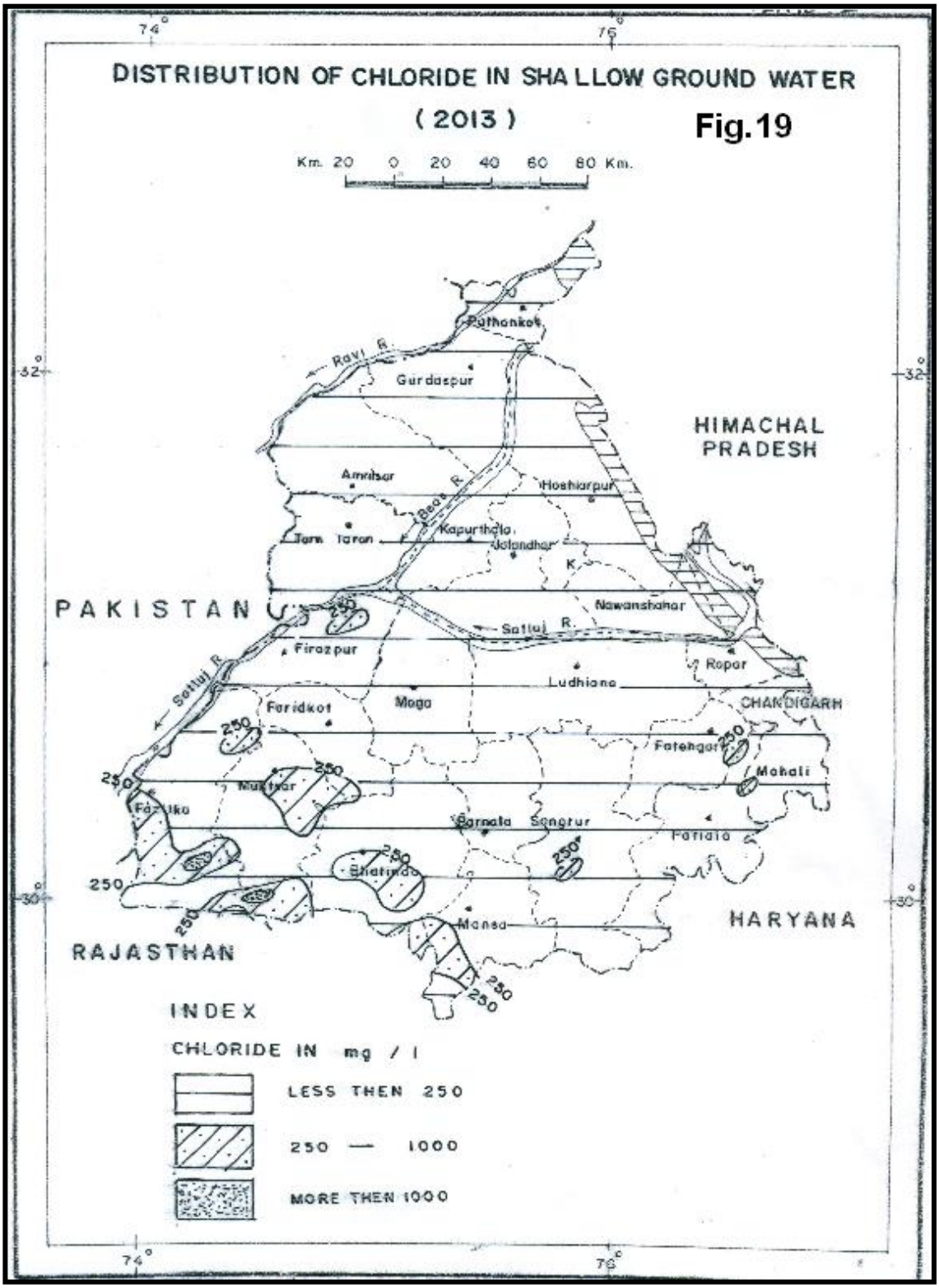


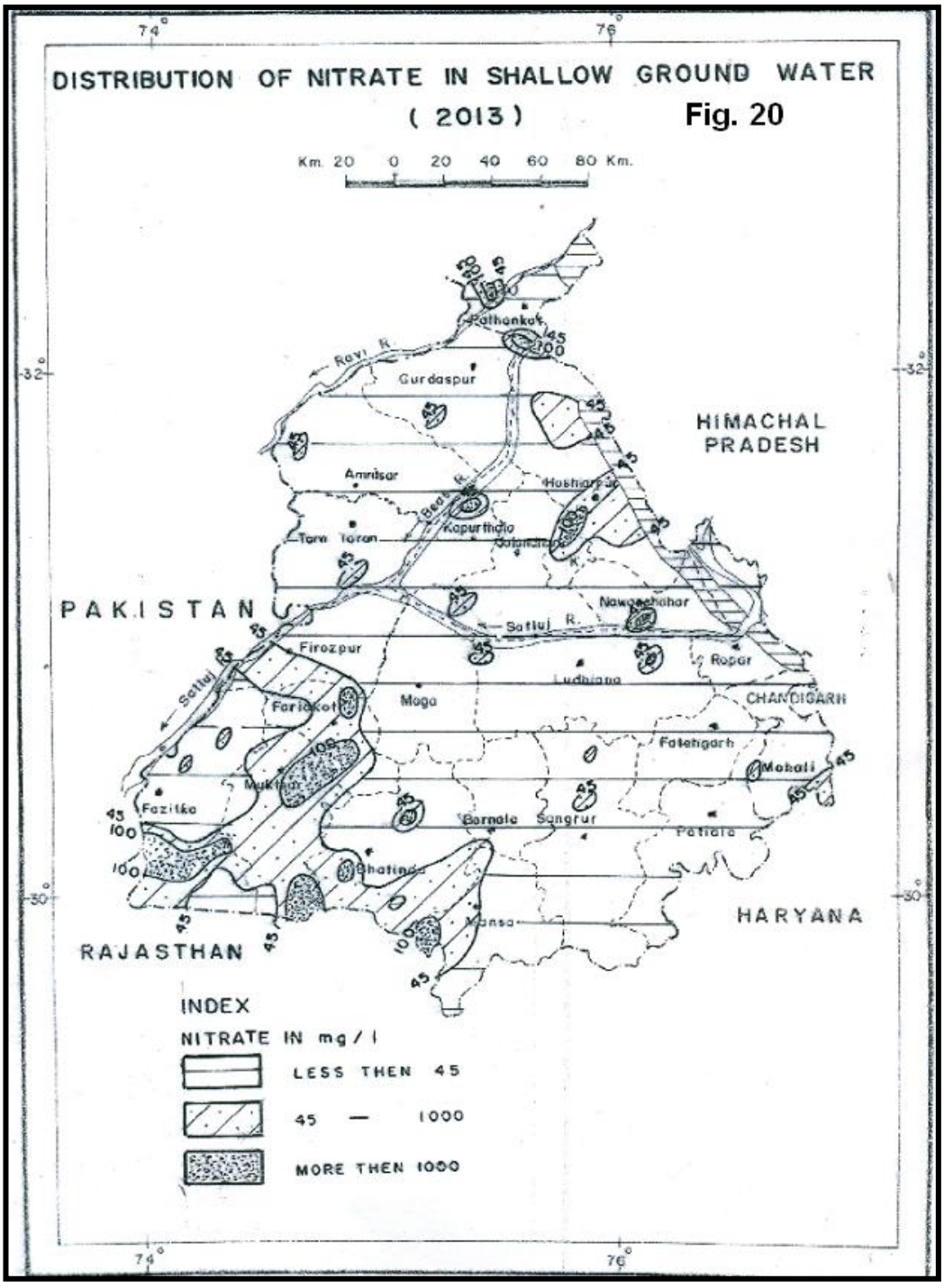
4.3 DISTRIBUTION OF CHLORIDE (CL)

Chloride content of ground water normally follows the distribution pattern of EC and it ranges from 3.5 mg/L to 1509 mg/L in the entire State. Chloride concentration above 400 mg/L gives salty taste to water and based on these aesthetic considerations, BIS has recommended a desirable limit of 250 mg/L for chloride in drinking water. This limit can be extended to 1000 mg/L in case of absence of a source with desirable concentration. Grouping of samples in these categories based on chloride content, it is found that Chloride is less than 250 mg/L in 88.6 % of the samples, between 250 and 1000 mg/L in 9.6 % samples and only 0.8% of the samples are found to have Chloride above 1000 mg/L. indicates that Cl is below 250 mg/L in most of the districts, it is between 250 and 1000 mg/L in Patiala, Fatehgarh and Firozepur district as well as southern and southwestern parts of the State. Cl is more than 1000 mg/L in isolated places in Ferozepur and Muktsar district. Map showing spatial distribution of Cl contents in ground water Fig. 19.

4.4 DISTRIBUTION OF NITRATE (NO_3)

Occurrence of nitrate in ground water above 5.0 mg/L reflects contamination at some stage of its percolation and circulation. The probable sources of nitrate contamination of ground water are through excessive application of fertilizers, bacterial nitrification of organic nitrogen, and seepage from animal and human wastes and atmospheric inputs. In the State, nitrate in water samples varies from traces to 326 mg/L. BIS permits a maximum concentration of 45 mg/L nitrate in drinking water. Considering this limit, it is found that 75.1% of the samples, spread over the entire State, have nitrate below 45 and 24.9% have nitrate more than 45 mg/L. Spatial distribution of nitrate indicates that ground water within permissible nitrate content generally occurs in the northern and central parts with a few isolated patches with nitrate above 45mg/L. A considerable area of the southern and southwestern part of the state has nitrate concentration exceeding 45 mg/L as shown in Fig.20. Furthermore, quite a significant number water samples from Bhatinda, Ferozepur, Faridkot and Muktsar districts are found to have nitrate above 100 mg/L. Map showing spatial distribution of Nitrate (NO_3) contents in ground water Fig. 20.


DISTRIBUTION OF CHLORIDE IN SHALLOW GROUND WATER
(2013)
Fig.19
Km. 20 0 20 40 60 80 Km.
74°
75°
32°
30°
Pathankot
Ravi R.
Gurdaspur
HIMACHAL PRADESH
Amritsar
Hoshiarpur
Beas R.
Tarn Taran
Kapurthala
Jalandhar
K.
PAKISTAN
Nawanshahar
Satluj R.
Firozpur
Ropar
Ludhiana
Satluj R.
Moga
Faridkot
CHANDIGARH
Fatehgarh
Mohali
Muktsar
Fazilka
Barnala
Sangrur
Patiala
Bhatinda
Mansa
HARYANA
RAJASTHAN
250
INDEX
CHLORIDE IN mg / l
LESS THEN 250
250 — 1000
MORE THEN 1000


DISTRIBUTION OF NITRATE IN SHALLOW GROUND WATER
(2013)
Fig. 20
Km. 20 0 20 40 60 80 Km.
74°
76°
32°
30°
Pathankot
Ravi R.
Gurdaspur
HIMACHAL PRADESH
Amritsar
Beas R.
Hoshiarpur
Kapurthala
Tarn Taran
PAKISTAN
Nawanshahar
Satluj R.
Firozpur
Ropar
Ludhiana
Satluj
Faridkot
Moga
CHANDIGARH
Fatehgarh
Mohali
Muktsar
Fazilka
Barnala
Sangrur
Patiala
Bhatinda
Mansa
HARYANA
RAJASTHAN
INDEX
NITRATE IN mg / l
LESS THEN 45
45 — 1000
MORE THEN 1000

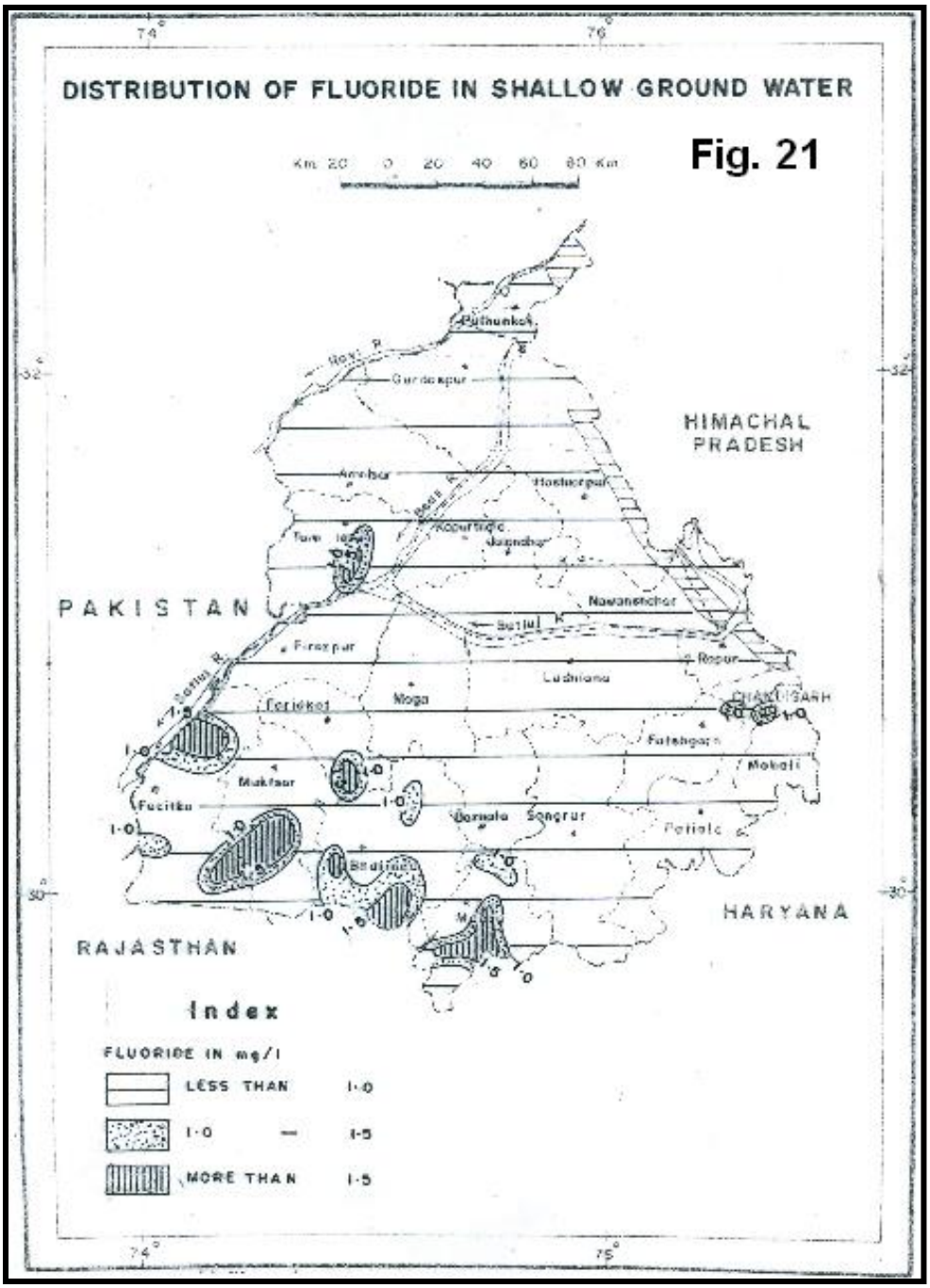
4.5 DISTRIBUTION OF FLUORIDE (F)

Fluoride in small amounts in drinking water is beneficial while in large amounts it is injurious. The fluoride content in ground water ranges from nil to 9.87 mg/L. BIS recommends that fluoride concentration up to 1.0 mg/L in drinking water is desirable, up to 1.5 mg/L is permitted and above 1.5 mg/L is injurious. Classification of samples based on this recommendation, it is found that 86.6% samples have fluoride in desirable range, 6.1% in the permissible and the remaining 7.3% have fluoride above 1.5 mg/L. Map showing spatial distribution of fluoride contents in ground water (Fig. 21) indicates that ground water in most parts of the State has desirable concentration of fluoride. Ground waters with fluoride above 1.5 mg/L are found mainly in Bathinda, Faridkot, Ferozepur, Mansa, Muktsar, Tarantaran and Ropar districts of the State. It is worth mentioning that high fluoride waters are encountered in areas where agriculture activities are predominant. It indicates the possibility that fluoride has come from the phosphatic fertilizers, which have fluoride as impurity.

4.6 TYPES OF WATERS

Considering the predominance of the cation and anion in the chemical composition of ground water, its type is determined and its relation with its occurrence in an area as well as with its salinity is studied. It is found that no discernible relationship between type of water and its occurrence in any particular area could be established. Nearly all types of waters are available in each district of the State. However, study of relation of water type with salinity of the water clearly indicates that nearly 43.8 % ground waters of the State are fresh, have low salinity and predominance of calcium + magnesium cations and bicarbonate as anion. About 50 % ground waters having intermediate salinity and are of mixed type. In these waters, mostly HCO_3 as anion dominates but no individual cation predominates. At some places HCO_3-type of waters with sodium as dominant cation are also encountered in low to moderately saline ground waters. This can be attributed either to precipitation of $CaCO_3$ due to loss of CO_2 or dissolution of Na-salts from the topsoil layers or to ion exchange reaction during the downward percolation of water. At some isolated locations, sulphate is found to be dominant anion. In the remaining ground waters, where salinity is high; mostly Na is the dominant cation and Cl or Cl + SO_4+NO_3

(Mixed anion) are dominant. Nevertheless, a few exceptions have also been found in these simple and well-defined types of ground waters.



4.7 SUITABILITY GROUND WATER FOR DRINKING

Salinity, chloride, fluoride and nitrate are the important parameters that are normally considered for evaluating the suitability of ground water for drinking uses. Based on recommendations made for these parameters by BIS, it is found that ground water at quite a few places is not suitable for drinking uses because of either EC/Cl/F/NO_3 or all of them. It is observed that unsuitable quality of ground water occurs in the southern and southwestern regions, while in the northern and central areas ground water is of suitable quality for drinking uses. Table-5 below shows district-wise distribution of ground waters in different classes of suitability based upon EC, Cl, F and NO_3 contents. District-wise availability of potable ground waters is also shown as bar diagram in Plate-3. The bar diagram (base GWMS-2012) clearly shows that most of the groundwater occurring in the districts Amritsar, Fatehgarh Sahib, Hoshiarpur, Jallandhar, Kapurthala, Ludhiana, Moga, Nawanshar, Patiala, Ropar, Sangrur, SAS Nagar and Tarantaran occupy almost 75% length of the bar and has almost all the parameters within desirable limit for drinking purposes, thus can be considered as potable. Ground waters from the districts of Faridkot, Ferozepur and Muktsar have bar length less than 50% indicating low potable rating.

Plate-3 District wise Distribution of Potable Waters in Punjab.

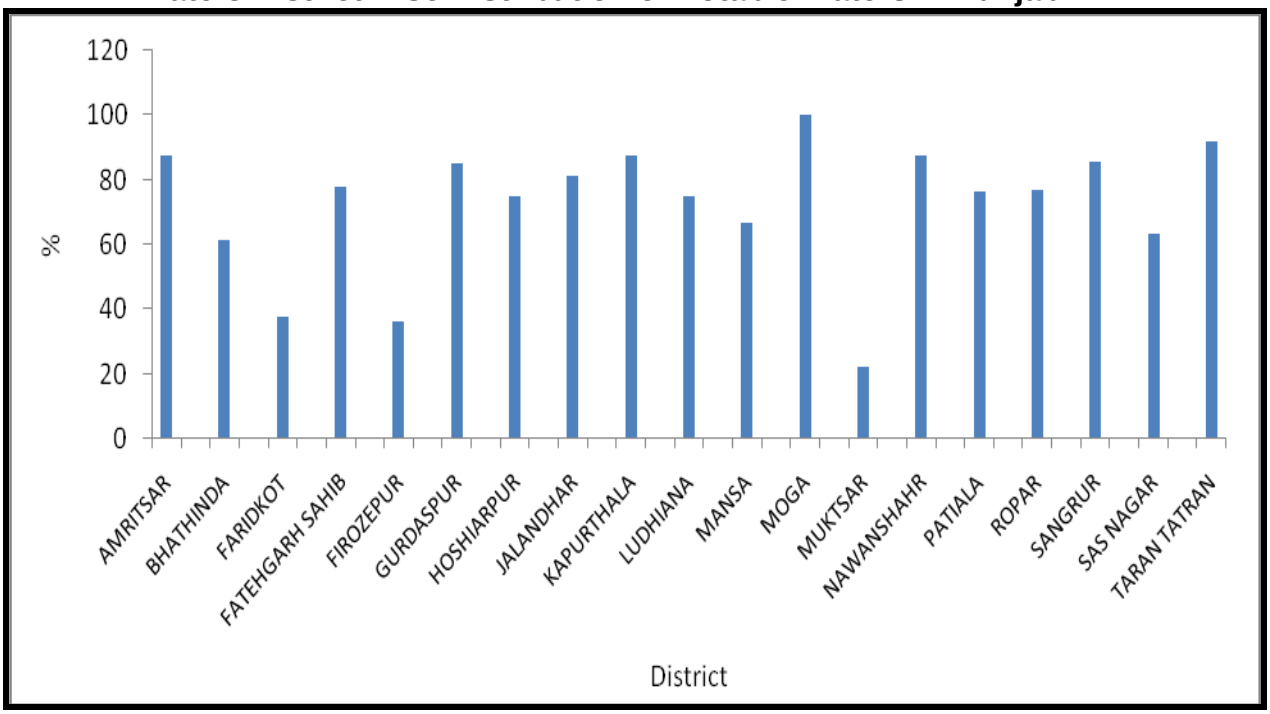


Table 5. Distribution of ground water samples in different classes of drinking water suitability.

S.N	District	EC in 25^0C in µS/cm			Cl in mg/L			NO_3 in mg/L			F in mg/L		
		<750	750-3000	>3000	<250	250-1000	>1000	<45	45-100	>100	<1.0	1.0-1.5	>1.5
1	Amritsar	5	3	0	8	0	0	7	1	0	8	0	0
2	Bathinda	5	15	6	18	8	0	14	6	6	19	4	3
3	Faridkot	2	4	2	6	2	0	4	1	3	4	0	4
4	Fatehgarh Sahib	6	3	0	8	1	0	7	1	1	8	1	0
5	Ferozepur	7	10	5	15	6	1	11	7	4	18	2	2
6	Gurdaspur	23	4	0	27	0	0	23	2	2	26	0	1
7	Hoshiarpur	16	0	0	16	0	0	15	1	0	16	0	0
8	Jallandhar	11	5	0	16	0	0	13	3	0	16	0	0
9	Kapurthala	6	2	0	8	0	0	7	0	1	8	0	0
10	Ludhiana	12	8	0	19	1	0	15	3	2	20	0	0
11	Mansa	2	5	2	7	2	0	6	3	0	4	2	3
12	Moga	5	3	0	8	0	0	8	0	0	7	1	0
13	Muktsar	1	5	3	5	3	1	3	3	3	7	0	2
14	Nawanshahar	6	2	0	8	0	0	7	0	1	8	0	0
15	Patiala	6	10	1	16	1	0	14	3	0	14	2	1
16	Ropar	9	4	0	12	1	0	12	1	0	10	1	2
17	Sangrur	8	6	0	14	0	0	13	1	0	13	1	0
18	SAS Nagar	4	7	0	11	0	0	7	3	1	11	0	0
19	Tarantaran	4	8	0	12	0	0	10	2	0	9	2	1
	Total 261	138	104	19	234	25	2	196	41	24	226	16	19

4.8 SUITABILITY OF GROUND WATER FOR IRRIGATION

The suitability of ground water for irrigation is generally assessed considering salinity expressed as EC, sodium in relation to calcium and magnesium in terms of SAR, sodium in relation to carbonate in terms of RSC. EC and SAR range from 185 to 8892 µS/cm at 25^0C and 0.14 to 32.00 respectively. Waters having high values of EC and SAR causes salinity and sodium hazards respectively when used for customary irrigation.

USSL: Plot of USSL diagram based on EC and SAR indicates that ground water occurring in the northern and central parts of the State falls under C_2S_1 and C_3S_1 classes of irrigation waters. It indicates that most of these waters are suitable for irrigating semi-salt tolerant crops on all soils. Ground water mostly from the southern and southwestern parts comprising of Bhatinda, Faridkot, Ferozepur, Mansa, Moga, Muktsar, Patiala and Ropar districts falls under C_3S_2,C_3S_3, C_3S_4, C_4S_1, C_4S_2, C_4S_3 and C_4S_4 classes of irrigation classification. Such waters when used continuously for irrigation, they are likely to cause salinity hazards and lead to reduction in crop yields. They may also cause sodium hazards and lead to hardening of soils when used for irrigation without the addition of adequate quantity of gypsum.

RSC: Alkali hazards of irrigation ground waters are estimated through the computation of Residual Sodium Carbonate (RSC), also known as Eaton's Index. Waters with RSC value <1.25 meq/L are safe for irrigational uses, RSC between 1.25 and 2.5 are marginal and waters with RSC value >2.5 meq/L are unsafe. Based on RSC values of ground waters, it is found that 66.7% of the waters are safe, 11.9% marginal and the remaining 21.5% are unfit for irrigational uses. RSC of ground waters are found to vary from below zero (-32.78) to 16.12 meq/l. However, exceptionally high RSC values, 23.99, are also encountered at Gurusar, district Bathinda.

The district wise distribution of ground waters in different categories of suitability for irrigational uses based on USSL and RSC considerations is given in Table-6.

Table 6. Irrigation rating of ground waters of Punjab.

(Based on Eaton's index and USSL Classification)					
S. No.	District	IRRIGATION SUITABILITY			
		EATON's INDEX (RSC in meq/L)			*USSL Classification*
		Safe <1.25	Marginal 1.25-2.5	Unsafe >2.5	
1	AMRITSAR	6	1	1	C2S1, C3S1,C3S2
2	BHATHINDA	12	1	13	C2S1, C3S1, C4S1, C3S2, C4S2 C4S4 C2S2, C3S3 C3S4
3	FARIDKOT	6	1	1	C3S1, C3S2, C4S4
4	FATEHGARH SAHIB	7	1	1	C2S1, C3S1
5	FIROZEPUR	17	0	5	C3S1,C3S2,C4S4
6	GURDASPUR	24	3	0	C1S1,C2S1, C3S1, C3S2
7	HOSHIARPUR	13	3	0	C2S1
8	JALANDHAR	8	4	4	C2S1, C3S1, C3S2
9	KAPURTHALA	6	1	1	C2S1, C3S1
10	LUDHIANA	17	2	1	C2S1, C3S1, , C3S2
11	MANSA	7	0	2	C2S1, C3S1, C3S2, C3S4, C4S4
12	MOGA	5	2	1	C2S1, C3S1, C3S2, C3S4, C4S4
13	MUKTSAR	7	0	2	C3S1, C3S2, C4S1, C4S3,C4S4
14	NAWANSHAHR	7	1	0	C2S1, C3S1
15	PATIALA	7	5	5	C2S1, C3S1, C3S2, C4S4
16	ROPAR	6	1	6	C2S1, C3S1, C3S2, C3S4, C4S2
17	SANGRUR	8	1	5	C2S1,C3S1,C3S2
18	SAS NAGAR	8	2	1	C2S1,C3S1
19	TARANTARAN	3	2	7	C2S1,C3S1,C3S2
	TOTAL 261	174	31	56	

Most of ground waters from Amritsar, Fatehgarh Sahib, Gurdaspur, Hoshiarpur, Jallandhar, Kapurthala and Ropar are suitable for irrigation for semi-salt tolerant crops on adequately drained soils. The waters from districts of Bhatinda, Faridkot, Ferozepur, Mansa, Muktsar, Patiala and Sangrur show wide variability in irrigation rating.

4.9 SUITABILITY OF GROUND WATER FOR INDUSTRIES

Industries, in general, use water for variety of works depending upon the nature and size of the industry. As such specifications for suitability of water for industries vary widely depending upon the process in each industry. Therefore, chemical quality of water and its suitability could not be discussed due to diversified nature of industries.

4.10 TEMPORAL VARIATION

The temporal changes in ground water quality are studied through percent of well water falling in different categories of suitability criteria based on concentration of important parameters such as salinity (EC), chloride, nitrate and fluoride contents. The percent well waters falling in desirable, permissible and unsuitable classes of BIS-1991 standards during 2012 are compared with percent well waters in same classes during 2008, 2009, 2010, & 2011. Table shows both positive and negative change in percent well waters in different suitability classes based on above parameters and overall variation in % wells from 2008 to 2012.

On perusal of the Table-7, it is evident that there is not much variation in the quality of ground water from 2011 to 2012 with respect to Specific conductance as there is an appreciable change in of 9% samples falling under safe class of suitability class with respect to Specific conductance but a change of samples falling in desirable class for chloride, nitrate and Fluoride has increased only by 1% , 2% and 1% , respectively, indicating improvement in ground water quality with reference to these parameters. However, when percent samples are compared with those of 2008, it is found that there is considerable improvement in water quality as indicated by percent increase of water samples falling in desirable class with respect to EC(16%), Cl(5%), F(7%), NO3(3%).

Table 7. Periodic variation in suitability classes of well waters of Punjab.

Parameter	Class	% of Samples					Periodic Variation 2009-13
		2009 (n=204)	2010 (n=231)	2011 (n=231)	2012 (n=242)	2013 (n=261)	
Salinity as EC	<750 µS/cm	37	39	44	44	53	+16
	750--3000	53	55	51	48	40	-13
	>3000	10	6	6	8	7	-3
Chloride as Cl	<250 mg/l	85	81	82	89	90	+5
	250 - 1000	15	18	17	10	9.5	-4.5
	>1000 mg/l	0	1	1	1	1	1
Nitrate as NO_3	< 45 mg/l	72	65	82	74	75	+3
	> 45 mg/l	28	35	18	26	25	-3
Fluoride as F	<1.0 mg/l	80	78	79	85	87	+7
	1.0 - 1.50	6	10	8	4	6	0
	>1.50 mg/l	14	12	13	11	7	-7

4.11 CONCLUSION & RECOMMENDATIONS (CHEMICAL)

Conclusion drawn for quality evaluations of ground water and its suitability for various uses is based on macro level studies through monitoring stations sampled during 2013. It can be concluded that in Punjab

- Ground water is generally suitable for drinking uses except at few places in the southern and south western parts where it is not suitable due to high EC or high fluoride or nitrate or combination of all.
- Almost all waters are suitable for irrigation on well-drained soils for growing salt tolerant crops like wheat, mustard, rice, barley and maize etc. However, at few places where EC of ground water goes beyond 5000 µS/cm and SAR is more than 10, such waters are not suitable for customary irrigation.
- It is recommended that areas identified with unsuitable or marginally suitable water quality should be monitored on micro level to effectively delineate such areas and use suitable management measures.

5.0 CHANDIGARH

5.1 COMPOSITION AND QUALITY OF GROUND WATER

Quality of shallow ground water of Chandigarh is evaluated through three samples collected during May 2013 and no specific treatment such as acidification or filtration was given at the time of sampling. Samples were analyzed for major cations (Ca, Mg, Na, K) and anions (CO_3, HCO_3, Cl, NO_3, SO_4) in addition to pH, EC, F, TH as $CaCO_3$, Si as SiO_2, B and PO_4 in the Regional Chemical Laboratory at Chandigarh as per APHA 2012 standard analytical procedures.

The results of chemical analysis of ground water sample (Appendix V) reveals that it is alkaline in nature with pH from 7.9 to 8.40 and moderately mineralized with EC ranging from 509 to 815 µS/cm at 25^0C. Among anions, carbonate ion is found to be absent to 12 mg/l whereas bicarbonate concentration ranges from 187 to 326 mg/L. The chloride values range from 28 to 58 mg/l, while the sulphate values vary from 34 to 62 mg/l. Nitrate concentrations are found to range between 0.4 to be 19 mg/l. The Fluoride content is low and maximum concentration is 0.50 mg/L which is below the

desirable limit of 1.0 mg/L. The cations such as calcium and magnesium are present in low concentration and their highest values are 43 mg/L and 38 mg/. The sodium concentration varies between 32 to 64 mg/L. The maximum potassium concentration reported is 104 mg/L. Total hardness of water sample expressed as $CaCO_3$ is found to range between 149 and 224 mg/L. The perusal of chemical analysis data indicates that ground water is of Na-Ca-HCO_3, and Mg-K-HCO_3 type. The ground water is suitable for domestic use as all parameters are within the permissible limits of drinking water quality standards prescribed by BIS-2012. Though no guidelines for Potassium in drinking water have been prescribed by BIS, exceptionally high value of 104 mg/l have been observed in sample collected from Burail village. The suitability of groundwater for irrigational uses is determined by considering the values of salinity (EC), sodium adsorption ratio (SAR) and residual sodium carbonate (RSC). Based on highest reported values for EC (815 µS/cm.), SAR (2.07) and RSC (1.22), it can be concluded that groundwater of Chandigarh is suitable for irrigation. The USSL classification of irrigation waters indicates that it falls in C_2S_1 class and can be used for customary irrigation.

5.2 TEMPORAL VARIATION

On comparison with chemical data of GWMS 2012, it is observed that there is not much change in water quality in terms salinity but there has been an improvement in water quality in terms of nitrate which has decreased from 72 mg/L in 2012 to a maximum value of 19 mg/L in 2013. There has been no significant change in Chloride and Fluoride concentration during this period.

5.3 CONCLUSION & RECOMMENDATION (CHEMICAL)

Conclusion drawn for quality evaluations of ground water and its suitability for various uses is based on macro level studies through monitoring stations sampled during 2013. It can be concluded that in Chandigarh ground water is generally suitable for drinking and groundwater is suitable for irrigation purposes.

DEPTH TO WATER LEVEL m(bgl)					ANNEXURE I	
DISTRICT	**Sl. No.**	**Locations**	**May-13**	**Aug-13**	**Nov-13**	**Jan-14**
CHANDIGARH	1	Burail	4.62	3.97	2.82	2.92
	2	Csio-combined	20.47	22.00	20.52	20.87
	3	CSIO-S	21.48	20.33	20.50	20.74
	4	MaloyaPZM	8.40	7.68	7.94	8.31
	5	New Industrial Area	22.49	12.79	18.19	22.94
	6	Sec-27, Ar Well	38.36	38.46	38.51	44.41
	7	SECT 10C (D)	27.75	25.95	26.84	25.79
	8	SECT 10C (S)	15.58	14.18	16.27	15.13
	9	SECT 21D (D)	15.40	14.05	14.62	-
	10	SECT 21D (S)	11.42	-	-	9.46
	11	SECT 31D (D)	19.92	19.58	19.05	17.67
	12	SECT 31D (S)	9.61	11.24	11.44	10.79
	13	SECT 37D (S)	6.36	3.92	4.43	4.31
	14	SECT 39D (S)	5.40	3.48	4.15	4.47
	15	SECT 44D (S)	2.05	1.95	2.55	2.80
	16	Sector 52- PZ	17.70	17.30	17.82	14.25
	17	Sector-46 (shallow)	6.18	6.10	6.44	6.40
AMRITSAR	18	Aima Khurd-Pz	12.80	13.70	-	12.01
	19	Ajnala	12.35	12.55	11.98	11.52
	20	Aminshah Khalra	11.95	10.13	10.22	9.83
	21	Amritsar1	24.94	24.90	24.54	-
	22	Bahla-Pz	7.88	8.98	-	-
	23	Bakipur-Pz	-	-	-	19.14
	24	Bal Kalan-Pz	-	-	-	15.50
	25	Bath-Pz	-	-	-	19.28
	26	Beas07	14.48	13.62	13.90	13.94
	27	Bhagala-Pz	-	-	-	7.40
	28	Bhalaipur-Pz	-	-	-	19.00

	29	Bhankar Kalan-Pz	-	-	-	13.18
	30	Bhattaywad-Pz	-	-	-	12.40
	31	Bhikiwind- Pz	14.65	15.61	14.82	14.35
	32	Bhura-Pz	-	-	-	12.35
	33	Bhure-Pz	-	-	-	15.20
	34	Bhusse-Pz	-	-	-	13.86
	35	Boparai Khurd-Pz	15.05	17.15	-	15.05
	36	Brahmpur-Pz	-	-	-	16.80
	37	Burjwal-Pz	-	-	-	14.09
	38	Chabal 07	18.12	18.89	18.10	17.62
	39	Chak Dogra-Pz	-	-	-	9.70
	40	Chakkare Khan-Pz	-	-	-	17.70
	41	ChogWan- Pz	11.42	11.97	10.30	8.85
	42	Chola Sahib-Pz	16.62	18.36	17.13	16.82
	43	Choudhary Wala-Pz	-	-	-	17.10
	44	Chuselawad-Pz	17.10	18.22	-	16.70
	45	Dhariwal-Pz	-	-	-	12.55
	46	Dholan-Pz	-	-	-	5.55
	47	Dhulika-Pz	-	-	-	16.10
	48	Dohan-Pz	-	-	-	17.20
	49	Ekalgoda-Pz	-	-	-	20.30
	50	Gago Mahal- Pz	6.90	6.10	5.65	5.75
	51	Gandi Wind-Pz	11.37	10.83	10.49	10.41
	52	Gill wali-Pz	-	-	-	17.40
	53	Goindwal 07	20.13	19.00	19.44	19.47
	54	Gujjaran Wali-Pz	-	-	-	7.50
	55	Jandiala Guru-Pz	19.14	19.57	19.15	18.45
	56	Jandoke-Pz	-	-	-	17.28
	57	Jasrur-Pz	-	-	-	7.70
	58	Jethuwal-Pz	-	-	-	14.60
	59	Kalsia Kalan	15.31	-	15.37	
	60	Kalsia Kalan07	15.79	16.76	15.85	15.35

	61	Kandowali-Pz	-	-	-	12.10
	62	Karyal-Pz	-	-	-	7.50
	63	Khadur Sahib-Pz	18.04	19.14	18.45	17.83
	64	Khalra-Pz	-	-	-	11.50
	65	Khilchian-Pz	14.90	16.00	-	14.20
	66	Kotbudda-Pz	-	-	-	12.70
	67	Kotli Sur Singh-Pz	14.40	15.50	-	14.19
	68	Mahendipur-Pz	-	-	-	14.18
	69	Mahima-Pz	-	-	-	16.40
	70	Majitha- Pz	11.40	-	-	
	71	Makhan Windi-Pz	-	-	-	16.30
	72	Marhona-Pz	-	-	-	17.16
	73	Mari Kamboke-Pz	-	-	-	7.28
	74	Mehleykey-Pz	-	-	-	11.20
	75	Mehta-Pz	-	-	-	11.70
	76	Miran Chak-Pz	-	-	-	15.70
	77	Mohawa	14.82	15.01	14.30	13.92
	78	Nangal Sahaul-Pz	-	-	-	5.60
	79	Nawan Tanal- Pz	11.58	10.91	10.30	10.29
	80	Pakharpura-Pz	-	-	-	7.60
	81	Pindan-Pz	-	-	-	15.90
	82	Rajoke-Pz	-	-	-	5.86
	83	Rampura-Pz	14.12	15.80	-	10.90
	84	Ratoke-Pz	18.29	19.95	16.98	16.62
	85	Rupowal Brahmana-Pz	12.05	13.15	-	12.75
	86	Sabran-Pz	-	-	-	18.90
	87	Sahab Pura- Pz	18.56	19.08	19.65	17.87
	88	Sathiala-Pz	-	-	-	14.80
	89	Shabura-Pz	-	-	-	12.80
	90	Sham Nagar-Pz	-	-	-	7.40
	91	Sheron-Pz	-	-	-	17.78
	92	Talwandi Dogra-Pz	14.60	19.60	-	16.60

	93	Tarsika-Pz	-	-	-	13.20
	94	Thatha- Pz	18.25	19.38	-	17.88
	95	Ugar Aulakh-Pz	-	-	-	8.30
	96	Vadala Kalan-Pz	-	-	-	14.10
	97	Wachhoya-Pz	10.45	12.15	-	8.85
BATHINDA	98	Ablu	12.76	13.11	12.87	12.48
	99	Badiala-Pz	24.75	26.99	25.55	24.89
	100	Bagher Mohabat Singh-Pz	-	-	-	8.21
	101	Bahman Jassa Singh-Pz	11.55	-	-	11.65
	102	Bahman Kaur Singh-Pz	-	-	-	9.09
	103	Balianwali-Pz	-	-	-	18.23
	104	Balluana1	4.29	3.59	3.90	3.83
	105	Balluana-Pz	-	-	-	5.26
	106	Banbhiha-Pz	-	-	-	4.42
	107	Bhagibandar	8.46	8.30	5.93	8.19
	108	Bugran-Pz	-	-	-	24.16
	109	Burj Gill-Pz	-	-	-	19.85
	110	Burj-Pz	-	-	-	9.33
	111	Deratapp	5.49	5.31	5.61	5.48
	112	Dhapali1	19.18	20.00	20.23	18.72
	113	Dhapali-Pz	18.82	20.65	19.86	19.37
	114	Dialpur Mirza	20.19	22.37	21.49	20.60
	115	Dialpura Bhlaike	22.24	23.03	22.15	22.24
	116	Dulle Wala-Pz	-	-	-	25.57
	117	Ganga-Pz	13.45	14.25	13.62	13.40
	118	Ghudda	-	4.84	4.89	4.84
	119	Gill Patti-DW	7.46	-	-	7.35
	120	Gulabgarh 1 (vs)	13.25	12.76	11.32	-
	121	Gulabgarh 2 (s)	12.67	-	13.00	12.20
	122	Guru Sar-Pz	9.64	8.74	8.68	8.45
	123	Gurusar	9.15	-	-	-
	124	Harraipur-Pz	-	-	-	15.75

	125	Jajjal	8.00	7.65	7.64	7.44
	126	Jassi Bhagwali	9.62	7.39	7.12	6.96
	127	Jassi Paowali-Pz	-	-	-	7.00
	128	Jhanduke	19.22	22.17	19.50	19.32
	129	Jhanduke-Pz	-	-	-	18.23
	130	Kahan Singh Wala-DW	15.50	-	-	15.24
	131	Kalla Bandar	6.25	6.52	9.15	6.30
	132	Kalyan Sukha-Pz	-	-	-	18.55
	133	Kot Bhaktu-Pz	-	-	-	4.98
	134	Kot Fatta	-	-	-	10.73
	135	Kot Guru	-	-	-	5.91
	136	Kot Shamir	13.43	13.66	13.61	13.26
	137	Kothaguru-Pz	20.03	21.20	21.03	20.44
	138	Lahri	9.20	8.82	8.56	8.47
	139	Lalliana-Pz	-	-	-	6.07
	140	Lehra Dhulkot-Pz	-	-	-	16.42
	141	Lehra Khanna-Dw	15.80	-	-	15.65
	142	Maisar Khana	13.40	13.12	12.56	12.28
	143	Maisar Khana-Pz	13.74	-	-	13.68
	144	Mandi Kalan-Pz	-	-	-	19.45
	145	Mehraj-Pz	-	-	-	17.08
	146	Mehta-Pz	-	-	-	7.06
	147	Multania-Pz	-	-	-	6.35
	148	Nahinwala	10.99	9.74	9.19	9.44
	149	Nathana-Pz	-	-	-	16.23
	150	Nathena-Pz	-	-	-	5.55
	151	Phul	19.73	21.44	22.20	20.91
	152	Phulla	14.85	14.98	16.55	-
	153	Phulla1	14.85	15.54	15.70	15.20
	154	Puhla-Pz	18.10	-	-	17.30
	155	Raike Kalan	2.44	2.46	2.19	1.89
	156	Rajgarh Kubey-Pz	9.18	-	-	9.38

	157	Rampura	20.70	23.20	23.40	22.14
	158	Rayya-Pz	-	-	-	21.34
	159	Sangat -Pz	7.71	7.36	7.16	7.15
	160	Seema-DW	14.97	-	-	14.68
	161	Sidhana	-	-	-	16.00
	162	Sooch-Pz	-	-	-	16.46
	163	Teona-Pz	5.40	-	-	4.91
	164	Tungwali-Pz	-	-	-	13.89
	165	Bead Sikhanwala- Pz	9.56	8.70	8.21	-
	166	Behabal Kalan-Pz	-	-	-	10.90
	167	Burj Jawahar Singh-Pz	15.75	-	-	15.80
	168	Chahd Baja	15.72	16.25	16.35	15.47
	169	Chak Kalan-Pz	-	-	-	2.80
	170	Devrana-Pz	4.22	-	-	2.50
	171	Dhaipai-Pz	7.76	-	-	7.85
	172	Dhilwan Kalan	8.05	8.55	7.90	7.70
	173	Dhudi-Pz	-	-	-	12.20
	174	Dipsinghwala	4.02	2.77	3.87	3.68
	175	Fatehgarh-Pz	-	-	-	16.00
FARIDKOT	176	Ghuiana-Pz	-	-	-	5.10
	177	Karirwali	9.86	8.74	7.80	7.75
	178	Kauni-Pz	-	-	-	3.20
	179	Koharwala- DW	-	-	-	7.40
	180	Kot Kapura	7.30	8.00	7.95	7.62
	181	Matta	7.28	8.04	7.62	7.47
	182	Mehmuana	2.28	0.20	1.20	1.15
	183	Pahluwala-Pz	-	-	-	2.95
	184	Ratti Rori-Pz	-	-	-	1.60
	185	Rorian Kapura-Pz	-	-	-	9.30
	186	Sandhwan-Pz	-	-	-	5.25
	187	Sher Singh Wala- Pz	4.00	1.85	2.52	-
FATEH GARH	188	Amloh1	23.25	24.66	26.20	23.90

	189	Badalialasingh	33.36	49.92	34.94	33.40
	190	Bagga Kalan	21.05	-	-	20.90
	191	Balpur	19.95	-	-	20.50
	192	Bassi Pathana	17.17	17.92	17.35	15.68
	193	Bhagrana	6.04	10.40	3.74	4.80
	194	Bhateri1	29.15	29.22	30.39	29.82
	195	Burj	17.20	-	-	16.15
	196	Chunni Kalan	-	-	-	14.79
	197	Fatehgarh Sahib	18.80	-	-	-
	198	Fatehgarh Sahib-Pz	18.88	19.08	20.19	17.55
	199	Jai Singh Wala	14.15	-	-	-
	200	Jhambela	19.85	-	-	-
	201	Khara	23.62	-	-	-
	202	Lohar Majra	19.02	-	-	-
	203	Nalini-Pz	-	19.98	-	-
	204	Pawala	12.12	5.24	11.30	11.80
	205	Sado Majra	15.80	-	-	-
	206	Shahpur	20.80	-	-	-
	207	Tahalpur	19.60	-	-	-
	208	Talwara	19.15	-	-	-
FIROZPUR	209	Abohar	1.99	2.05	2.40	2.25
	210	Alamgarh	1.44	0.89	1.41	1.26
	211	Asifwala-Pz	-	-	-	6.80
	212	Bannawala	2.16	-	1.60	1.34
	213	Bara Mansur Wala-Pz	25.60	-	-	-
	214	Bazirdpura	8.82	-	8.90	0.82
	215	Chak Kala Tibba	1.89	2.61	1.59	2.19
	216	Chamb-Pz	16.85	-	-	-
	217	Danewal Satkosi	4.56	4.18	4.46	4.26
	218	Dipulana-Pz	6.28	5.73	4.87	-
	219	Dulchi Ke-Pz	-	-	-	8.20
	220	Fazilka-Pz	-	-	-	10.03

	221	Godiwala-Pz	-	-	-	3.14
	222	Gogiani-Pz	17.10	-	-	
	223	Guru Harsahai-Pz	-	-	-	5.24
	224	Himmatpura-Pz	-	-	-	6.21
	225	Jaimal Singhwala Pz	9.19	9.57	8.86	8.50
	226	Jandwala Watan-Pz	-	-	-	2.40
	227	Jhottian Wali-Pz	-	-	-	5.90
	228	Kahan Singh Wala-Pz	-	-	-	12.00
	229	Kandh Wala-Pz	-	-	-	4.05
	230	Khan Wala-Pz	-	-	-	4.21
	231	Khere Ki Uttar-Pz	-	-	-	16.92
	232	Khuiansarwar- Pz	1.40	0.35	1.05	0.82
	233	Kundal1	0.53	-	1.22	0.00
	234	Ladhuwala	1.44	0.30	0.80	1.31
	235	Lauhke Kalan- Pz	16.44	-	17.73	-
	236	Lohere Khurd-Pz	19.03	-	-	-
	237	Machi Bugra	-	-	-	10.42
	238	Machi Bugra/ Gujran-Pz	-	-	-	12.25
	239	Mahuana-Pz	-	-	-	4.01
	240	Mallanwala Khas-Pz	12.00	-	-	-
	241	Malluwala-Pz	21.06	-	-	-
	242	Malsian-Pz	9.67	10.47	9.74	-
	243	Malukpur-Pz	-	-	-	1.20
	244	Mana Singh Wala-Pz	-	-	-	3.86
	245	Markhiwa Bhamni-Pz	-	-	-	5.73
	246	Mohkam Khan Wala-Pz	-	-	-	12.43
	247	Mohre Wala-Pz	7.40	7.93	7.00	-
	248	Motiwala 07pz	10.97	11.35	10.18	10.10
	249	Mudki-Pz	-	-	-	10.65
	250	Mullian Wali-Pz	-	-	-	2.16
	251	Muradwala Dal-Pz	-	-	-	1.04
	252	Nihalkhera	2.02	1.37	1.97	1.44

	253	Nure-Ki-Uttar 07pz	15.44	16.40	25.27	14.98
	254	Pancha Wali-Pz	-	-	-	10.91
	255	Piyarana	4.47	2.36	3.55	3.31
	256	Ramsara-Pz	-	-	-	3.27
	257	Rukne Wala-Pz	-	-	-	6.95
	258	Sadhusha Wala-Pz	-	-	-	11.20
	259	Sham Singhwala-Pz	4.79	3.24	3.75	4.10
	260	Sherewala-Pz	-	-	-	8.03
	261	Singhpura-Pz	-	-	-	2.61
	262	Sitoganno	3.08	2.56	2.87	2.78
	263	Sohangarh Ratte	2.07	1.95	1.23	0.57
	264	Swah Wala- Pz	9.43	9.56	8.87	-
	265	Talwandi Jalle Khan-pz	26.05	-	-	-
	266	Tibbi Taiwan Laluwalla-Pz	3.91	-	-	-
	267	Wage Wala-Pz	-	-	-	9.65
	268	Waryam Khera	-	2.27	-	-
GURDASPUR	269	Aulakhkalan	20.11	-	18.71	18.53
	270	Bamyal	5.90	2.98	5.10	4.78
	271	Bhagowal	8.10	5.34	-	6.76
	272	Bham	15.20	14.34	13.57	13.59
	273	Bhoa	4.53	3.01	4.16	3.92
	274	Bilasbal-Pz	17.10	-	-	-
	275	Chahal Kalan-Pz	9.10	-	-	-
	276	Dakoha-Pz	13.98	14.18	12.95	12.64
	277	Dera Baba Nanak	7.26	5.20	5.77	5.80
	278	Dhandoi-Pz	10.45	-	-	-
	279	Dhianpur	10.79	10.19	16.48	14.55
	280	Dinanagar	-	-	-	3.57
	281	Gajikort-Pz	3.80	-	-	-
	282	Galri	5.52	2.06	4.92	4.00
	283	Ghania Ki bangar- Pz	8.05	7.62	6.95	6.98
	284	Gharotakalan	10.74	6.37	7.17	7.21

	285	Ghoh	12.76	11.56	5.35	-
	286	Ghoh DW	15.03	8.23	6.36	6.31
	287	Ghumani Khurd-Pz	7.10	-	-	-
	288	Gurdaspur-Pz	10.20	-	-	-
	289	Harchowal-Pz	15.65	-	-	-
	290	Hargobindpur	19.09	18.26	18.04	18.21
	291	Jhakolahri	2.59	2.33	3.05	2.78
	292	Jhandalbana-Pz	3.10	-	-	-
	293	Kala Afgana-Pz	8.65	-	-	-
	294	Kalanaur2	-	10.04	11.18	10.94
	295	Kalanaur-Pz	5.67	3.81	3.57	3.53
	296	Kaure-Pz	14.35	-	-	-
	297	Khanikhui	1.96	1.16	1.74	1.41
	298	Khanmalik-Pz	10.60	-	-	-
	299	Khatgarh-Pz	4.10	-	-	-
	300	Langurwal-Pz	8.10	-	-	-
	301	Madipur Fatehgarhchuria	10.25	10.10	9.55	9.51
	302	Malikpur-Pz	8.60	-	-	-
	303	Mallewal-Pz	6.65	-	-	-
	304	Masana-Pz	4.75	-	-	-
	305	Massit-Pz	3.40	-	-	-
	306	Mullowali 1(vs)	4.58	2.91	3.89	3.68
	307	Mullowali 2(m)	4.17	-	4.17	2.73
	308	Nangal-Pz	3.60	-	-	-
	309	Nawan Pind	6.22	3.56	4.34	5.67
	310	Nishayara	6.38	4.26	4.35	4.46
	311	Pandoritalab	2.67	1.78	2.20	2.27
	312	Parcha-Pz	6.60	-	-	-
	313	Pathankot1	6.23	4.12	4.80	6.21
	314	Quaddian -Pz	7.30	-	-	-
	315	Saleh Chak-S	3.73	1.20	-	2.49
	316	Salehchak(vs)	4.24	1.73	-	2.92

	317	Sarna1	9.85	5.50	9.20	9.53
	318	Sathial-Pz	12.43	10.99	12.18	10.74
	319	Shahpur Jattan-Pz	5.75	-	-	-
	320	Shikar-Pz	9.90	-	-	-
	321	Tikriwala-Pz	8.55	-	-	-
HOSHIARPUR	322	Adowal Garhi-Pz	-	15.89	15.88	15.75
	323	Bhamnaur	-	11.29	12.43	13.51
	324	Chohal	-	0.69	3.25	4.02
	325	Dasuya2 (s)	-	8.80	7.33	7.49
	326	Durimiwal	-	2.72	3.09	3.30
	327	Garh Di Wala-Pz	-	10.28	11.11	9.97
	328	Garhshankar (s)	-	24.10	18.88	18.12
	329	Hazipur	-	4.66	7.42	8.02
	330	Mahilpur-Pz	-	18.10	18.58	18.47
	331	Mukerian Dw	-	1.55	1.26	1.87
	332	Nangal Bihala- DW	-	11.08	9.88	10.01
	333	Phuglana- Pz	-	25.80	23.29	21.15
	334	Rampur Colony (HSP) pz-medium	-	17.71	18.88	22.27
	335	Sham Chaurasi	-	11.85	-	-
	336	Simbli- OW	-	-	-	14.42
	337	Simbli-Pz	-	-	15.42	14.73
	338	Talwara1	-	11.12	11.17	11.00
	339	Thakarwala	-	9.48	10.03	10.37
JALANDHAR	340	Adampur 1(d)	23.55	27.90	19.71	15.81
	341	Adampur 3(s)	8.40	8.52	7.10	6.73
	342	Adarman-Pz	18.00	-	-	-
	343	Allawalpur	6.99	5.48	5.80	-
	344	Billi Chahrami-Pz	33.00	-	-	-
	345	Gohiran	32.36	33.09	30.45	-
	346	Hardo Pharwal-Pz	27.10	-	-	-
	347	Jalandhar 3(vs)	33.23	33.78	33.58	32.65
	348	Jandiala-Pz	26.23	-	27.12	26.25

	349	Kalyanpur-Pz	30.00	-	-	-
	350	Kartarpur 2(s)	18.69	16.73	15.59	16.15
	351	Kharal Kalan Pz-S	15.40	13.39	13.46	11.66
	352	Lallian kalan Pz-S	31.44	33.67	32.63	31.86
	353	Nakodar 2(m)	28.56	31.34	28.33	30.23
	354	Nakodar 3(s)	29.15	31.74	31.14	30.10
	355	Nangal Shaman	30.70	-	-	-
	356	Nussi-Pz	29.50	-	-	-
	357	Phillaur 2(s)	15.39	15.78	15.67	15.56
	358	Sarih Pz-S	25.10	-	-	26.25
	359	Shahkot(s)	26.39	24.95	29.00	26.75
	360	Talwandi Bhutial-Pz	22.40	-	-	-
	361	Talwani Madho-Pz	29.20	-	-	-
	362	Talwan-Pz	18.50	-	-	-
	363	Udhopur	8.98	6.50	7.65	8.08
KAPURTHALA	364	Bhatnura Khurd- S	13.37	15.71	13.10	12.97
	365	Bholath M	8.44	8.51	7.64	7.45
	366	Bholath S	8.70	9.33	8.22	7.94
	367	Dalla	20.13	21.60	20.48	18.90
	368	Hussainpura-S Pz	-	-	-	18.00
	369	Hussainpura-VS Pz	-	-	-	18.07
	370	Kapurthala2 (s)	20.23	19.66	18.38	17.74
	371	Phagwara2 (s)	25.67	27.83	25.90	25.19
	372	Sultanpur2 (s)	15.30	11.75	14.16	13.91
	373	Talwandi Chaudary -Pz	9.60	9.74	8.87	8.41
LUDHIANA	374	Badowal	9.78	-	-	-
	375	Begowal	9.78	10.64	8.94	9.83
	376	Bhahlolpur-DW	13.23	12.00	12.00	12.13
	377	Chattar Singh Park-ldh	40.01	-	-	-
	378	Doraha-Pz	7.07	6.73	6.85	6.70
	379	Gopalpur 2(s)	15.19	15.85	16.23	15.76
	380	Harnampur	17.85	-	-	-

	381	Habbowal	20.87	20.15	-	-
	382	Ikloha-Pz	20.17	19.98	20.35	20.10
	383	Kadon-Pz	11.08	11.61	-	-
	384	Kalsian	22.80	-	-	-
	385	Khandur	18.55	-	-	-
	386	Lalan1	9.92	10.48	9.40	9.27
	387	Lil- II Pz	13.55	12.31	15.70	15.43
	388	Lil-Pz III	13.59	-	12.63	12.37
	389	Ludhiana 3(vs)	20.87	-	-	-
	390	Maksudra-Pz	-	10.03	9.84	9.65
	391	Mushkabad	11.00	12.61	12.01	11.92
	392	P.A.U.Ludhiana 2(s)	12.73	27.54	25.09	24.83
	393	Punjeta	25.23	-	10.18	10.02
	394	Rajona Khurd	22.10	-	-	-
	395	Rashin	21.24	-	-	-
	396	Samrala 2(s)	13.53	13.79	13.80	15.87
	397	Sherian	4.01	4.13	3.88	3.87
	398	Sidhwan Bet-Pz	11.65	6.49	6.27	6.13
	399	Upplan	8.88	-	-	-
	400	Utlan	13.90	13.11	13.25	11.65
MANSA	401	Bhikhi 2 (s)	14.06	14.60	14.51	14.01
	402	Budhlada	11.62	12.39	11.84	11.49
	403	Budhlada-Pz	11.75	12.36	12.28	11.75
	404	Burj Bhalaike	4.85	0.69	3.84	3.55
	405	Fattamaluka	5.19	4.64	4.91	4.56
	406	Jhanda Khurd Pz	10.65	11.24	-	-
	407	Kot Dhamru	6.89	7.21	7.67	7.23
	408	Kotra	10.05	10.50	10.08	9.78
	409	Raipur-Pz	5.80	7.84	7.65	5.94
	410	Ralla	9.21	9.73	-	8.06
MOGA	411	Baje Ke-Pz	14.74	16.07	14.47	13.69
	412	Budh Singh Wala-Pz	18.54	20.50	20.20	19.54

	413	Chogawan-Pz	28.75	31.11	32.19	29.75
	414	Dagru- Pz	29.53	31.09	32.35	30.55
	415	Damru Khurd	17.33	-	19.70	18.47
	416	Darapur 07pz	23.81	24.73	26.08	23.13
	417	Daulatpur Niwan-Pz	26.22	-	-	-
	418	Himatpura-Pz	26.60	-	-	-
	419	Jhandewala-Pz	29.18	-	-	-
	420	Khokri Kalan-Pz	24.84	-	-	-
	421	Mangewala-Pz	20.96	-	-	-
	422	Nihalsinghwala-Pz	28.05	29.66	30.01	28.51
	423	Raonke Kalan-Pz	25.00	-	-	-
	424	Samalsar-Pz	16.35	-	-	-
MUKTSAR	425	Abulkharana-Pz	1.67	-	-	-
	426	Balocha Khera(rasoolpur)	0.62	0.42	1.05	0.85
	427	Bariwala-Pz	1.73	-	-	-
	428	Bhaliana	8.04	8.23	8.03	7.82
	429	Bhamma(bam)	-	1.30	9.90	-
	430	Bhiti Wala-Pz	1.57	-	-	-
	431	Doda	-	-	2.06	0.31
	432	Doda-Pz	2.86	-	1.76	-
	433	Jhabelwali-Pz	2.60	-	-	-
	434	Jhurar-Pz	2.15	-	-	-
	435	Kabar Wala	2.67	1.88	2.15	2.33
	436	Khunde Halal-Pz	2.20	2.64	1.75	1.60
	437	Killian Wali-Pz	6.28	-	-	-
	438	Kollian Wali-pz	1.30	-	-	-
	439	Kuttianwali	1.04	-	0.19	0.14
	440	Labanianwali	2.61	1.05	2.60	2.37
	441	Lambi	2.00	-	2.26	-0.78
	442	Lambi-Pz	2.58	1.89	1.36	-
	443	Muktsar	4.36	2.48	2.92	3.08
	444	Murar Kalan-Pz	2.45	-	-	-

	445	Phulu Khera-Pz	1.57	-	-	-
	446	Ratta Khera Chota-Pz	2.22	-	-	-
	447	Rupana-Pz	1.80	-	-	-
	448	Wadhai-Pz	2.15	-	-	-
NAWANSHAHR	449	Baharam-Pz	17.00	-	-	-
	450	Bahlora Kallan- Pz	5.89	5.87	5.30	5.21
	451	Bahua-Pz	21.20	-	-	-
	452	Balachore	-	18.28	17.66	17.52
	453	Kariam-Pz	14.70	-	-	-
	454	Mauhra-Pz	31.41	30.64	30.15	29.72
	455	Rahon	9.70	9.83	9.91	9.60
	456	Raipur Dhaba-Pz	14.77	16.11	14.39	14.07
PATIALA	457	Antala	3.74	1.54	2.90	5.00
	458	Banur 07pz	20.14	21.05	20.95	21.17
	459	Bassma Pipla	-	4.88	-	-
	460	Bhankhar-Pz	25.60	-	-	-
	461	Bhojo majri 07pz	20.99	21.93	22.29	21.53
	462	Binzal-Pz	26.30	-	-	-
	463	Birkauli	24.40	26.71	26.32	24.90
	464	Chandiala-Pz	21.30	-	-	-
	465	Chhat	7.35	8.05	7.79	8.02
	466	Dera Bassi 07pz	12.35	11.80	11.59	11.41
	467	Devigarh	29.43	32.66	29.32	
	468	Devigarh 1Pz	29.47	32.88	29.63	29.43
	469	Devigarh IIPz	29.43	32.86	29.71	29.41
	470	Devigarh-III Pz	29.63	32.87	30.20	29.64
	471	Dhakdaba 07	21.92	22.52	23.29	21.40
	472	Gholu majra 07pz	-	9.98	10.15	10.38
	473	Haluka	7.70	6.98	6.82	6.84
	474	Handesaran-s	14.80	14.58	18.99	15.89
	475	Hari Majra	-	5.53	-	-
	476	Harion Kalan-Pz	37.40	-	-	-

	477	Joli	6.90	5.00	3.80	5.22
	478	Kakrala-Pz	32.70	-	-	-
	479	Kalyan 07pz	22.03	23.35	23.20	21.69
	480	Kami Kalan	12.76	11.35		12.59
	481	Kutha Kheri-Pz	31.90	-	-	-
	482	Lacharu Kalan	5.29	3.68	3.67	3.45
	483	Lachkani-Pz	19.40	20.24	19.30	19.06
	484	Miranpur- Pz	25.08	-	30.29	27.50
	485	Mirapur	24.68	25.12	29.89	28.91
	486	Mirpur-Pz	-	3.84	2.41	3.09
	487	Nanhera-Pz	23.90	-	-	-
	488	Nariana	12.80	12.26	11.19	11.57
	489	Patran-Pz	37.27	35.86	36.62	37.33
	490	Rajpura Pz M	-	31.10	29.40	
	491	Samana-Pz	29.90	30.82	30.38	29.65
	492	Samaspur-Pz	23.20	-	-	-
	493	Sangatpura-Pz	23.95	-	25.56	24.45
	494	Singhpura-Pz	24.60	-	-	-
	495	Sirsini	-	0.43	0.94	1.23
	496	Thua	29.96	33.77	33.65	30.09
RUPNAGAR	497	Ahmedpur	5.14	4.87	4.20	3.98
	498	Bera Chauta	4.83	3.18	3.60	3.96
	499	Bhalan	4.65	0.60	2.36	2.97
	500	Braham Pur	4.95	2.15	3.86	4.23
	501	Chakdera	4.25	4.16	4.21	4.12
	502	Chanalon	-	-	8.20	8.72
	503	Chatamli- Pz	39.05	37.55	37.25	33.18
	504	Dhair	6.44	5.40	6.98	7.84
	505	Dheri	5.40	3.75	3.88	4.34
	506	Dumewal	10.58	9.88	9.62	10.22
	507	Dusarna	12.90	-	-	-
	508	Gharoon	17.85	-	-	-

	509	Ghoga	5.33	0.58	2.52	3.93
	510	Hardinamoh	3.04	1.05	1.95	1.90
	511	Kakrali	-	18.89	17.82	18.45
	512	Kharar	-	-	-	12.06
	513	Kurrha-Pz	18.15	-	-	-
	514	Landran	-	-	-	0.82
	515	Landran-Pz	15.75	15.93	18.62	15.45
	516	Rupnagar	-	-	-	9.55
	517	Raipur Kalan	16.10	-	-	-
	518	Rurki Heeran-Pz	19.15	19.37	17.44	17.34
	519	Soara	6.60	4.35	3.88	4.15
SANGRUR	520	Bagarian-Pz	-	27.28	27.74	27.51
	521	Bapla-Pz	29.89	-	-	-
	522	Barnala (s)	31.59	32.50	-	31.42
	523	Bhadaur-Pz	21.49	23.08	-	21.30
	524	Bhojowali-Pz	29.61	33.34	31.70	30.05
	525	Bugra 1	26.38	27.86	27.71	26.26
	526	Chural Kalan M	22.74	24.30	23.81	22.75
	527	Dharamgarh-Pz	23.82	-	-	-
	528	Gahl 07pz	18.01	20.08	20.15	-
	529	Gehlon-Pz	18.20	-	-	18.20
	530	Ghanauri Kalan-Pz	38.18	43.89	37.05	37.00
	531	Hassanpur-Pz	24.96	-	-	-
	532	Kala Jhar-Pz	27.40	-	-	-
	533	Kubbe-Pz	18.60	-	-	-
	534	Kuler Khurd-Pz	28.95	-	-	-
	535	Kurar-Pz	32.60	-	-	-
	536	Ladda-Pz	27.70	29.99	30.06	28.70
	537	Lehal Kalan-Pz	23.88	-	-	-
	538	Longowal-Pz	23.79	24.82	24.56	24.46
	539	Mahal Kalan-Pz	26.46	29.18	27.28	26.35
	540	Malerkotla	31.19	28.86	32.20	-

	541	Malerkotla-DW	31.19	28.86	32.20	31.83
	542	Manvi-Pz	21.36	20.15	19.67	12.49
	543	Mehsampur 07pz	32.58	-	-	32.99
	544	Mehsampur-Pz	29.94	-	-	-
	545	Nangal-Pz	34.50	-	-	-
	546	Panjgaraian- Pz	32.52	-	-	-
	547	Ramgarh-Pz	19.40	-	-	-
	548	Rampur Channa-Pz	23.32	-	-	-
	549	Rurki Kalan-Pz	18.78	-	-	-
	550	Sunam-Pz	35.03	30.75	30.78	30.65
	551	Tappa Mandi-Pz	26.98	-	-	-

SEASONAL WATER LEVEL FLUCTUATION (m)					ANNEXURE II	
DISTRICT	**Sl. No.**	**Locations**	**Jan2013 &May2013**	**May2013 &Aug2013**	**May2013 &Nov2013**	**May2013 &Jan2014**
CHANDIGARH	1	Burail	-1.81	0.65	1.80	1.83
	2	Csio-combined	3.29	-1.53	-0.05	-0.20
	3	CSIO-S	-0.97	1.15	0.98	0.95
	4	MaloyaPZM	-0.02	0.72	0.46	1.18
	5	New Industrial Area	-1.97	9.70	4.30	-0.05
	6	Sec-27, Ar Well	-1.15	-0.10	-0.15	-0.37
	7	SECT 10C (D)	-2.12	1.80	0.91	-0.20
	8	SECT 10C (S)	-	1.40	-0.69	-0.30
	9	SECT 21D (D)	-1.33	1.35	0.78	1.25
	10	SECT 31D (D)	-1.68	0.34	0.87	2.28
	11	SECT 31D (S)	-0.25	-1.63	-1.83	-1.22
	12	SECT 37D (S)	-2.20	2.44	1.93	4.00
	13	SECT 39D (S)	0.79	1.92	1.25	1.25
	14	SECT 44D (S)	1.50	0.10	-0.50	-0.54
	15	Sector 52- PZ	-0.88	0.40	-0.12	0.35
	16	Sector-46 (shallow)	1.04	0.08	-0.26	-0.37
AMRITSAR	17	Aima Khurd-Pz	-	-0.90	-	0.79
	18	Ajnala	-	-0.20	0.38	0.83
	19	Aminshah Khalra	-1.47	1.82	1.74	2.13
	20	Amritsar1	-0.67	0.04	0.40	-
	21	Bahla-Pz	-	-1.10	-	-
	22	Beas07	-0.41	0.86	0.58	0.54
	23	Bhikiwind- Pz	-0.18	-0.96	-0.17	0.30
	24	Boparai Khurd-Pz	-	-2.10	-	0.00
	25	Chabal 07	0.13	-0.77	0.02	0.50
	26	ChogWan- Pz	-1.59	-0.55	1.12	2.57
	27	Chola Sahib-Pz	0.37	-1.74	-0.51	-0.20
	28	Chuselawad-Pz	-	-1.12	-	0.40
	29	Gago Mahal- Pz	-0.05	0.80	1.25	1.15
	30	Gandi Wind-Pz	-0.21	0.54	0.88	0.96

	31	Goindwal 07	-0.35	1.13	0.69	0.66
	32	Jandiala Guru-Pz	-0.32	-0.43	-0.01	0.69
	33	Kalsia Kalan	0.37	-	-0.06	-
	34	Kalsia Kalan07	-0.11	-0.97	-0.06	0.44
	35	Khilchian-Pz	-	-1.10	-	0.70
	36	Kotli Sur Singh-Pz	-	-1.10	-	0.21
	37	Mohawa	-0.58	-0.19	0.52	0.90
	38	Nawan Tanal- Pz	-0.84	0.67	1.28	1.29
	39	Rampura-Pz	-	-1.68	-	3.22
	40	Ratoke-Pz	-0.70	-1.66	1.31	1.67
	41	Rupowal Brahmana-Pz	-	-1.10	-	-0.70
	42	Sahab Pura- Pz	0.15	-0.52	-1.09	0.69
	43	Talwandi Dogra-Pz	-	-5.00	-	-2.00
	44	Thatha- Pz	-	-1.13	-	0.37
	45	Wachhoya-Pz	-	-1.70	-	1.60
BATHINDA	46	Ablu	-1.09	-0.35	-0.11	0.28
	47	Badiala-Pz	-0.10	-2.24	-0.80	-0.14
	48	Bahman Jassa Singh-Pz	-0.04	-	-	-0.10
	49	Balluana1	-0.07	0.70	0.39	0.46
	50	Bhagibandar	-0.11	0.16	2.53	0.27
	51	Deratapp	-0.36	0.18	-0.12	0.01
	52	Dhapali1	-1.90	-0.82	-1.05	0.46
	53	Dhapali-Pz	-0.37	-1.83	-1.04	-0.55
	54	Dialpur Mirza	-0.01	-2.18	-1.30	-0.41
	55	Dialpura Bhlaike	-0.28	-0.79	0.09	0.00
	56	Ganga-Pz	-0.05	-0.80	-0.17	0.05
	57	Gill Patti-DW	-0.04	-	-	0.11
	58	Gulabgarh 1 (vs)	-0.03	0.49	1.93	
	59	Gulabgarh 2 (s)	-0.40	-	-0.33	0.47
	60	Guru Sar-Pz	-0.62	0.90	0.96	1.19
	61	Gurusar	0.32	-	-	-
	62	Harraipur-Pz	-0.08	-	-	-
	63	Jajjal	-1.25	0.35	0.36	0.56

	64	Jassi Bhagwali	-	2.23	2.50	2.66
	65	Jhanduke	4.93	-2.95	-0.28	-0.10
	66	Kahan Singh Wala-DW	-0.20	-	-	0.26
	67	Kalla Bandar	0.83	-0.27	-2.90	-0.05
	68	Kot Shamir	0.15	-0.23	-0.18	0.17
	69	Kothaguru-Pz	0.17	-1.17	-1.00	-0.41
	70	Lahri	-0.01	0.38	0.64	0.73
	71	Lehra Khanna-Dw	-0.40	-	-	0.15
	72	Maisar Khana	-0.36	0.28	0.84	1.12
	73	Maisar Khana-Pz	0.00	-	-	0.06
	74	Nahinwala	-0.94	1.25	1.80	1.55
	75	Phul	-0.53	-1.71	-2.47	-1.18
	76	Phulla	-0.15	-0.13	-1.70	
	77	Phulla1	-0.15	-0.69	-0.85	-0.35
	78	Puhla-Pz	-1.50	-	-	0.80
	79	Raike Kalan	0.32	-0.02	0.25	0.55
	80	Rajgarh Kubey-Pz	0.02	-	-	-0.20
	81	Rampura	-0.60	-2.50	-2.70	-1.44
	82	Sangat -Pz	-0.01	0.35	0.55	0.56
	83	Seema-DW	-0.15	-	-	0.29
	84	Teona-Pz	-0.10	-	-	0.49
FARIDKOT	85	Bead Sikhanwala- Pz	0.75	0.86	1.35	
	86	Burj Jawahar Singh-Pz	-1.70	-	-	-0.05
	87	Chahd Baja	0.58	-0.53	-0.63	0.25
	88	Devrana-Pz	-1.68	-	-	1.72
	89	Dhaipai-Pz	-0.30	-	-	-0.09
	90	Dhilwan Kalan	-0.15	-0.50	0.15	0.35
	91	Dipsinghwala	-0.32	1.25	0.15	0.34
	92	Karirwali	-0.26	1.12	2.06	2.11
	93	Kot Kapura	0.07	-0.70	-0.65	-0.32
	94	Matta	-0.18	-0.76	-0.34	-0.19
	95	Mehmuana	-0.03	2.08	1.08	1.13
	96	Bagga Kalan	-	-	-	0.15

	97	Balpur	-	-	-	-0.55
	98	Bassi Pathana	-0.51	-0.75	-0.18	1.49
	99	Bhagrana	-0.24	-4.36	2.30	1.24
	100	Bhateri1	1.60	-0.07	-1.24	-0.67
	101	Burj	-	-	-	1.05
	102	Fatehgarh Sahib	-	-0.20	-	-
	103	Fatehgarh Sahib-Pz	-0.38	-	-1.31	1.33
	104	Pawala	1.52	6.88	0.82	0.32
FIROZPUR	105	Abohar	-0.43	-0.06	-0.41	-0.26
	106	Alamgarh	-0.31	0.55	0.03	0.18
	107	Bannawala	0.09	-	0.56	0.82
	108	Bara Mansur Wala-Pz	0.30	-	-	-
	109	Bazirdpura	0.23	-	-0.08	8.00
	110	Chak Kala Tibba	-0.07	-0.72	0.30	-0.30
	111	Chamb-Pz	0.45	-	-	-
	112	Danewal Satkosi	-0.04	0.38	0.10	0.30
	113	Dipulana-Pz	-0.58	0.55	1.41	-
	114	Gogiani-Pz	0.10	-	-	-
	115	Jaimal Singhwala Pz	0.99	-0.38	0.33	0.69
	116	Khuiansarwar- Pz	-0.30	1.05	0.35	0.58
	117	Kundal1	-0.25	-	-0.69	0.53
	118	Ladhuwala	-0.76	1.14	0.64	0.13
	119	Lauhke Kalan- Pz	1.11	-	-1.29	-
	120	Lohere Khurd-Pz	-0.05	-	-	-
	121	Mallanwala Khas-Pz	0.05	-	-	-
	122	Malluwala-Pz	0.26	-	-	-
	123	Malsian-Pz	-0.02	-0.80	-0.07	-
	124	Mohre Wala-Pz	0.75	-0.53	0.40	-
	125	Motiwala 07pz	-0.94	-0.38	0.79	0.87
	126	Nihalkhera	-0.43	0.65	0.05	0.58
	127	Nure-Ki-Uttar 07pz	0.29	-0.96	-9.83	0.46
	128	Piyarana	-0.07	2.11	0.92	1.16
	129	Sham Singhwala-Pz	-0.39	1.55	1.04	0.69

	130	Sitoganno	0.36	0.52	0.21	0.30
	131	Sohangarh Ratte	-1.06	0.12	0.84	1.50
	132	Swah Wala- Pz	-0.28	-0.13	0.56	-
	133	Talwandi Jalle Khan-pz	-0.02	-	-	-
	134	Tibbi Taiwan Laluwalla-Pz	-0.27	-	-	-
	135	Waryam Khera	0.50	0.18	-	-
GURDASPUR	136	Aulakhkalan	-0.40	2.92	1.40	1.58
	137	Bamyal	-0.74	2.76	0.80	1.12
	138	Bhagowal	-0.57	-	-	1.34
	139	Bham	-1.66	0.86	1.63	1.61
	140	Bhoa	-0.50	1.52	0.37	0.61
	141	Dakoha-Pz	-0.23	-0.20	1.03	1.34
	142	Dera Baba Nanak	-0.03	2.06	1.49	1.47
	143	Dhianpur	-0.63	0.60	-5.69	-3.76
	144	Galri	-0.70	3.46	0.60	1.52
	145	Ghania Ki bangar- Pz	-0.27	0.43	1.10	1.07
	146	Gharotakalan	-2.51	4.37	3.57	3.53
	147	Ghoh	-0.06	1.20	7.41	-
	148	Ghoh DW	-2.33	6.80	8.67	8.72
	149	Hargobindpur	-0.49	0.83	1.05	0.88
	150	Jhakolahri	-0.20	0.26	-0.46	-0.19
	151	Kalanaur-Pz	-0.84	1.86	2.10	2.14
	152	Khanikhui	-0.34	0.80	0.22	0.55
	153	Madipur Fatehgarhchuria	-0.07	0.15	0.70	0.74
	154	Mullowali 1(vs)	0.00	1.67	0.69	0.90
	155	Mullowali 2(m)	0.12	-	0.00	1.44
	156	Nawan Pind	0.05	2.66	1.89	0.55
	157	Nishayara	-0.73	2.12	2.03	1.92
	158	Pandoritalab	-0.30	0.89	0.47	0.40
	159	Pathankot1	-1.73	2.11	1.43	0.02
	160	Quaddian -Pz	0.00	-	-	-
	161	Saleh Chak-S	-	2.53	-	1.24
	162	Salehchak(vs)	-	2.51	-	1.32

	163	Sarna1	-0.28	4.35	0.65	0.32
	164	Sathial-Pz	-0.84	1.44	0.25	1.69
HOSHIARPUR	165	Adowal Garhi-Pz	-1.04	0.05	0.06	0.19
	166	Bhamnaur	-1.65	6.26	5.12	4.04
	167	Chohal	0.32	3.29	0.73	-0.04
	168	Dasuya2 (s)	-1.36	-0.60	0.87	0.71
	169	Durimiwal	-0.40	1.39	1.02	0.81
	170	Garh Di Wala-Pz	-2.75	1.42	0.59	1.73
	171	Garhshankar (s)	-2.07	-0.27	4.95	5.71
	172	Hazipur	-1.01	4.79	2.03	1.43
	173	Mahilpur-Pz	-4.24	0.36	-0.12	-0.01
	174	Mukerian Dw	-0.48	0.99	1.28	0.67
	175	Nangal Bihala- DW	-0.90	1.45	2.65	2.52
	176	Phuglana- Pz	-4.94	1.48	3.99	6.13
	177	Rampur Colonypz-medium	-1.61	3.53	2.36	-1.03
	178	Sham Chaurasi	-	0.50	-	-
	179	Simbli-Pz	-0.95	-	0.68	1.37
	180	Talwara1	-0.51	0.96	0.91	1.08
	181	Thakarwala	-0.58	1.08	0.53	0.19
JALANDHAR	182	Adampur 1(d)	-5.93	-4.35	3.84	7.74
	183	Adampur 3(s)	-1.22	-0.12	1.30	1.67
	184	Adarman-Pz	0.27	-	-	-
	185	Allawalpur	-0.70	1.51	1.19	-
	186	Gohiran	-3.69	-0.73	1.91	-
	187	Jalandhar 3(vs)	-1.81	-0.55	-0.35	0.58
	188	Jandiala-Pz	0.27	-	-0.89	-0.02
	189	Kalyanpur-Pz	1.02	-	-	-
	190	Kartarpur 2(s)	-2.62	1.96	3.10	2.54
	191	Kharal Kalan Pz-S	-4.45	2.01	1.94	3.74
	192	Lallian kalan Pz-S	-4.28	-2.23	-1.19	-0.42
	193	Nakodar 2(m)	0.08	-2.78	0.23	-1.67
	194	Nakodar 3(s)	0.21	-2.59	-1.99	-0.95
	195	Nangal Shaman	-0.63	-	-	-

	196	Nussi-Pz	1.16	-	-	-
	197	Phillaur 2(s)	-0.35	-0.39	-0.28	-0.17
	198	Sarih Pz-S	1.14	-	-	-1.15
	199	Shahkot(s)	0.41	1.44	-2.61	-0.36
	200	Talwan-Pz	0.60	-	-	-
	201	Udhopur	-0.98	2.48	1.33	0.90
KAPURTHALA	202	Bhatnura Khurd- S	-0.20	-2.34	0.27	0.40
	203	Bholath M	-0.53	-0.07	0.80	0.99
	204	Bholath S	-	-0.63	0.48	0.76
	205	Dalla	-0.90	-1.47	-0.35	1.23
	206	Kapurthala2 (s)	-3.25	0.57	1.85	2.49
	207	Phagwara2 (s)	-0.79	-2.16	-0.23	0.48
	208	Sultanpur2 (s)	-1.43	3.55	1.14	1.39
	209	Talwandi Chaudary -Pz	-0.14	-0.14	0.73	1.19
LUDHIANA	210	Badowal	0.07	-	-	-
	211	Begowal	0.07	-0.86	0.84	-0.05
	212	Bhahlolpur-DW	-0.69	1.23	1.23	1.10
	213	Doraha-Pz	-0.31	0.34	0.22	0.37
	214	Gopalpur 2(s)	0.10	-0.66	-1.04	-0.57
	215	Habbowal	-	0.72	-	-
	216	Ikloha-Pz	-0.27	0.19	-0.18	0.07
	217	Kadon-Pz	-	-0.53	-	-
	218	Lalan1	-0.62	-0.56	0.52	0.65
	219	Lil- II Pz	-0.28	1.24	-2.15	-1.88
	220	Lil-Pz III	-1.12	-	0.96	1.22
	221	Maksudra-Pz	-	0.97	1.16	1.35
	222	Mushkabad	-0.87	0.12	0.72	0.81
	223	P.A.U.Ludhiana 2(s)	3.70	-2.31	0.14	0.40
	224	Punjeta	0.24	-	-0.36	-0.20
	225	Samrala 2(s)	0.56	-0.26	-0.27	-2.34
	226	Sherian	0.01	-0.12	0.13	0.14
	227	Sidhwan Bet-Pz	-3.53	5.16	5.38	5.52
	228	Utlan	-	0.79	0.65	2.25

MANSA	229	Bhikhi 2 (s)	-0.05	-0.54	-0.45	0.05
	230	Budhlada	-0.17	-0.77	-0.22	0.13
	231	Budhlada-Pz	-0.24	-0.61	-0.53	0.00
	232	Burj Bhalaike	-0.99	4.16	1.01	1.30
	233	Fattamaluka	-0.05	0.55	0.28	0.63
	234	Jhanda Khurd Pz	1.76	-0.59	-	-
	235	Kot Dhamru	-0.09	-0.32	-0.78	-0.34
	236	Kotra	0.00	-0.45	-0.03	0.27
	237	Raipur-Pz	2.33	-2.04	-1.85	-0.14
	238	Ralla	0.20	-0.52	-	1.15
MOGA	239	Baje Ke-Pz	5.36	-1.33	0.27	1.05
	240	Budh Singh Wala-Pz	0.31	-1.96	-1.66	-1.00
	241	Chogawan-Pz	0.69	-2.36	-3.44	-1.00
	242	Dagru- Pz	0.82	-1.56	-2.82	-1.02
	243	Damru Khurd	0.65	-	-2.37	-1.14
	244	Darapur 07pz	-0.86	-0.92	-2.27	0.68
	245	Nihalsinghwala-Pz	1.80	-1.61	-1.96	-0.46
	246	Raonke Kalan-Pz	-2.40	-	-	-
	247	Samalsar-Pz	-1.00	-	-	-
MUKTSAR	248	Abulkharana-Pz	0.14	-	-	-
	249	Balocha Khera(rasoolpur)	-0.23	0.20	-0.43	-0.23
	250	Bhaliana	-1.07	-0.19	0.01	0.22
	251	Bhiti Wala-Pz	-0.03	-	-	-
	252	Doda-Pz	-0.34	-	1.10	-
	253	Jhabelwali-Pz	-0.80	-	-	-
	254	Jhurar-Pz	-0.45	-	-	-
	255	Kabar Wala	0.07	0.79	0.52	0.34
	256	Khunde Halal-Pz	-0.05	-0.44	0.45	0.60
	257	Killian Wali-Pz	-0.10	-	-	-
	258	Kuttianwali	0.13	-	0.85	0.90
	259	Labanianwali	-0.56	1.56	0.01	0.24
	260	Lambi	-0.20	-	-0.26	2.78
	261	Lambi-Pz	-0.14	0.69	1.22	-

	262	Muktsar	-0.28	1.88	1.44	1.28
	263	Murar Kalan-Pz	-0.70	-	-	-
	264	Phulu Khera-Pz	0.02	-	-	-
NAWAN SHAHR	265	Baharam-Pz	0.34	-	-	-
	266	Bahlora Kallan- Pz	-0.55	0.02	0.59	0.68
	267	Bahua-Pz	0.12	-	-	-
	268	Kariam-Pz	-0.65	-	-	-
	269	Mauhra-Pz	-1.81	0.77	1.26	1.69
	270	Rahon	-0.35	-0.13	-0.21	0.10
	271	Raipur Dhaba-Pz	-0.79	-1.34	0.38	0.70
PATIALA	272	Antala	1.01	2.20	0.84	-1.26
	273	Banur 07pz	-0.09	-0.91	-0.81	-1.03
	274	Bhankhar-Pz	11.40	-	-	-
	275	Bhojo majri 07pz	-1.29	-0.94	-1.30	-0.54
	276	Binzal-Pz	-0.05	-	-	-
	277	Birkauli	0.72	-2.31	-1.92	-0.50
	278	Chandiala-Pz	2.82	-	-	-
	279	Chhat	-	-0.70	-0.44	-0.67
	280	Dera Bassi 07pz	-0.65	0.55	0.76	0.94
	281	Devigarh	-1.90	-3.23	0.11	-
	282	Devigarh 1Pz	-1.94	-3.41	-0.16	0.04
	283	Devigarh IIPz	-0.15	-3.43	-0.28	0.02
	284	Devigarh-III Pz	-1.36	-3.24	-0.57	-0.01
	285	Dhakdaba 07	-0.08	-0.60	-1.37	0.52
	286	Haluka	-0.22	0.72	0.88	0.86
	287	Handesaran-s	-0.12	0.22	-4.19	-1.09
	288	Joli	-0.67	1.90	3.10	1.68
	289	Kalyan 07pz	-0.13	-1.32	-1.17	0.34
	290	Kami Kalan	0.69	1.41	-	0.17
	291	Lacharu Kalan	-0.80	1.61	1.62	1.84
	292	Lachkani-Pz	-0.60	-0.84	0.10	0.34
	293	Miranpur- Pz	3.34	-	-5.21	-2.42
	294	Mirapur	3.34	-0.44	-5.21	-4.23

	295	Nanhera-Pz	-2.20	-	-	-
	296	Nariana	0.02	0.54	1.61	1.23
	297	Patran-Pz	-2.02	1.41	0.65	-0.06
	298	Samana-Pz	2.05	-0.92	-0.48	0.25
	299	Samaspur-Pz	0.50	-	-	-
	300	Sangatpura-Pz	-0.11	-	-1.61	-0.50
	301	Singhpura-Pz	0.70	-	-	-
	302	Thua	4.68	-3.81	-3.69	-0.13
RUPNAGAR	303	Ahmedpur	-0.52	0.27	0.94	1.16
	304	Bera Chauta	-0.15	1.65	1.23	0.88
	305	Bhalan	-1.00	4.05	2.29	1.68
	306	Braham Pur	-0.35	2.80	1.09	0.73
	307	Chakdera	0.10	0.09	0.04	0.13
	308	Chatamli- Pz	-9.80	1.50	1.80	5.87
	309	Dhair	1.83	1.04	-0.54	-1.40
	310	Dheri	-0.12	1.65	1.52	1.06
	311	Dumewal	1.18	0.70	0.96	0.36
	312	Dusarna	-0.10	-	-	-
	313	Gharoon	-0.15	-	-	-
	314	Ghoga	0.14	4.75	2.81	1.40
	315	Hardinamoh	-0.80	1.99	1.09	1.14
	316	Kurrha-Pz	3.55	-	-	-
	317	Landran-Pz	-2.29	-0.18	-2.87	0.30
	318	Raipur Kalan	0.60	-	-	-
	319	Rurki Heeran-Pz	-1.23	-0.22	1.71	1.81
	320	Soara	-0.33	2.25	2.72	2.45
SANGRUR	321	Barnala (s)	-	-0.91	-	0.17
	322	Bhadaur-Pz	0.04	-1.59	-	0.19
	323	Bhojowali-Pz	-0.06	-3.73	-2.09	-0.44
	324	Bugra 1	5.39	-1.48	-1.33	0.12
	325	Chural Kalan M	-0.18	-1.56	-1.07	-0.01
	326	Dharamgarh-Pz	-0.03	-	-	-
	327	Gahl 07pz	-	-2.07	-2.14	

	328	Gehlon-Pz	-0.49	-	-	0.00
	329	Ghanauri Kalan-Pz	-	-5.71	1.13	1.18
	330	Hassanpur-Pz	-0.10	-	-	-
	331	Kala Jhar-Pz	-0.25	-	-	-
	332	Kubbe-Pz	-0.35	-	-	-
	333	Kuler Khurd-Pz	-0.15	-	-	-
	334	Kurar-Pz	-1.35	-	-	-
	335	Ladda-Pz	0.08	-2.29	-2.36	-1.00
	336	Lehal Kalan-Pz	-0.13	-	-	-
	337	Longowal-Pz	-0.06	-1.03	-0.77	-0.67
	338	Mahal Kalan-Pz	0.26	-2.72	-0.82	0.11
	339	Malerkotla	-0.36	2.33	-1.01	-
	340	Malerkotla-DW	-0.36	2.33	-1.01	-0.64
	341	Manvi-Pz	-	1.21	1.69	8.87
	342	Mehsampur-Pz	-0.14	-	-	-3.05
	343	Nangal-Pz	-0.75	-	-	-
	344	Ramgarh-Pz	-0.38	-	-	-
	345	Sunam-Pz	-5.44	4.28	4.25	4.38
	346	Tappa Mandi-Pz	-0.45	-	-	-

ANNUAL WATER LEVEL FLUCTUATION (M)					ANNEXURE III	
DISTRICT	**S. No.**	**Locations**	**May 2012 & 2013**	**Aug 2012 & 2013**	**Nov 2012 & 2013**	**Jan 2013 &2014**
CHANDIGARH	1	Burail	-1.50	-1.50	-0.32	0.02
	2	Csio-combined	3.20	-	0.20	3.09
	3	CSIO-S	-3.63	-	0.08	-0.02
	4	MaloyaPZM	-	0.16	0.46	1.16
	5	New Industrial Area	-2.45	4.80	3.43	-2.02
	6	Sec-27, Ar Well	-1.65	-0.60	-3.50	-1.52
	7	SECT 10C (D)	-	22.50	0.31	-2.32
	8	SECT 10C (S)	-	-	-0.83	-
	9	SECT 21D (D)	-	0.45	-4.49	-0.08
	10	SECT 31D (D)	-0.40	0.22	-0.85	0.60
	11	SECT 31D (S)	2.15	1.20	-2.14	-1.47
	12	SECT 37D (S)	0.14	0.54	-0.27	1.80
	13	SECT 39D (S)	-0.85	0.64	0.42	2.04
	14	SECT 44D (S)	1.40	0.48	-0.52	0.96
	15	Sector 52- PZ	-0.10	-2.00	-1.27	-0.53
	16	Sector-46 (shallow)	2.80	6.18	0.64	0.67
AMRITSAR	17	Ajnala	0.15	0.55	1.95	-
	18	Aminshah Khalra	-	-	-0.38	0.66
	19	Amritsar1	-0.45	-0.51	-3.85	-
	20	Beas07	-0.03	0.72	0.25	0.13
	21	Bhalaipur-Pz	-	-	0.13	-
	22	Bhikiwind- Pz	-0.15	-0.51	-	0.12
	23	Chabal 07	-0.50	-0.35	-	0.63
	24	ChogWan- Pz	-0.37	0.30	-0.95	0.98
	25	Chola Sahib-Pz	-	0.39	-0.03	0.17
	26	Gago Mahal- Pz	-0.30	1.47	0.92	1.10
	27	Gandi Wind-Pz	-0.60	1.42	0.08	0.75
	28	Goindwal 07	0.14	1.55	0.19	0.31
	29	Jandiala Guru-Pz	-0.59	-	-0.16	0.37

	30	Kalsia Kalan	0.92	-	-0.20	-
	31	Kalsia Kalan07	0.44	-0.05	-0.20	0.33
	32	Khadur Sahib-Pz	0.26	0.41	0.18	0.35
	33	Mohawa	-0.02	0.87	0.70	0.32
	34	Nawan Tanal- Pz	-	1.31	0.68	0.45
	35	Ratoke-Pz	-0.63	3.26	-0.24	0.97
	36	Sahab Pura- Pz	-0.57	-0.37	-0.57	0.84
BATHINDA	37	Ablu	-0.84	0.01	0.02	-0.81
	38	Badiala-Pz	-2.18	-	-0.29	-0.24
	39	Bahman Jassa Singh-Pz	-0.50	-	-	-0.14
	40	Balluana1	-0.16	0.13	0.40	0.39
	41	Bhagibandar	0.07	0.40	2.63	0.16
	42	Deratapp	-0.29	-1.68	-1.39	-0.35
	43	Dhapali1	-0.13	-1.62	-0.73	-1.44
	44	Dhapali-Pz	-1.86	-1.10	-0.81	-0.92
	45	Dialpur Mirza	1.84	-0.70	-0.38	-0.42
	46	Dialpura Bhlaike	-1.12	0.63	2.51	-0.28
	47	Ganga-Pz	-	-0.07	0.29	0.00
	48	Ghudda	-	0.65	0.50	0.86
	49	Gill Patti-DW	-0.54	-	-	0.07
	50	Gulabgarh 1 (vs)	-1.26	0.70	2.02	-
	51	Gulabgarh 2 (s)	-1.50	-	-1.27	0.07
	52	Guru Sar-Pz	-0.51	0.57	0.37	0.57
	53	Gurusar	-0.02	-	-	-
	54	Jajjal	-0.03	0.51	1.29	0.48
	55	Jassi Bhagwali	-1.09	1.48	2.72	1.41
	56	Jassi Paowali-Pz	-	-0.07	-	-
	57	Jhanduke	-0.19	-	-	4.83
	58	Jhanduke-Pz	-	-	0.04	-
	59	Kahan Singh Wala-DW	-0.81	-	-	0.06
	60	Kalla Bandar	1.45	-0.85	-1.75	0.78
	61	Kot Shamir	0.21	0.13	0.55	0.32

	62	Kothaguru-Pz	-1.03	-0.40	-0.28	-0.24
	63	Lahri	-0.07	0.58	0.54	0.72
	64	Lehra Khanna-Dw	-1.22	-	-	-0.25
	65	Maisar Khana	-0.92	2.14	-	0.76
	66	Maisar Khana-Pz	-	-	-0.68	0.06
	67	Nahinwala	-1.32	0.61	1.02	0.61
	68	Phul	-1.82	-1.39	-1.86	-1.71
	69	Phulla	-1.12	0.02	-1.54	-
	70	Phulla1	-1.12	-0.54	-2.79	-0.50
	71	Puhla-Pz	-2.45	-	-	-0.70
	72	Raike Kalan	-0.43	1.14	0.74	0.87
	73	Rajgarh Kubey-Pz	-	-	-	-0.18
	74	Rampura	-2.20	-1.11	-2.00	-2.04
	75	Sangat -Pz	-	-	0.59	0.55
	76	Seema-DW	-0.73	-	-	0.14
	77	Teona-Pz	-0.66	-	-	0.39
FARIDKOT	78	Bead Sikhanwala- Pz	-0.44	1.40	0.59	-
	79	Burj Jawahar Singh-Pz	-1.55	-	-	-1.75
	80	Chahd Baja	-0.42	1.05	0.62	0.83
	81	Devrana-Pz	-0.80	-	-	0.04
	82	Dhaipai-Pz	-0.40	-	-	-0.39
	83	Dhilwan Kalan	-0.34	0.38	0.30	0.20
	84	Dipsinghwala	0.03	1.46	-0.38	0.02
	85	Karirwali	-0.97	1.52	1.98	1.85
	86	Kot Kapura	-0.58	-0.75	-0.74	-0.25
	87	Matta	-0.69	0.04	-0.13	-0.37
	88	Mehmuana	0.02	2.00	1.31	1.10
	89	Sher Singh Wala- Pz	-0.24	2.90	1.42	-
FATEH GARH	90	Amloh1	-1.33	-1.72	-3.10	-0.73
	91	Badalialasingh	-0.86	-14.65	-1.36	3.75
	92	Bagga Kalan	-1.25	-	-	-
	93	Balpur	-0.75	-	-	-

	94	Bassi Pathana	-1.04	1.37	-0.99	0.98
	95	Bhagrana	-0.27	-	1.57	1.00
	96	Bhateri1	0.10	1.29	-0.89	0.93
	97	Burj	-2.05	-	-	-
	98	Fatehgarh Sahib	-0.50	-	-	-
	99	Fatehgarh Sahib-Pz	-1.28	-0.76	-1.77	0.95
	100	Jai Singh Wala	0.10	-	-	-
	101	Jhambela	-1.05	-	-	-
	102	Lohar Majra	-1.17	-	-	-
	103	Nalini-Pz	-	-3.83	-	-
	104	Pawala	-0.48	-	1.29	1.84
	105	Sado Majra	0.20	-	-	-
	106	Shahpur	-0.45	-	-	-
	107	Tahalpur	-0.35	-	-	-
	108	Talwara	-1.55	-	-	-
FIROZPUR	109	Abohar	-0.21	0.11	-0.43	-0.69
	110	Alamgarh	-0.15	-0.68	-0.01	-0.13
	111	Bannawala	1.10	-	1.00	0.91
	112	Bazirdpura	0.25	-	0.28	8.23
	113	Chak Kala Tibba	-0.07	0.03	0.52	-0.37
	114	Chamb-Pz	-0.13	-	-	-
	115	Danewal Satkosi	0.25	1.05	1.25	0.26
	116	Dipulana-Pz	-0.03	0.65	0.71	-
	117	Gogiani-Pz	-0.54	-	-	-
	118	Jaimal Singhwala Pz	0.11	0.59	0.69	1.68
	119	Khuiansarwar- Pz	0.09	1.32	0.31	0.28
	120	Kundal1	0.05	-	-0.92	0.28
	121	Ladhuwala	0.46	0.05	-0.03	-0.63
	122	Lauhke Kalan- Pz	0.02	-	0.94	-
	123	Malluwala-Pz	-0.14	-	-	-
	124	Malsian-Pz	-0.53	0.49	0.12	-
	125	Mohre Wala-Pz	-0.48	1.34	0.61	-

	126	Motiwala 07pz	0.72	-0.03	0.45	-0.07
	127	Nihalkhera	0.40	1.79	0.27	0.15
	128	Nure-Ki-Uttar 07pz	-0.14	1.70	-9.27	0.75
	129	Piyarana	0.43	3.44	0.91	1.09
	130	Sham Singhwala-Pz	-0.31	1.30	0.42	0.30
	131	Sitoganno	0.40	0.96	0.60	0.66
	132	Sohangarh Ratte	0.13	-0.15	0.33	0.44
	133	Swah Wala- Pz	-0.19	0.63	0.54	-
	134	Waryam Khera	0.53	0.37	-	-
GURDASPUR	135	Aulakhkalan	0.66	-	-	1.18
	136	Bamyal	-0.08	0.95	-	0.38
	137	Bhagowal	-	-	-	0.77
	138	Bham	-1.83	0.06	-1.03	-0.05
	139	Bhoa	-0.04	-0.62	0.00	0.11
	140	Chahal Kalan-Pz	-1.50	-	-	-
	141	Dakoha-Pz	-0.71	0.78	0.78	1.11
	142	Dera Baba Nanak	-0.52	1.69	1.77	1.44
	143	Dhianpur	-0.29	1.31	-	-4.39
	144	Dinanagar	-	-	-	0.26
	145	Galri	-0.83	2.34	0.00	0.82
	146	Ghania Ki bangar- Pz	-0.50	1.29	1.02	0.80
	147	Gharotakalan	-2.05	2.33	-	1.02
	148	Ghoh	7.74	3.29	12.27	-
	149	Ghoh DW	4.47	6.62	10.76	6.39
	150	Harchowal-Pz	-1.35	-	-	-
	151	Hargobindpur	-0.44	0.46	-0.34	0.39
	152	Jhakolahri	-0.28	-0.54	-0.39	-0.39
	153	Kalanaur2	-	-	0.95	0.85
	154	Kalanaur-Pz	-	2.99	1.43	1.30
	155	Khanikhui	0.30	0.20	0.47	0.21
	156	Madipur Fatehgarhchuria	-0.52	1.23	0.37	0.67
	157	Malikpur-Pz	0.00	-	-	-

	158	Mallewal-Pz	-1.48	-	-	-
	159	Masana-Pz	-0.15	-	-	-
	160	Massit-Pz	-1.72	-	-	-
	161	Mullowali 1(vs)	-	2.13	-	0.90
	162	Mullowali 2(m)	-	-	-	1.56
	163	Nawan Pind	-0.34	-1.36	-1.11	0.60
	164	Nishayara	-1.03	-	1.55	1.19
	165	Pandoritalab	0.12	0.8	0.27	0.10
	166	Pathankot1	-1.38	-2.06	-1.49	-1.71
	167	Quaddian -Pz	-0.48	-	-	-
	168	Sarna1	-0.75	1.85	-0.40	0.04
	169	Sathial-Pz	-	1.45	-0.56	0.85
	170	Shikar-Pz	-1.84	-	-	-
HOSHIARPUR	171	Adowal Garhi-Pz	-2.09	-0.74	-1.77	-0.85
	172	Bhamnaur	-1.70	5.07	2.38	2.39
	173	Chohal	-0.95	5.06	0.68	0.28
	174	Dasuya2 (s)	-1.48	-3.22	-	-0.65
	175	Durimiwal	0.19	1.31	0.54	0.41
	176	Garh Di Wala-Pz	0.05	-0.75	-0.68	-1.02
	177	Garhshankar (s)	-2.55	-3.32	2.64	3.64
	178	Hazipur	-0.48	4.01	1.34	0.42
	179	Mahilpur-Pz	-1.34	-0.72	-1.78	-4.25
	180	Mukerian Dw	-0.03	1.31	0.76	0.19
	181	Nangal Bihala- DW	-0.77	-1.65	2.30	1.62
	182	Phuglana- Pz	1.60	4.40	3.93	1.19
	183	Rampur Colony (HSP) pz-medium	-0.24	6.99	2.72	-2.64
	184	Sham Chaurasi	-0.47	-	-	-
	185	Simbli-Pz	-	-	0.68	0.42
	186	Talwara1	-0.09	0.05	0.35	0.57
	187	Thakarwala	-1.25	-1.80	-0.17	-0.39
JALANDHAR	188	Adampur 1(d)	-5.05	-7.31	2.36	1.81
	189	Adampur 3(s)	-0.92	-0.59	0.58	0.45

	190	Adarman-Pz	-0.40	-	-	-
	191	Allawalpur	1.73	1.92	0.42	-
	192	Billi Chahrami-Pz	-1.90	-	-	-
	193	Gohiran	-	-5.44	-3.30	-
	194	Hardo Pharwal-Pz	-1.95	-	-	-
	195	Jalandhar 3(vs)	-1.37	-3.72	-1.99	-1.23
	196	Jandiala-Pz	3.73	-	-0.34	0.25
	197	Kalyanpur-Pz	0.40	-	-	-
	198	Kartarpur 2(s)	-2.30	1.66	1.23	-0.08
	199	Kharal Kalan Pz-S	-2.00	-	-0.14	-0.71
	200	Lallian kalan Pz-S	-4.04	-	-0.63	-4.70
	201	Nakodar 2(m)	3.32	0.30	2.16	-1.59
	202	Nakodar 3(s)	-1.38	-2.60	-1.04	-0.74
	203	Nangal Shaman	-2.60	-	-	-
	204	Nussi-Pz	0.20	-	-	-
	205	Phillaur 2(s)	1.52	-0.80	-0.12	-0.52
	206	Sarih Pz-S	-	-	-	-0.01
	207	Shahkot(s)	-1.23	0.48	-1.40	0.05
	208	Talwandi Bhutial-Pz	-0.95	-	-	-
	209	Talwani Madho-Pz	-1.60	-	-	-
	210	Talwan-Pz	-0.35	-	-	-
	211	Udhopur	-1.70	0.07	-1.17	-0.08
KAPURTHALA	212	Bhatnura Khurd- S	1.17	-	0.18	0.20
	213	Bholath M	-0.82	0.61	0.37	0.46
	214	Bholath S	-1.75	-1.77	-2.24	-
	215	Dalla	0.85	-	0.22	0.33
	216	Kapurthala2 (s)	-2.50	0.05	6.35	-0.76
	217	Phagwara2 (s)	-3.59	-0.94	-1.12	-0.31
	218	Sultanpur2 (s)	0.20	-	10.64	-0.04
	219	Talwandi Chaudary -Pz	-0.21	1.91	0.82	1.05
LUDHIANA	220	Badowal	-0.76	-	-	-
	221	Begowal	-0.76	-3.27	0.86	0.02

	222	Bhahlolpur-DW	-0.75	-0.10	-0.06	0.41
	223	Doraha-Pz	-2.52	0.02	0.02	0.06
	224	Gopalpur 2(s)	-1.31	-2.09	-0.78	-0.47
	225	Habbowal	1.95	-0.07	-	-
	226	Harnampur	-0.67	-	-	-
	227	Ikloha-Pz	-1.47	0.17	-0.26	-0.20
	228	Kalsian	-0.15	-	-	-
	229	Khandur	-0.27	-	-	-
	230	Lalan1	-0.53	-0.80	-0.22	0.03
	231	Lil- II Pz	-1.27	-0.43	-3.27	-2.16
	232	Lil-Pz III	-0.99	-	-	0.10
	233	Mushkabad	-1.23	-0.06	0.06	-0.06
	234	P.A.U.Ludhiana 2(s)	0.24	-3.00	-0.68	4.10
	235	Punjeta	-	-	-0.38	0.04
	236	Rajona Khurd	-0.54	-	-	-
	237	Rashin	0.23	-	-	-
	238	Samrala 2(s)	-1.34	-1.20	-1.09	-1.78
	239	Sherian	-0.67	0.01	0.12	0.15
	240	Sidhwan Bet-Pz	-3.55	0.51	1.54	1.99
	241	Upplan	-0.64	-	-	-
	242	Utlan	-0.20	1.09	-	-
MANSA	243	Bhikhi 2 (s)	-0.68	-0.53	-0.29	0.00
	244	Budhlada	-0.71	-1.06	-0.11	-0.04
	245	Budhlada-Pz	-1.05	-0.59	-0.63	-0.24
	246	Burj Bhalaike	-1.43	3.80	0.36	0.31
	247	Fattamaluka	0.47	1.04	0.14	0.58
	248	Jhanda Khurd Pz	-	0.16	-	-
	249	Kot Dhamru	-0.39	-0.87	-0.25	-0.43
	250	Kotra	-0.97	-0.08	-	0.27
	251	Raipur-Pz	2.20	0.25	0.44	2.19
	252	Ralla	-0.78	-1.38	-	1.35
MOGA	253	Baje Ke-Pz	-0.74	2.81	0.25	6.41

	254	Budh Singh Wala-Pz	-0.73	-0.35	-0.57	-0.69
	255	Chogawan-Pz	-1.28	-0.54	-1.82	-0.31
	256	Dagru- Pz	-1.14	-0.61	-1.54	-0.20
	257	Damru Khurd	-1.23	-	-0.53	-0.49
	258	Darapur 07pz	0.64	-1.34	-2.39	-0.18
	259	Nihalsinghwala-Pz	-1.55	-0.56	-1.16	1.34
	260	Raonke Kalan-Pz	-1.15	-	-	-
	261	Samalsar-Pz	-1.15	-	-	-
MUKTSAR	262	Abulkharana-Pz	0.68	-	-	-
	263	Balocha Khera(rasoolpur)	0.17	0.53	-0.43	-0.46
	264	Bariwala-Pz	-0.03	-	-	-
	265	Bhaliana	-0.58	0.11	0.15	-0.85
	266	Doda	-	-	0.45	2.21
	267	Doda-Pz	-0.01	-	0.94	-
	268	Jhabelwali-Pz	0.40	-	-	-
	269	Jhurar-Pz	0.05	-	-	-
	270	Kabar Wala	-0.02	1.18	0.44	0.41
	271	Khunde Halal-Pz	0.00	1.01	0.90	0.55
	272	Killian Wali-Pz	0.50	-	-	-
	273	Kollian Wali-pz	0.05	-	-	-
	274	Kuttianwali	-0.24	-	0.58	1.03
	275	Labanianwali	-0.35	2.18	-0.07	-0.32
	276	Lambi	0.07	1.30	0.71	2.58
	277	Lambi-Pz	0.01	1.80	1.16	-
	278	Muktsar	-0.52	-	1.13	1.00
	279	Baharam-Pz	-0.30	-	-	-
NAWANSHAHR	280	Bahlora Kallan- Pz	-0.89	-0.02	0.54	0.13
	281	Bahua-Pz	0.80	-	-	-
	282	Balachore	-	-8.52	0.95	0.69
	283	Kariam-Pz	-0.95	-	-	-
	284	Mauhra-Pz	-	-	0.49	-0.12
	285	Rahon	-1.08	-0.56	-0.52	-0.25

	286	Raipur Dhaba-Pz	-1.72	-	0.33	-0.09
PATIALA	287	Antala	0.00	-	0.45	-0.25
	288	Banur 07pz	2.10	-	0.23	-1.12
	289	Bhankhar-Pz	6.00	-	-	-
	290	Bhojo majri 07pz	-1.84	-	-2.32	-1.83
	291	Binzal-Pz	-0.70	-	-	-
	292	Birkauli	-0.81	-1.30	-0.89	0.22
	293	Chandiala-Pz	2.35	-	-	-
	294	Chhat	-	-	-0.87	-
	295	Dera Bassi 07pz	-	-	0.54	0.29
	296	Devigarh	-1.89	-	0.63	
	297	Devigarh 1Pz	-1.93	-	0.63	-1.90
	298	Devigarh IIPz	-1.99	-	0.77	-0.13
	299	Devigarh-III Pz	-1.73	-	0.75	-1.37
	300	Dhakdaba 07	-1.31	-	-1.59	0.44
	301	Haluka	0.35	-	0.74	0.64
	302	Handesaran-s	-0.30	-	-4.20	-1.21
	303	Harion Kalan-Pz	-6.25	-	-	-
	304	Joli	-0.15	-	2.44	1.01
	305	Kakrala-Pz	-2.50	-	-	-
	306	Kalyan 07pz	-1.55	-	-0.97	0.21
	307	Kami Kalan	0.00	1.52	-	0.86
	308	Kutha Kheri-Pz	4.10	-	-	-
	309	Lacharu Kalan	0.07	2.08	0.19	1.04
	310	Lachkani-Pz	-	-5.73	-0.34	-0.26
	311	Miranpur- Pz	0.62	-	-0.21	0.92
	312	Mirapur	0.62	1.56	-0.21	-0.89
	313	Nanhera-Pz	-2.40	-	-	-
	314	Nariana	-0.71	-	1.14	1.25
	315	Patran-Pz	-3.96	-1.77	-1.77	-2.08
	316	Samana-Pz	-1.63	-1.76	-0.83	2.30
	317	Samaspur-Pz	-0.10	-	-	-

	318	Sangatpura-Pz	-	-	-1.31	-0.61
	319	Singhpura-Pz	-2.30	-	-	-
	320	Sirsini	-	1.27	-	0.23
	321	Thua	1.64	0.32	0.29	4.55
RUPNAGAR	322	Ahmedpur	0.30	-1.18	0.17	0.64
	323	Bera Chauta	-1.20	0.89	0.84	0.73
	324	Bhalan	-1.10	3.85	1.25	0.68
	325	Braham Pur	0.55	0.54	-0.01	0.38
	326	Chakdera	-1.05	-1.86	-0.25	0.23
	327	Chatamli- Pz	-18.10	-15.82	-1.00	-3.93
	328	Dhair	-	1.49	-2.82	0.43
	329	Dheri	-0.90	0.20	2.35	0.94
	330	Dumewal	-1.50	1.10	0.52	1.54
	331	Dusarna	2.30	-	-	-
	332	Gharoon	-0.35	-	-	-
	333	Ghoga	1.70	4.95	2.51	1.54
	334	Hardinamoh	-0.50	-0.03	0.27	0.34
	335	Kakrali	-	-0.82	1.53	0.79
	336	Kurrha-Pz	1.45	-	-	-
	337	Landran-Pz	-1.10	-0.69	-3.60	-1.99
	338	Raipur Kalan	0.30	-	-	-
	339	Rupnagar	-	-	-	-3.12
	340	Rurki Heeran-Pz	-0.40	1.29	0.56	0.58
	341	Soara	0.30	0.05	1.43	2.12
SANGRUR	342	Bapla-Pz	0.11	-	-	-
	343	Bagarian-Pz	-	-1.42	-1.60	-1.60
	344	Barnala (s)	-1.22	-1.49	-	0.21
	345	Bhadaur-Pz	-1.64	-	-	0.13
	346	Bugra 1	-2.16	-1.38	-1.36	5.51
	347	Chural Kalan M	-0.95	-1.31	-0.76	-0.19
	348	Dharamgarh-Pz	-0.93	-	-	-
	349	Gahl 07pz	-0.96	-	-1.25	-

	350	Gehlon-Pz	-1.90	-	-	-0.49
	351	Hassanpur-Pz	-0.97	-	-	-
	352	Kala Jhar-Pz	-2.13	-	-	-
	353	Kubbe-Pz	-1.40	-	-	-
	354	Kuler Khurd-Pz	-0.23	-	-	-
	355	Kurar-Pz	-2.05	-	-	-
	356	Ladda-Pz	-1.79	-1.65	-1.79	-0.92
	357	Lehal Kalan-Pz	-1.66	-	-	-
	358	Longowal-Pz	-1.24	-1.07	-	-0.73
	359	Mahal Kalan-Pz	-1.86	-	0.37	0.37
	360	Malerkotla	-1.21	0.90	-1.17	-
	361	Malerkotla-DW	-1.21	1.90	-1.17	-1.00
	362	Mehsampur 07pz	-2.26	-	-	-
	363	Mehsampur-Pz	-0.50	-	-	-3.19
	364	Nangal-Pz	-1.60	-	-	-
	365	Panjgaraian- Pz	-0.52	-	-	-
	366	Ramgarh-Pz	-1.40	-	-	-
	367	Rampur Channa-Pz	-0.53	-	-	-
	368	Rurki Kalan-Pz	-1.59	-	-	-
	369	Sunam-Pz	-6.77	-1.61	-1.33	-1.06

DECADAL MEAN WATER LEVEL FLUCTUATION (M)					ANNEXURE IV	
District	**S. No.**	**Locations**	**2003-2012 & May 2013**	**2003-2012 & Aug 2013**	**2003-2012 & Nov 2013**	**2004-2013 & Jan 2014**
Chandigarh	1	Burail	2.04	1.53	0.19	-0.01
	2	Csio-combined	-0.69	2.27	0.55	-0.97
	3	CSIO-S	3.01	-0.13	0.59	1.08
	4	MaloyaPZM	0.17	-0.56	-0.38	-0.74
	5	New Industrial Area	1.21	-7.28	-3.56	2.14
	6	Sec-27, Ar Well	1.64	1.36	2.07	1.79
	7	SECT 10C (D)	5.31	-1.49	2.94	5.21
	8	SECT 10C (S)	-0.04	-0.47	0.70	-0.85
	9	SECT 21D (D)	2.12	0.87	1.90	0.87
	10	SECT 21D (S)	3.20	-	-	-
	11	SECT 31D (D)	1.77	0.89	0.86	-0.03
	12	SECT 31D (S)	-1.41	0.06	1.04	0.27
	13	SECT 37D (S)	1.86	0.24	0.54	-1.57
	14	SECT 39D (S)	1.33	-0.05	0.53	-0.23
	15	SECT 44D (S)	-0.92	-0.21	0.33	0.03
	16	Sector 52- PZ	-2.32	-0.56	-0.18	-0.10
	17	Sector-46 (shallow)	-0.55	-1.12	-0.07	0.07
AMRITSAR	18	Ajnala	1.64	1.16	0.74	0.58
	19	Aminshah Khalra	3.41	1.27	1.51	0.99
	20	Amritsar1	2.20	1.89	1.99	-
	21	Beas07	0.47	-0.15	0.12	0.27
	22	Bhikiwind- Pz	0.15	0.51	-0.13	0.37
	23	Chabal 07	1.06	1.38	1.28	0.29
	24	ChogWan- Pz	0.37	-0.30	0.95	-0.84
	25	Chola Sahib-Pz	-	-0.39	0.03	0.24
	26	Gago Mahal- Pz	0.30	-1.47	-0.92	-0.83
	27	Gandi Wind-Pz	0.60	-1.42	-0.08	-0.31
	28	Goindwal 07	0.39	-0.23	-0.18	0.13
	29	Jandiala Guru-Pz	0.59	-	0.16	0.11

	30	Kalsia Kalan	0.13	-	0.52	-
	31	Kalsia Kalan07	1.14	1.07	0.63	0.63
	32	Khadur Sahib-Pz	-0.26	-0.41	-0.18	0.08
	33	Mohawa	2.72	1.27	1.87	1.65
	34	Nawan Tanal- Pz	-	-1.31	-0.68	-0.45
	35	Ratoke-Pz	0.63	-3.26	0.24	-0.49
	36	Sahab Pura- Pz	0.57	0.37	0.57	-0.84
BATHINDA	37	Ablu	2.22	2.21	2.29	2.08
	38	Badiala-Pz	2.18	-	0.29	0.24
	39	Bahman Jassa Singh-Pz	0.50	-	-	0.42
	40	Balluana1	0.22	-0.72	-0.13	-0.31
	41	Bhagibandar	0.30	-0.06	-2.47	-0.03
	42	Deratapp	0.52	0.60	0.91	0.57
	43	Dhapali1	7.47	8.15	7.88	6.61
	44	Dhapali-Pz	1.86	1.10	0.81	0.92
	45	Dialpur Mirza	3.41	5.42	4.56	4.15
	46	Dialpura Bhlaike	5.09	4.71	3.75	4.19
	47	Ganga-Pz	-	0.07	-0.29	0.00
	48	Ghudda	-	-2.08	-1.73	-1.84
	49	Gill Patti-DW	0.54	-	-	0.51
	50	Gulabgarh 1 (vs)	1.69	0.52	-0.31	-
	51	Gulabgarh 2 (s)	1.55	-	1.87	0.84
	52	Guru Sar-Pz	0.51	-0.57	-0.37	-0.49
	53	Gurusar	0.02	-	-	-
	54	Jajjal	-0.38	-0.72	-0.70	-0.51
	55	Jassi Bhagwali	0.21	-1.75	-2.32	-2.21
	56	Jhanduke	3.35	5.45	3.16	3.31
	57	Kahan Singh Wala-DW	0.81	-	-	0.39
	58	Kalla Bandar	-4.32	-3.66	-1.16	-3.84
	59	Kot Shamir	0.55	1.01	0.84	0.27
	60	Kothaguru-Pz	1.03	0.40	0.28	0.24
	61	Lahri	0.92	0.90	0.51	0.30

	62	Lehra Khanna-Dw	1.22	-	-	0.88
	63	Maisar Khana	3.05	-	2.11	1.83
	64	Maisar Khana-Pz	-	-	-	-0.06
	65	Nahinwala	3.18	2.28	1.17	1.48
	66	Phul	4.69	2.10	6.54	5.53
	67	Phulla	2.44	5.54	1.54	3.15
	68	Phulla1	3.38	0.71	3.54	-
	69	Puhla-Pz	2.45	3.14	-	1.51
	70	Raike Kalan	-1.25	-2.05	-1.80	-1.66
	71	Rajgarh Kubey-Pz	-	-	-	0.18
	72	Rampura	5.10	6.87	7.35	6.90
	73	Sangat -Pz	-	-	-0.59	-0.55
	74	Seema-DW	0.73	-	-	0.63
	75	Teona-Pz	0.66	-		0.19
FARIDKOT	76	Bead Sikhanwala- Pz	0.44	-1.40	-0.59	-
	77	Burj Jawahar Singh-Pz	1.63	-	-	1.83
	78	Chahd Baja	1.61	0.49	1.25	0.76
	79	Devrana-Pz	0.66	-	-	0.04
	80	Dhaipai-Pz	0.45	-	-	0.40
	81	Dhilwan Kalan	0.90	1.03	0.52	0.71
	82	Dipsinghwala	0.58	0.05	1.45	1.04
	83	Karirwali	1.59	-0.31	-0.60	-0.52
	84	Kot Kapura	1.27	1.94	1.69	1.48
	85	Matta	1.41	1.39	1.24	1.32
	86	Mehmuana	-1.18	-2.82	-1.81	-1.76
	87	Sher Singh Wala- Pz	0.24	-2.90	-1.42	-
FATEH GARH	88	Amloh1	2.02	3.51	4.68	2.60
	89	Badalialasingh	3.95	17.88	4.76	3.51
	90	Bagga Kalan	0.95	-	-	0.40
	91	Balpur	0.65	-	-	1.35
	92	Bassi Pathana	2.70	2.87	1.33	1.19
	93	Bhagrana	-0.57	4.67	-1.12	-0.69

	94	Bhateri1	3.85	2.79	4.63	4.31
	95	Burj	1.65	-	-	1.03
	96	Chunni Kalan	-	-	-	-1.06
	97	Fatehgarh Sahib	0.35	-	-	-
	98	Fatehgarh Sahib-Pz	1.48	-	2.64	0.00
	99	Jai Singh Wala	-0.30	1.40	-	-
	100	Jhambela	0.78	-	-	-
	101	Khara	6.72	-	-	-
	102	Lohar Majra	1.65	-	-	-
	103	Nalini-Pz	-	3.83	-	-
	104	Pawala	0.51	-5.94	-0.12	-0.20
	105	Sado Majra	-0.45	-	-	-
	106	Shahpur	0.15	-	-	-
	107	Tahalpur	0.18	-	-	-
	108	Talwara	1.15	-	-	-
FIROZPUR	109	Abohar	-0.25	-0.20	0.25	0.27
	110	Alamgarh	-0.69	-1.08	-0.62	-0.53
	111	Asifwala-Pz	-	-	-	0.18
	112	Bannawala	-0.50	-	-1.55	-1.37
	113	Bazirdpura	-1.86	-	-1.63	-9.60
	114	Chak Kala Tibba	-1.11	0.03	-1.20	-0.26
	115	Chamb-Pz	0.54	-	-	-
	116	Danewal Satkosi	0.02	-0.67	-0.20	-0.30
	117	Dipulana-Pz	0.03	-0.65	-0.71	-
	118	Fazilka-Pz	-	-	-	-1.27
	119	Gogiani-Pz	0.56	-	-	-
	120	Guru Harsahai-Pz	-	-	-	0.34
	121	Jaimal Singhwala Pz	-0.25	-0.24	-0.55	-0.82
	122	Jandwala Watan-Pz	-	-	-	0.60
	123	Jhottian Wali-Pz	-	-	-	0.27
	124	Kandh Wala-Pz	-	-	-	-0.43
	125	Khere Ki Uttar-Pz	-	-	-	-0.09

	126	Khuiansarwar- Pz	-0.09	-1.32	-0.31	-0.46
	127	Kundal1	-1.00	-0.03	-0.41	-1.45
	128	Ladhuwala	-0.15	-	0.12	0.23
	129	Lauhke Kalan- Pz	-0.02	-	-0.94	-
	130	Mahuana-Pz	-	-	-	-1.69
	131	Malluwala-Pz	0.27	-	-	-
	132	Malsian-Pz	0.53	-0.49	-0.12	-
	133	Mana Singh Wala-Pz	-	-	-	-0.03
	134	Markhiwa Bhamni-Pz	-	-	-	0.25
	135	Mohre Wala-Pz	0.48	-1.34	-0.61	-
	136	Motiwala 07pz	-0.06	0.15	-0.20	0.07
	137	Mullian Wali-Pz	-	-	-	0.39
	138	Nihalkhera	-1.56	-2.13	-1.65	-1.82
	139	Nure-Ki-Uttar 07pz	0.05	0.36	9.56	-0.36
	140	Pancha Wali-Pz	-	-	-	-0.14
	141	Piyarana	-0.63	-3.21	-1.26	-1.40
	142	Sham Singhwala-Pz	0.21	-1.30	-0.48	0.08
	143	Singhpura-Pz	-	-	-	0.50
	144	Sitoganno	-3.62	-3.84	-3.36	-3.63
	145	Sohangarh Ratte	-0.27	0.29	-0.36	-1.16
	146	Swah Wala- Pz	0.19	-0.63	-0.54	-
	147	Waryam Khera	-2.34	-1.68	-	-
GURDASPUR	148	Aulakhkalan	0.88	-	-0.24	-0.56
	149	Bamyal	-0.16	-0.90	0.34	-0.08
	150	Bhagowal	1.30	-0.57	-	0.37
	151	Bham	2.00	1.37	1.23	0.98
	152	Bhoa	-0.09	-0.19	0.09	-0.10
	153	Chahal Kalan-Pz	1.61	-	-	-
	154	Dakoha-Pz	0.71	-	-0.78	-0.05
	155	Dera Baba Nanak	0.18	-0.78	-0.92	-1.04
	156	Dhianpur	-2.85	-1.72	2.73	2.55
	157	Dinanagar	-	-	-	-0.25

	158	Galri	0.57	-3.30	0.99	-0.32
	159	Ghania Ki bangar- Pz	0.50	-0.65	-1.02	-0.80
	160	Gharotakalan	2.05	-1.29	-0.96	-0.89
	161	Ghoh	-3.98	-1.68	-8.66	-
	162	Ghoh DW	-2.55	-3.60	-6.74	-6.43
	163	Harchowal-Pz	1.51	-8.08	-	-
	164	Hargobindpur	0.65	0.04	0.22	0.38
	165	Jhakolahri	-0.07	0.07	0.48	0.16
	166	Kalanaur2	-	-1.54	-1.42	-1.20
	167	Kalanaur-Pz	-	-2.99	-1.43	-1.30
	168	Khanikhui	-0.33	-0.05	-0.03	-0.26
	169	Madipur Fatehgarhchuria	2.10	0.75	1.15	1.22
	170	Malikpur-Pz	-0.09	-	-	-
	171	Mallewal-Pz	1.48	-	-	-
	172	Masana-Pz	0.35	-	-	-
	173	Massit-Pz	1.39	-	-	-
	174	Mullowali 1(vs)	0.59	-1.01	0.37	-0.52
	175	Mullowali 2(m)	0.19	-	0.91	-0.92
	176	Nawan Pind	-0.45	0.09	-2.31	-0.41
	177	Nishayara	1.29	-0.52	-0.27	-0.12
	178	Pandoritalab	-0.58	-1.05	-0.88	-0.82
	179	Pathankot1	0.94	0.61	-0.01	0.74
	180	Quaddian -Pz	-0.05	-	-	-
	181	Salehchak(vs)	-	-	-	-0.28
	182	Sarna1	0.54	-0.77	1.91	0.76
	183	Shikar-Pz	1.50	-1.45	0.56	-0.79
HOSHIARPUR	184	Adowal Garhi-Pz	2.09	0.74	1.77	1.92
	185	Bhamnaur	3.14	-2.46	-0.42	-0.30
	186	Chohal	0.34	-3.25	-0.47	0.17
	187	Dasuya2 (s)	1.46	3.28	2.12	1.92
	188	Durimiwal	0.22	-0.41	-0.06	-0.16
	189	Garh Di Wala-Pz	-0.05	0.75	0.68	1.71

	190	Garhshankar (s)	5.08	4.72	0.34	0.87
	191	Hazipur	0.60	-2.73	-0.45	-0.46
	192	Mahilpur-Pz	1.34	0.72	1.78	3.33
	193	Mukerian Dw	-0.73	-0.21	-0.61	-0.36
	194	Nangal Bihala- DW	2.53	1.92	0.43	0.66
	195	Phuglana- Pz	-1.60	-4.40	-3.93	-0.91
	196	Rampur Colony (HSP) pz-medium	3.98	-0.54	1.21	5.89
	197	Sham Chaurasi	-0.51	-0.01	-0.68	-
	198	Simbli-Pz	-	-	-	-0.42
	199	Talwara1	0.32	0.12	-0.07	-0.31
	200	Thakarwala	0.96	0.05	0.44	1.44
JALANDHAR	201	Adampur 1(d)	3.77	6.19	0.91	-1.08
	202	Adampur 3(s)	1.25	1.22	0.43	-0.03
	203	Adarman-Pz	0.43	-	-	-
	204	Allawalpur	-0.05	-0.89	-0.17	-
	205	Billi Chahrami-Pz	1.35	-	-	-
	206	Gohiran	5.80	5.26	4.91	-
	207	Hardo Pharwal-Pz	5.15	-	-	-
	208	Jalandhar 3(vs)	5.86	7.26	6.81	6.22
	209	Jandiala-Pz	-3.73	-	0.34	-0.25
	210	Kalyanpur-Pz	1.28	-	-	-
	211	Kartarpur 2(s)	2.46	-1.13	-0.13	1.24
	212	Kharal Kalan Pz-S	4.28	2.65	2.64	0.44
	213	Lallian kalan Pz-S	3.22	-	0.41	2.32
	214	Nakodar 2(m)	2.26	2.64	1.52	4.24
	215	Nakodar 3(s)	3.89	4.08	4.35	4.80
	216	Nangal Shaman	4.03	-	-	-
	217	Nussi-Pz	-0.18	-	-	-
	218	Phillaur 2(s)	-0.57	0.60	0.54	0.24
	219	Sarih Pz-S	-	-	-	0.01
	220	Shahkot(s)	1.77	0.22	3.10	1.37

	221	Talwandi Bhutial-Pz	1.58	-	-	-
	222	Talwani Madho-Pz	2.33	-	-	-
	223	Talwan-Pz	0.32	-	-	-
	224	Udhopur	1.31	-0.14	1.22	1.09
KAPURTHALA	225	Bhatnura Khurd- S	-0.30	1.27	0.63	-0.20
	226	Bholath M	0.97	0.77	0.56	0.40
	227	Bholath S	1.24	1.25	0.77	0.98
	228	Dalla	1.76	-0.44	2.60	2.37
	229	Kapurthala2 (s)	3.07	1.98	0.94	1.60
	230	Phagwara2 (s)	3.46	5.05	2.44	4.21
	231	Sultanpur2 (s)	3.64	-1.53	-1.27	1.43
	232	Talwandi Chaudary -Pz	0.21	-1.91	-0.82	-0.75
LUDHIANA	233	Badowal	0.76	-	-	-
	234	Begowal	0.54	1.22	-0.34	0.77
	235	Bhahlolpur-DW	0.70	-0.27	0.22	0.06
	236	Chattar Singh Park-ldh	6.88	-	-	-
	237	Doraha-Pz	2.52	-0.02	-0.02	0.36
	238	Gopalpur 2(s)	2.44	3.66	3.30	3.15
	239	Habbowal	2.63	2.22	-	-
	240	Harnampur	0.59	-	-	-
	241	Ikloha-Pz	1.47	-0.17	0.26	1.18
	242	Kadon-Pz	-0.35	1.24	-	-
	243	Kalsian	0.07	-	-	-
	244	Khandur	0.31	-	-	-
	245	Lalan1	0.65	1.28	0.87	0.65
	246	Lil- II Pz	0.90	0.25	3.46	3.43
	247	Lil-Pz III	-0.90	-	-2.30	-1.08
	248	Ludhiana 3(vs)	0.31	-	-	-
	249	Mushkabad	0.62	0.57	0.60	0.67
	250	P.A.U.Ludhiana 2(s)	-1.11	2.38	0.40	-1.02
	251	Punjeta	-0.17	-	0.64	0.44
	252	Rajona Khurd	0.63	-	-	-

	253	Rashin	-0.30	-	-	-
	254	Samrala 2(s)	1.11	1.72	2.01	3.76
	255	Sherian	-0.48	-0.87	-0.40	-0.21
	256	Sidhwan Bet-Pz	3.55	-0.51	-1.54	-1.16
	257	Upplan	0.47	-	-	-
	258	Utlan	0.78	-0.73	0.14	-1.39
MANSA	259	Bhikhi 2 (s)	2.18	2.32	2.29	2.29
	260	Budhlada	2.21	2.45	2.08	1.89
	261	Budhlada-Pz	1.05	0.59	0.63	0.65
	262	Burj Bhalaike	0.60	-3.41	0.22	-0.32
	263	Fattamaluka	0.24	-0.60	0.08	-0.42
	264	Jhanda Khurd Pz	1.33	1.02	-	-
	265	Kot Dhamru	0.58	0.73	1.40	0.62
	266	Kotra	1.94	2.11	2.05	1.71
	267	Raipur-Pz	-2.20	-0.31	-0.44	-2.19
	268	Ralla	1.86	1.48	-	0.61
MOGA	269	Baje Ke-Pz	0.74	-2.81	-0.25	-6.41
	270	Budh Singh Wala-Pz	0.73	0.35	0.57	1.40
	271	Chogawan-Pz	1.28	0.54	1.82	0.31
	272	Dagru- Pz	1.14	0.61	1.54	0.20
	273	Damru Khurd	4.11	-	5.26	4.56
	274	Darapur 07pz	2.29	3.33	4.65	2.04
	275	Daulatpur Niwan-Pz	1.71	-	-	-
	276	Himatpura-Pz	2.43	-	-	-
	277	Jhandewala-Pz	1.78	-	-	-
	278	Khokri Kalan-Pz	2.39	-	-	-
	279	Mangewala-Pz	1.85	-	-	-
	280	Nihalsinghwala-Pz	1.55	0.56	1.16	-1.34
	281	Raonke Kalan-Pz	2.23	-	-	-
	282	Samalsar-Pz	1.38	-	-	-
MUKTSAR	283	Abulkharana-Pz	-0.68	-	-	-
	284	Balocha Khera(rasoolpur)	-0.96	-1.09	-0.59	-0.48

	285	Bariwala-Pz	0.03	-	-	-
	286	Bhaliana	0.83	0.80	1.15	1.02
	287	Bhamma(bam)	-	-0.37	7.96	
	288	Doda	-	-	0.17	-1.47
	289	Doda-Pz	0.01	-	-0.94	-
	290	Jhabelwali-Pz	-0.51	-	-	-
	291	Jhurar-Pz	-0.19	-	-	-
	292	Kabar Wala	-0.66	-1.74	-1.36	-0.82
	293	Khunde Halal-Pz	0.00	-1.01	-0.90	-0.42
	294	Killian Wali-Pz	-0.50	-	-	-
	295	Kollian Wali-pz	-0.05	-	-	-
	296	Kuttianwali	-0.75	-	-1.58	-1.58
	297	Labanianwali	0.44	-1.59	0.61	0.31
	298	Lambi	0.43	-	0.74	-2.20
	299	Lambi-Pz	-0.01	-1.30	-1.16	-
	300	Muktsar	0.54	-0.87	-0.76	-0.32
	301	Murar Kalan-Pz	0.08	-	-	-
	302	Phulu Khera-Pz	-0.59	-	-	-
	303	Ratta Khera Chota-Pz	-0.08	-	-	-
	304	Rupana-Pz	-0.05	-	-	-
	305	Wadhai-Pz	-0.15	-	-	-
NAWANSHAHR	306	Baharam-Pz	1.03	-	-	-
	307	Bahlora Kallan- Pz	0.89	0.02	-0.54	0.44
	308	Bahua-Pz	2.10	-	-	-
	309	Balachore	-	2.11	0.88	0.78
	310	Mauhra-Pz	-	-	-0.49	1.21
	311	Kariam-Pz	-0.02	-	1.36	-
	312	Rahon	1.21	1.34	-0.33	1.39
	313	Raipur Dhaba-Pz	1.72	-	-	0.76
PATIALA	314	Antala	-0.36	-1.72	-0.31	-0.80
	315	Banur 07pz	1.13	2.86	2.22	3.21
	316	Bassma Pipla	-	-2.40	-	-

	317	Bhankhar-Pz	-2.58	-	-	-
	318	Bhojo majri 07pz	1.92	3.10	3.50	2.69
	319	Binzal-Pz	2.33	-	-	-
	320	Birkauli	3.61	3.70	4.93	3.84
	321	Chandiala-Pz	-2.60	-	-	-
	322	Chhat	-0.59	1.58	1.12	0.80
	323	Dera Bassi 07pz	-2.52	-2.41	-1.45	-1.56
	324	Devigarh	3.06	1.11	0.88	-
	325	Devigarh 1Pz	3.42	3.12	1.17	4.39
	326	Devigarh IIPz	3.25	2.53	1.11	4.37
	327	Devigarh-III Pz	3.14	1.85	1.87	4.76
	328	Dhakdaba 07	3.09	3.40	3.70	1.98
	329	Gholu majra 07pz	-	-0.51	0.23	0.09
	330	Haluka	-0.25	-1.00	-0.78	-0.41
	331	Handesaran-s	0.68	1.18	5.25	2.31
	332	Hari Majra	-	-1.71	-	-
	333	Harion Kalan-Pz	5.97	-	-	-
	334	Joli	-1.74	-3.16	-3.60	-2.31
	335	Kakrala-Pz	1.58	-	-	-
	336	Kalyan 07pz	2.01	3.75	3.52	2.18
	337	Kami Kalan	-2.23	-2.07	-	-1.13
	338	Kutha Kheri-Pz	-2.38	-	-	-
	339	Lacharu Kalan	-1.71	-3.06	-2.31	-2.67
	340	Lachkani-Pz	-	5.73	0.34	0.26
	341	Miranpur- Pz	-0.37	-	2.30	1.50
	342	Mirapur	3.38	-3.06	5.20	5.11
	343	Mirpur-Pz	-	-0.26	-0.34	-0.98
	344	Nanhera-Pz	2.23	-	-	-
	345	Nariana	1.39	0.30	0.44	0.61
	346	Patran-Pz	3.96	1.77	1.77	2.93
	347	Rajpura Pz M	-	10.34	7.38	-
	348	Samana-Pz	1.63	1.76	0.83	-0.15

	349	Samaspur-Pz	0.68	-	1.31	-
	350	Sangatpura-Pz	-	-	-	0.61
	351	Singhpura-Pz	6.93	-	-	-
	352	Sirsini	-	-0.68	-0.31	-0.51
	353	Thua	4.93	4.83	6.46	3.52
RUPNAGAR	354	Ahmedpur	-0.88	-0.70	-0.79	-0.82
	355	Bera Chauta	1.04	-0.61	-0.15	0.24
	356	Bhalan	0.60	-3.05	-0.89	-0.21
	357	Braham Pur	0.25	-0.84	-0.35	-0.37
	358	Chakdera	-0.45	0.35	-0.04	-0.08
	359	Chanalon	-	-	0.22	0.55
	360	Chatamli- Pz	18.10	15.82	1.00	6.08
	361	Dhair	-2.80	-2.56	-0.45	0.19
	362	Dheri	-0.13	-1.03	-0.83	-0.69
	363	Dumewal	0.24	-0.23	0.42	0.79
	364	Dusarna	-2.90	-	-	-
	365	Gharoon	0.24	-	-	-
	366	Ghoga	-1.29	-3.49	-1.02	-0.57
	367	Hardinamoh	0.29	-0.42	0.02	-0.16
	368	Kurrha-Pz	-0.68	-	-	-
	369	Kakrali	-	-0.66	-1.59	-0.76
	370	Kharar	-	-	-	-0.96
	371	Landran	-	-	-	-3.39
	372	Landran-Pz	1.10	0.69	3.60	2.03
	373	Raipur Kalan	-0.71	-	-	-
	374	Rupnagar	-	-	-	0.81
	375	Rurki Heeran-Pz	0.40	-1.29	-0.56	0.11
	376	Soara	-0.99	-1.00	-1.08	-1.76
SANGRUR	377	Bagarian-Pz	-	1.42	1.60	1.60
	378	Bapla-Pz	0.02	-	-	-
	379	Barnala (s)	5.20	4.99	-	3.95
	380	Bhadaur-Pz	1.64	-	-	-0.13

	381	Bugra 1	6.48	6.49	7.09	2.72
	382	Chural Kalan M	5.49	5.93	5.38	5.18
	383	Dharamgarh-Pz	1.25	-	-	-
	384	Gahl 07pz	3.30	5.74	4.27	-
	385	Gehlon-Pz	1.90	-	-	1.77
	386	Hassanpur-Pz	1.57	-	-	-
	387	Kala Jhar-Pz	1.90	-	-	-
	388	Kubbe-Pz	2.32	-	-	-
	389	Kuler Khurd-Pz	0.31	-	-	-
	390	Kurar-Pz	2.72	-	-	-
	391	Ladda-Pz	1.79	1.65	1.79	2.03
	392	Lehal Kalan-Pz	2.01	-	-	-
	393	Longowal-Pz	1.24	1.07	-	1.41
	394	Mahal Kalan-Pz	1.86	-	-0.37	-0.37
	395	Malerkotla	5.11	1.58	5.26	-
	396	Malerkotla-DW	2.26	-0.52	3.20	3.62
	397	Mehsampur 07pz	3.22	-	-	3.24
	398	Mehsampur-Pz	0.10	-	-	-
	399	Nangal-Pz	2.63	-	-	-
	400	Panjgaraian- Pz	1.07	-	-	-
	401	Ramgarh-Pz	1.97	-	-	-
	402	Rampur Channa-Pz	0.50	-	-	-
	403	Rurki Kalan-Pz	1.47	-	-	-
	404	Sunam-Pz	6.77	1.61	1.33	1.82
	405	Tappa Mandi-Pz	-0.04	-	-	-

RESULTS OF CHEMICAL ANALYSIS OF WATER SAMPLES FROM NHS IN PUNJAB (2013) — ANNEXURE-V

SR	DISTRICT LOCATION	WELL NO.	pH	EC in µS/cm at 25^{0}C	CO_3	HCO_3	Cl	SO_4	NO_3	F	PO_4	Ca	Mg	Na	K	SiO_2	T.H as $CaCO_3$	SAR	RSC in meq/l
	AMRITSAR																		
	MOHAWA	44I-2C7	7.42	370	0	169	21	18	nd	0.09	nd	24	15	24	12	25	123	0.95	0.34
1	AMRITSAR	44I-2D3	7.87	628	0	260	35	40	24	0.28	nd	21	29	67	11	22	171	2.22	0.83
2	BEAS	44M-2B11	7.75	770	0	223	67	54	65	0.37	nd	47	29	70	7.3	25	234	1.98	-1.08
3	CHABAL	44I-3D1	8.61	421	0	193	5.3	18	0.1	0.17	nd	15	14	63	5.3	23	96	2.81	1.26
4	AJNALA	44I-1D4	8.28	980	0	266	142	72	2.2	0.16	nd	21	29	145	11	16	171	4.81	0.93
5	GOINDWAL	44M-3A6	8.40	1099	0	447	67	105	1.8	0.12	nd	17	22	210	6.7	22	133	7.92	4.67
6	NAYA TALEN		8.21	501	0	212	35	18	19	0.06	nd	30	21	44	6.4	24	160	1.51	0.25
7	JANDIALA GURU	44M-2A3	8.25	535	0	248	21	39	16	0.76	nd	28	31	38	9.8	24	197	1.18	0.12
	BHATHINDA																		
8	NAHIANWALI	44J-3D3	LEAKED																
9	DERA TAPPA	44J-3D4	8.40	646	36	134	35	100	8.4	0.43	0.14	63	31	18	10	18	286	0.46	-2.30
10	ABLU	44J-3D6	7.86	1045		215	97	200	30	0.08	nd	71	24	118	18	26	274	3.09	-1.99
11	RAIKE KALAN	44J-4C6	7.99	2300		378	18	775	63	0.93	0.08	74	81	315	7.5	22	516	6.02	-4.16
12	JASSI BHAGWAL	44J-4D1	7.3	1024		366	57	50	96	1.02	0.08	31	43	107	21	19	255	2.92	0.91
13	GARHI BUTTAR	44J-4D2	8.02	903		293	60	100	26	0.28	0.08	41	62	37	11	19	357	0.85	-2.34
14	BALLUANA	44J-4D3	8.49	647	18	183	43	75	10	0.81	0.08	14	35	63	7.9	17	179	2.05	0.02
15	GHUDA	44J-4D5	8.66	3058	36	824	174	500	67	6.88	0.08	22	46	655	7.5	16	133	18.24	9.82
16	GANGA	44J-3DP3	LEAKED																
17	RAMPURA PHULLA	44N-3A2	8.26	1701		543	142	200	27	0.4	0.07	33	52	263	8	21	296	6.65	2.98
18	PHULLA	44N-3A3	8.65	1200	72	244	75	50	125	1.44	nd	16	22	100	187	14	130	3.81	3.79
19	DIALPUR BHALAIKE	44N-3A1	8.80	1260	60	232	95	185	32	0.53	nd	16	32	220	6.0	17	170	7.31	2.37
20	DIALPURMIRZA	44N-3A7	8.78	1888	108	598	89	212	30	1.15	nd	12	29	410	6.0	20	150	14.60	10.42
21	PHUL	44N-3A9	8.51	991	60	262	78	85	12	0.48		20	20	177	4.1		133	6.70	3.65
23	MAISER KHANNA	44N-4A4	8.53	1847	36	134	255	325	79	0.08	0.07	37	47	296	9	29	286	7.62	-2.32
24	BHAGI BHANDAR	44N-4A5	9.04	3445	174	744	411	225	137	1.01	0.07	8.2	59	335	650	17	324	8.98	12.73
26	LAHRI	44O-1A2	8.5	4945	108	1147	532	350	264	0.88	0.09	12	69	990	18	23	316	24.31	16.12
27	JAJJAL	44O-1A4	8.81	2285	114	781	92	125	64	2.58	0.08	10	11	495	5.7	15	71	25.70	15.20
28	JHANDUKE	44N-4A8	8.84	1760	54	311	156	300	23	0.66	0.12	18	37	316	4	17	199	9.79	2.96
29	KHAILIWALA	44J-3DP1	8.57	653	36	159	32	80	7.5	0.16	0.07	10	45	52	7	15	209	1.56	-0.39
30	GULABGARH	44J-4DP1	8.59	2490	72	226	333	500	22	0.73	0.10	4.1	166	279	17	22	694	4.61	-7.75
31	LAMBI	44J-4C3	7.48	4826		140	560	1350	200	0.08	0.11	421	171	273	145	25	1756	2.84	-32.78
32	SANGAT KALAN	44J-4DP2	8.3	4472		873	362	1000	145	0.60	0.09	14	98	940	15	21	367	19.54	5.55
33	GURUSAR	44O-1AP1	8.75	5605	138	1489	372	575	246	3.37	0.10	0	61	1165	15	23	250	32.00	23.99
34	BADIALA	44M-4BP4	8.81	2490	78	458	287	320	96	0.80	0.07	8.2	26	552	5	18	128	21.28	7.56
35	KATH GURU	44N-3AP2	8.80	2267	108	586	143	298	32	0.78	nd	16	32	478	9.0	22	170	15.88	9.77
	FARIDKOT																		
36	MEHMANA	44J-2C6	8.29	1870		227	201	460	37	0.32	nd	74	38	268	49	20	343	6.31	-3.10
37	KOTKAPURA	44J-2D2	8.48	1326	34	168	77	280	113	0.61	nd	39	50	129	70	22	304	3.22	-2.17
38	CHANDBAJA	44J-2D5	8.34	1892	59	203	197	300	109	2.89	nd	16	62	302	6	23	294	7.65	-0.60

39	DHILWANKALAN	44J-2D9	8.53	3135	71	478	267	600	138	1.72	nd	43	38	580	95	18	265	15.54	4.93
40	KARIRWALI	44J-3D5	8.96	5245	106	251	556	1550	16	2.68	0.01	16	55	1148	38		265	30.61	2.33
41	MATTA	44J-3D7	8.84	1998	59	153	225	360	68	1.6	0.01	20	91	263	5.7	24	421	5.56	-4.01
42	Sher Singh(pz)	44J-2CP1	8.39	300	18	54	21	64	4.6	0.29	nd	20	19	19	5.8	11	127	0.73	-1.08
43	Beed Sirkhawala(pz)	44J-2DP1	LEAKED																
	FATEHGARH SAHIB																		
44	NALINI	53B-2BP3	8.62	590	25	192	48	50	16	0.06	0.01	16	29	75	8	23	160	2.59	0.80
45	BHATERI	53B-2CP2	8.50	435	50	154	13	15	0.3	0.15	0.01	28	22	36	6.5	22	160	1.24	0.98
46	BASSIPATHANA	53B-2B5	8.12	575	0	295	13	52	26	0.06	0.01	64	17	45	7.1	21	230	1.29	0.24
47	FATEHGARH SAHIB		8.62	475	38	167	21	40	9.2	0.31	0.01	20	29	43	13	20	170	1.44	0.62
48	AMLOH	53B-2A4	7.25	995	0	269	75	72	187	0.38	0.01	92	49	50	14	22	430	1.05	-4.21
49	BADLI ALASINGH	53B-2A4	8.50	570	50	205	27	42	1	0.64	0.02	20	27	78	6.8	22	160	2.67	1.81
50	BHGRANA	53B-2C16	7.85	1730	0	397	340	142	0.9	0.22	nd	56	126	133	7.4	18	660	2.26	-6.65
51	PAWLA	53B-2C11	9.00	2120	101	551	95	345	55	0.64	0.04	28	36	75	610	22	220	2.21	8.04
52	CHUNNI KALAN	53B-2C17	8.6	625	25	218	55	32	19	1.03	0.01	40	32	52	6.3	19	230	1.49	-0.22
	FIROZEPUR																		
53	NUREKEUTTAR	44J2BP3	8.36	842	29	185	42	195	3.9	0.96	nd	27	24	137	6.8	20	167	4.62	0.68
54	PIYARANA	44J-1C8	8.34	1560	48	491	63	280	53	0.45	0.01	34	45	273	23	23	245	7.23	4.25
55	LADHAWALA	44J-2B3	8.44	1751	24	192	211	360	46	0.56	nd	48	48	222	88	20	317	5.42	-2.40
56	RATTEWALA	44J-2B6	8.09	6091		514	737	1950	28	0.98	0.01	71	71	1366	68	24	470	27.43	-0.96
57	NIHAL KHERA	44J-4A2	7.9	1427		275	161	280	4	0.29	nd	74	67	123	23	22	461	2.49	-4.70
58	ABOHAR	44J-4A4	8.34	8892	24	96	1509	2100	326	0.49	nd	161	114	1769	44	14	872	26.08	-15.04
59	ALAMGARH	44J-4A5	8.01	2161		299	267	320	140	0.33	nd	71	69	157	212	19	461	3.18	-4.32
60	WARYAM KHERA	44J-4A6	8.51	681	29	114	42	87	81	0.59	nd	43	43	31	7.1	20	284	0.80	-2.85
61	DANEWALI SATKOSI	44J-4A7	7.94	5720		263	884	1300	248	1.11	nd	122	148	969	33	20	911	13.95	-13.95
62	SITOGANA	44J-4B3	8.12	6210		84	793	1500	42	0.1	nd	172	224	663	25	18	1352	7.85	-25.63
63	KUNDAL	44J-4B4	7.68	2070		169	542	100	126	0.08	ND	256	72	68	11	ND	934	0.97	-15.93
64	CHAK KALA TIBBA	44J-4B6	8.63	641	35	95	21	140	14	3.25	nd	43	24	55	7.4	17	206	1.67	-1.40
65	BAZIPUR BHOMA	44K-1B1	8.55	747	29	114	49	165	28	0.45	0.03	35	41	65	9.7	19	255	1.77	-2.28
66	BANNAWALA	44J-2AP1	8.17	5563		335	813	1250	50	1.3	nd	82	98	1004	20	19	608	17.72	-6.66
67	MOHREWALA	44J-1CP1	8.8	1261	47	227	49	270	77	0.71	nd	16	22	253	6.9	28	127	9.64	2.68
68	SHAM SINGH WALA		8.21	1238		430	42	220	55	0.51	0.01	20	24	244	9.3	22	147	8.71	4.08
69	MOTIWALA	44J-2BP2	8.08	1147		359	69	230	12	0.31	nd	39	36	179	8.6	24	245	4.97	0.98
70	DEEP SINGH WALA	44J-2C4	8.67	989	47	233	35	240	14	0.56	nd	16	17	213	3.9	16	108	8.84	3.19
71	KHUIAN SARWAR	44J-4A1		LEAKED															
72	JAIMALWAL	44I4DP1		LEAKED															
73	LAUKE KALAN	44I-4DP1	8.81	495	24	84	14	135	1.1	0.27	0.01	35	26	33	5.4	21	196	1.03	-1.71
74	SAHWALA	44J-2BP4	8.62	2452	94	466	133	460	86	2.97	0.24	20	2.4	564	8	21	59	31.73	9.57
	GURDASPUR																		
75	DERA BABA NANAK	43P-4A1	8.58	485	24	212	39	144	nd	0.1	nd	15	37	76	56	15	192	2.40	0.48
76	GALHRI	43P-4B9	8.54	421	24	175	19	27	nd	0.19	0.007	23	28	22	17	16	176	0.73	0.22
77	NAWAN PIND	43P-3C5	8.28	185	0	79	3.5	22	nd	0.18	0.006	27	4.5	3.2	1.4	8.5	85	0.15	-0.42
78	GHOH	43P-3C6	8.08	504	0	248	30	22	16	0.28	nd	64	15	26	1.2	29	224	0.76	-0.36
79	PATHANKOT	43P-3C7	8.19	410	0	139	39	30	11	0.1	0.02	36	14	29	1.2	33	149	1.04	-0.67
80	SARMA	43P-3C8	8.18	234	0	109	7.1	24	2.1	0.11	nd	34	7.8	5.4	0.7	15	117	0.22	-0.55

81	BHOA	43P-3C9	8.22	237	0	109	5.3	25	1.2	0.15	nd	34	6.6	5.2	1.2	18	112	0.21	-0.45
82	JHAKOLARI	43P-4C3	8.47	1486	18	260	206	210	17	0.47	nd	21	37	255	12	21	208	7.76	0.77
83	GHAROTA KALAN	43P-4C5	8.72	1624	42	495	99	190	115	1.88	0.53	51	93	150	64	26	511	2.89	-0.68
84	KHANI KHUI	43P-4C6	8.83	251	18	91	3.5	22	0.4	0.12	0.06	41	5.2	3.6	2.5	13	123	0.14	-0.38
85	PANDORI TALAB	43P-4C8	8.27	772	0	181	60	80	100	0.18	0.01	70	45	19	3.5	24	362	0.44	-4.23
86	MADIPUR F. G HURIAN	44I-1D7	8.58	439	12	169	14	49	2.2	0.16	0.02	26	13	51	5.4	24	117	2.04	0.80
87	BATALA	44M-1A2	8.13	790	0	151	67	114	90	0.31	0.01	60	35	56	6.7	25	293	1.42	-3.40
88	BHAGOWAL	44M-1A3	8.27	353	0	157	7.1	45	1.4	0.27	nd	39	16	11	5.6	22	160	0.37	-0.69
89	NISHAYARA(DOKWALI)	44M-1B2	8.27	403	0	200	7.1	34	15	0.17	nd	30	25	20	5.6	19	176	0.65	-0.28
90	BHAM	44M-2B1	8.28	327	0	175	5.3	21	7.6	0.07	nd	30	19	12	3.6	19	155	0.42	-0.19
91	SRI HARGOBIND PUR	44M-2B2									LEAK								
92	QADDIAN N	44M-1B5	8.01	704	0	217	74	39	42	0.31	nd	45	28	60	7.8	19	229	1.73	-0.99
93	BAMYAL	43P-3B9	7.90	1712	0	338	184	195	172	0.21	nd	38	39	125	295	21	256	3.40	0.44
94	AULAKH KALAN	44M-1C8	7.91	522	0	284	8.9	32	18	0.12	nd	56	30	13	3.5	22	261	0.35	-0.61
95	DHIANPUR	44M-1A1	8.62	481	18	266	8.9	17	nd	0.84	nd	11	35	47	7.2	26	171	1.56	1.53
96	MULLOWALI, M	44M-1AP1	8.53	468	12	200	23	40	nd	0.14	nd	21	15	62	5.2	22	117	2.53	1.40
97	SALE CHAK	43P-4AP1	8.60	269	12	145	3.5	3.6	0.5	0.2	0.0245	19	6.4	33	3	19	75	1.67	1.30
98	KALANAUR	43P-4A2	8.06	568	0	247	19	59	17	0.25	0.017	40	29	41	2.7	14	219	1.20	-0.33
99	GHANIYA KI BANGER	44M-1A5A	8.42	242	6	115	3.5	20	1.2	0.4	nd	24	15	4.7	2.2	13	123	0.19	-0.35
100	SATHIALI (NANEKOT)	44J-1BP1	8.23	311	0	151	7.1	28	1.8	0.13	nd	32	15	7.2	6.8	21	144	0.26	-0.36
101	DOKOHA	44M-2BP1	8.25	420	0	236	8.9	14	13	0.46	nd	21	30	25	5.4	23	176	0.82	0.35
	HOSHIARPUR																		
102	HAZIPUR	44M-1C2	8.23	385	0	206	16	7.6	15	0.11	nd	41	17	18	1.5	18	171	0.60	-0.07
103	NANAGAL BIHALA	44M-1C4	7.96	727	0	260	50	17	83	0.13	nd	79	34	18	1.5	23	336	0.43	-2.48
104	TALWARA	44M-1D1	8.45	311	18	139	7.1	1.6	13	0.11	0.07	51	3.9	10	0.5	28	144	0.36	0.01
105	BHAMNAUR	44M-1D2	8.48	257	12	121	5.3	0	9.1	0.16	nd	30	9.1	11	0.9	27	112	0.45	0.14
106	SHAM CHAURASI	44M-2C9	8.78	402	30	200	7.1	2.4	nd	0.4	nd	15	13	62	3.4	20	91	2.83	2.46
107	CHOHAL	44M-2D5	8.29	314	0	157	11	5.6	14	0.15	nd	47	3.9	13	1.3	22	133	0.49	-0.09
108	THAKKAR WALA	44M-3D5	8.74	441	30	223	5.3	1.2	nd	0.25	nd	11	27	47	2.6	19	139	1.74	1.89
109	MUKERIAN	44M-1C3	8.14	455	0	217	34	10	nd	0.24	nd	49	13	27	2.8	15	176	0.89	0.04
110	DASSUYA, D	44M-1CP1	8.39	470	12	145	32	32	30	0.054	nd	28	23	36	1.5	28	165	1.22	-0.51
111	RAMPUR COLONY	44M-2DP1	8.03	574	0	175	28	56	68	0.073	nd	81	16	15	1.8	23	267	0.40	-2.49
112	GARHSHANKAR, S	53A-4AP1	8.53	406	18	236	8.9	0	nd	0.27	nd	13	34	30	2.4	21	171	0.99	1.02
113	ADOWAL GARHI	44M-1CP3	8.4	322	12	169	8.9	8	0.96	0.2	nd	30	16	19	0.8	33	139	0.70	0.36
114	GARHDIWALA	44M-1CP2	7.35	385	0	206	8.9	6.4	28	0.14	nd	30	22	17	7.2	20	165	0.58	0.07
115	PHUGLANA	44M-3DP1	7.72	695	0	163	35	40	190	0.29	nd	30	44	60	2	21	256	1.63	-2.44
116	MAHILPUR		7.93	599	0	157	85	17	68	0.18	nd	34	26	61	1.8	22	192	1.92	-1.26
117	SIMBLI		8.37	588	6	362	7.1	1.6	8.3	0.5	nd	15	45	45	4.5	20	224	1.31	1.68
	JALANDHAR																		
118	ALLWALPUR	44M-3C9	8.56	394	24	206	7.1	2	nd	0.27	nd	15	13	61	3	20	91	2.78	2.36
119	JALBHE	44M-3D8	8.45	471	18	223	21	11	nd	0.11	nd	13	17	68	4.7	20	101	2.92	2.21
120	UDHOPUR	44M-4C11	8.17	483	0	217	14	26	36	0.35	nd	28	21	47	3.2	21	155	1.64	0.43
121	KARTARPUR, S	44M-3BP1								LEAKED									
122	JALANDHAR, D	44M-3CP1	8.12	644	0	181	96	51	0.8	0.37	nd	34	31	55	5.7	26	213	1.64	-1.28
123	ADAMPUR, M	44M-3CP29	8.61	805	36	338	28	23	50	0.54	nd	11	12	170	3.4	19	75	8.44	5.20

124	SHAHKOT, S	44M-4BP1	8.08	784	0	200	78	62	95	0.09	0.011	41	39	72	6.3	27	261	1.93	-1.98
125	NAKODAR, D	44M-4BP2	8.26	1118	0	260	135	ND	40	0.95	nd	23	75	ND	3	ND	368		-3.05
126	PHILLAUR, S	44M-4DP1	8.45	892	18	423	44	38	22	0.43	0.015	11	43	132	6.7	25	203	4.02	3.45
127	GORIHAM	44M-4CP1	8.56	459	24	206	16	19	nd	0.35	nd	13	23	55	5.7	24	128	2.12	1.64
128	GORAYA, D	44M-4DP3	8.26	521	0	206	25	26	52	0.34	nd	26	22	53	5.3	22	155	1.85	0.27
129	SARIH, M	53D-4D2	8.80	863	65	381	7.1	ND	ND	ND	ND	11	9.1	ND	ND	ND	64		7.11
130	KHARAL KALAN	44M-2CP2	8.13	639	0	338	7.1	74	nd	0.2	nd	15	21	110	5.7	25	123	4.30	3.06
131	LALIAN KALAN, S	44M-3BP3	8.35	620	6	338	18	24	16	0.22	nd	17	39	63	16	21	203	1.92	1.68
132	JANDIALA GURU	44M-4C1A	8.00	447	0	206	30	4.4	22	0.51	nd	36	19	28	3.6	25	171	0.94	0.02
133	MALSIAN		8.21	439	0	217	34	7.2	4.3	0.32	nd	23	26	31	5.8	29	165	1.05	0.27
	KAPURTHALA																		
134	SULTANPUR LODHI	44M-4AP1	8.18	711	0	145	64	130	29	0.12	nd	45	28	60	13	12	229	1.73	-2.17
135	BHOLATH	44M-2CP1								LEAKED									
136	KAPURTHALA	44M-2BP2	7.80	1050	0	290	78	82	136	0.18	nd	79	35	93	8.7	23	341	2.19	-2.07
137	PHAGWARA	44M-4DP2	8.56	500	24	217	21	15	20	0.23	nd	17	34	42	6.7	27	181	1.35	0.71
138	DHILWAN	44M-2BP2	8.55	404	24	145	16	34	3	0.15	0.06	19	18	41	7.4	21	123	1.62	0.75
139	BHATMURA KHURD, D	44M-2CP3	8.28	812	0	356	50	58	31	0.07	0.006	19	44	96	8.3	23	229	2.76	1.27
140	TALWANDI CHAUDRI		8.72	370	24	193	3.5	6.8	0	0.24	nd	11	7.9	70	2.8	19	59	3.93	2.76
141	DALLA	44M-4A4	8.37	466	6	260	18	8	5.9	0.31	nd	36	21	39	4.5	22	176	1.28	0.94
	LUDHIANA																		
142	UTLANA	53B-1A4A	7.40	430	0	243	13	5	13	0.39	0.03	32	27	18	7.1	25	190	0.57	0.17
143	SAMRALA	53B-1AP1	7.50	847	0	256	61	48	123	0.16	nd	52	58	31	10	20	370	0.70	-3.17
144	MUSKABAD	53B-1A11	8.20	1750	0	666	259	34	4.1	0.39	3.52	176	71	89	24	30	731	1.43	-3.71
145	BHALOLPUR	53B-1B4	8.52	520	25	128	13	54	70	0.07	0.07	56	27	12	4.4	30	250	0.33	-2.08
146	SHERIAN	53B-1A13	8.32	805	63	269	13	130	0.3	0.4	0.02	40	27	120	10	15	210	3.59	2.29
147	BHATTION		8.26	670	0	141	48	50	134	0.22	0.1	60	34	22	4.3	24	290	0.56	-3.48
148	PUNJETA	53B-1A8	8.35	382	25	141	13	30	27	0	nd	48	19	11	5.6	26	200	0.34	-0.81
149	LALAN	53B-1A1	8.55	562	38	154	21	72	21	0.75	0.15	20	34	53	7.5	24	190	1.67	0.00
150	BEGOWAL	53B-1A14		LEAKED															
151	DORAHA	53B-1BP2	8.55	480	25	77	55	78	15	0.16	nd	28	29	39	3.5	14	190	1.23	-1.69
152	KADDON	53B-1A2	8.45	1025	25	115	211	78	0.8	0.1	nd	20	19	171	12	2.85	130	6.57	0.16
153	PAIL		8.02	930	0	384	102	32	15	0.46	nd	52	51	71	11	23	340	1.68	-0.50
154	MAKSUDRA	44N-1D5	8.10	945	0	359	75	80	18	0.3	nd	40	41	60	79	22	270	1.59	0.52
155	GOPALPUR	44N-2DP1	8.40	745	38	346	27	78	11	0.66	nd	36	34	110	8.4	24	230	3.16	2.34
156	PAU, LDH	44N-1DP1	8.35	488	25	128	13	58	61	0.26	nd	32	29	32	7.4	21	200	0.99	-1.05
157	LEEL	44N-2CP1	8.32	325	13	115	13	55	8.2	0.31	nd	44	17	6.7	6.2	21	180	0.22	-1.28
158	SIDHWAN BET	44N-1B4	7.90	875	0	346	34	210	65	0.32	nd	60	83	52	4.4	25	490	1.02	-4.15
159	JAGRAON	44N-1BP1	8.45	530	50	167	13	54	27	0.43	nd	32	24	61	6.4	24	180	1.99	0.83
160	MALAN KALAN		8.12	940	0	470	61	45	30	0.37	nd	40	36	130	9.4	27	250	3.59	2.75
161	IKLOHA	53B-2A1		LEAKED															
	MANSA																		
162	BHIKHI	44N-4CP1	8.90	1585	113	372	75	215	19	1.09	0.01	20	7.3	352	4	18	80	17.13	8.26
163	KOTRA	44N-4B6	8.80	928	76	192	48	126	23	0.34	nd	24	44	121	1.2	23	240	3.39	0.86
164	RALLA	44N-4B2	8.50	825	25	228	75	33	49	1.02	nd	40	34	30	85	18	240	0.84	-0.22
165	BURJ BHALAIKE	44O-1B5	8.50	5870	50	179	418	2065	54	0.82	nd	68	141	960	168	21	751	15.25	-10.39

166	KOT DHAMRU	44O-1B8	8.52	1069	25	256	89	212	17	2.1	0.01	32	36	170	17	13	230	4.90	0.47
167	FATTA MALUKA	44O-1B6	8.15	4990	0	564	626	1138	57	1.7	0.02	84	66	960	16	26	480	19.04	-0.38
168	JHANDRA KHURD	44O-2AP3	8.48	335	25	64	10	56	1.3	0.57	nd	36	15	7.4	4.6	11	150	0.26	-1.15
169	MOFAR	44O-1BP1	9.10	2130	164	423	214	242	33	3.4	nd	20	27	479	8	13	160	16.42	9.18
170	BUDHLADHA	44O-1C1	8.38	595	25	218	21	78	10	0.67	nd	56	39	15	7.7	15	300	0.38	-1.60
	MOGA																		
171	CHAUGAMAN	44N-1BP3	8.68	711	47	250	28	87	8	0.32	0.04	20	40	90	8.5	21	216	2.67	1.38
172	DAGRU	44N-1AP1	LEAKED																
173	BUDH.S.WALA	44N-2AP2	LEAKED																
174	NIHAL SINGH NALA	44N-2AP1	8.77	871	59	227	63	96	26	0.26	0.01	24	33	133	8.6	24	196	4.14	1.78
175	BAJEKE	44N-1AP2	8.39	412	18	78	21					12	28	24	6		147	0.87	-1.02
176	MANSIAN	44J-1AP1	8.25	512		179	21	90	3.8	0.08	nd	27	22	50	6.7	16	157	1.73	-0.22
177	DARAPUR	44J-1DP1	9.08	2330	106	418	98	580	23	1.38	0.02	12	17	502	75	27	98	21.85	8.39
178	DAMERU KHURD	44J-2D4	8.24	1675		239	126					51	43	264	5		304	6.59	-2.16
	MUKTSAR																		
179	BILOCH KHERA	44J-4B10	8.57	1154	35	191	105	155	83	1.72	nd	35	48	126	34	22	284	3.25	-1.40
180	LABIANWALI	44J-2C2	7.91	1424		275	118	290	59	0.09	nd	43	60	176	12	19	353	4.07	-2.57
181	MUKTSAR	44J-3C1	7.93	2574		287	452	350	108	0.69	nd	86	126	243	49	23	735	3.90	-9.95
182	BHALIANA	44J-3C8	7.99	5584		347	639			0.06	nd	74	176	804	229	29	911	11.60	-12.48
183	DODA	44J-3C9	7.99	5345		72	952	1250	291	0.05	0.01	282	57	840	170	29	941	11.93	-17.58
184	KUTTIANWALI	44J-4B8	7.94	5409		383	1025	925	24	0.34	nd	63	140	694	402	21	735	11.15	-8.38
185	QABARWALA	44J-4B9	8.83	1375	59	215	112	240	85	9.87	0.03	12	14	312	12	16	88	14.51	3.74
186	DIPULANA	44J-3BP2	8.17	1203		407	49	175	36	0.31	0.01	39	19	195	14	23	176	6.40	3.16
187	KHUNDE HALAL	44J-3BP1	8.37	416	12	96	35	50	1	0.21	0.05	55	100	27	4.5	17	137	0.50	-8.99
	NAWANSHAHR																		
188	BALACHAUR, D	53A-4BP2	8.20	392	0	163	14	15	40	0.1	nd	28	27	9.6	5.5	24	181	0.31	-0.95
189	MEHADPUR	53A-4AP2	8.42	440	12	260	8.9	2.4	0	0.12	nd	21	28	33	6.2	28	171	1.11	1.31
190	RAIPUR DABBA		8.56	449	18	248	8.9	2	9.5	0.54	nd	21	30	34	6.1	28	176	1.12	1.15
191	BAHLOR KALAN		8.55	923	24	290	35	166	2	0.35	0.006	21	40	130	8.1	22	219	3.84	1.22
192	MAUHAR		8.54	430	18	229	8.9	2.4	18	0.3	nd	21	28	35	2.8	24	171	1.18	1.00
193	RAHON	53A-4A3	8.17	1280	0	308	78	138	180	0.02	0.005	39	60	120	53	36	341	2.81	-1.83
194	NAWANPIND (TAPARIAN)	53A-4B3	8.42	346	12	187	5.3	0.4	14	0.22	nd	26	18	25	2.3	28	139	0.92	0.69
195	KARIMPUR CHHAWAL	53A-4B4	8.17	386	0	200	8.9	2	27	0.21	nd	36	18	18	2.2	28	165	0.61	0.00
	PATIALA																		
196	RAJPUR	53B-3CP4	8.40	5770	63	538	957	1100	76	1.5	nd	48	83	1218	10	17	460	24.67	1.70
197	PATRAN	53B-1AP2	8.80	1065	63	372	81	48	70	0.56	0.01	28	27	204	8.4	28	180	6.60	4.58
198	BHAJO MAJRA	53B-3AP2	8.30	580	25	269	21	48	16	0.26	0.01	52	24	54	6.7	22	230	1.55	0.67
199	SANGATPURA		8.58	630	25	231	21	90	21	0.4	0.08	28	19	92	19	24	150	3.29	1.66
200	KALYAN	53B-3BP4	8.65	745	38	192	55	125	26	0.48	nd	20	36	106	18	26	200	3.28	0.45
201	DHAKRABA	53B-3BP3	8.60	265	38	25	6.74	48	0	0.72	0.04	36	9.7	5.7	3.4	19	130	0.22	-0.92
202	SAMANA	53B-4A2A	8.40	765	25	128	89	86	77	0.46	0.02	36	34	83	14	23	230	2.38	-1.66
203	DEVIGARH	53B-3BP5	7.90	915	0	384	27	210	0.5	0.7	0.01	32	34	162	3.8	20	220	4.75	1.90
204	MIRPUR	53B-4BP4	7.72	1640	0	179	327	225	1.3	0.8	0.01	68	92	130	14	25	550	2.42	-8.03
205	LACHAKANI	53B-3C11	8.40	1015	25	269	109	105	32	0.35	0.01	32	29	150	24	22	200	4.62	1.26
206	BIR KAULI	53B-3CP1	8.80	985	63	218	68	194	0.66	0.96	nd	32	34	164	7.4	24	220	4.81	1.28

207	LACHARU KALAN	53B-3C11	8.60	1530	50	397	95	340	nd	1.36	0.01	24	29	330	4.5	15	180	10.73	4.59
208	KAMIKALAN	53B-3CP2	8.32	690	25	282	21	98	nd	0.44	nd	36	17	110	6	17	160	3.79	2.26
209	RAJ PURA	53B-3CP4	9.00	1660	88	308	95	392	12	1.6	0.01	16	22	378	5	23	130	14.40	5.37
210	TUHA	53B-2CP3	8.20	1685	0	346	197	330	2.2	0.32	0.01	60	36	280	2	21	300	7.06	-0.28
211	NARIANA	53B-2C12	8.90	1055	88	397	24	115	7.03	0.85	nd	16	36	210	2.5	23	190	6.66	5.68
212	BANUR	53B-2C2	8.72	460	25	167	27	38	nd	0.26	0.03	24	19	53	2.2	22	140	1.96	0.81
	ROPAR																		
213	AHMEDPUR	53A-4C3A	8.12	279	0	145	7.1	15	nd	0.16	0.005	26	12	15	2.7	17	112	0.61	0.09
214	HARDONAMOH	53A-4C5	7.63	732	0	302	90	0.4	0.74	0.31	0.012	68	23	50	5.7	23	267	1.34	-0.34
215	DHERI, DW	53B-2C7	8.18	337	0	157	11	35	nd	0.44	nd	56	0	19	2.8	15	139	0.70	-0.22
216	BRAHMPUR	53A-3B2	7.81	686	0	284	74	22	2.6	0.22	nd	47	39	38	3.4	20	277	0.99	-0.90
217	BHALAN	53A-3B4	8.19	398	0	223	8.9	20	0.2	0.22	0.009	23	16	44	2	19	123	1.72	1.19
218	DUMEWAL	53A-4B5	8.29	498	0	302	8.9	19	nd	0.28	nd	17	10	90	1.5	17	85	4.28	3.28
219	NURPUR BEDI	53A-4B6	7.85	1777	0	544	223	140	20	0.54	0.015	36	39	320	0.6	18	250	8.80	3.91
220	BARA CHAUNTA	53B1-1C1	8.44	1388	18	652	60	62	30	2.85	0.064	15	12	310	1.8	13	85	14.48	9.55
221	ROPAR	53B1-1B9	8.34	2290	6	616	266	230	47	0.79	0.091	28	65	350	86	20	336	8.29	3.55
222	SOARA	53B2-2C5	8.53	1000	24	441	18	100	1.9	2.15	0.018	24	5.1	215	2	13	80	10.40	6.41
223	LANDRAN	53B2-2C4	8.03	678	0	441	11	20	7.6	1.03	nd	32	30	92	4	16	203	2.81	3.16
224	CHATAMALI	53B-1CP1	7.81	618	0	266	39	25	23	0.35	0.005	60	29	21	7.7	20	267	0.56	-1.02
225	ROORKEE HEERAN	53B-1B6	8.58	475	24	212	14	18	7.5	0.45	0.008	15	21	65	0.5	17	123	2.54	1.80
	SANGRUR																		
226	BHADAUR	44N-3B4	8.40	1087	38	90	95	275	0.2	0.37	nd	32	15	190	8	17	140	6.95	-0.09
227	GAHL IIND	44N-2BP1	8.35	365	38	103	6.74	40	4.4	1.35	nd	40	19	11	3.7	17	180	0.36	-0.60
228	MALER KOTLA	44N-2D5	8.30	1035	38	295	61	155	48	0.54	0.07	20	29	191	8	24	170	6.39	2.72
229	MANDEVI	44O-1D7	8.60	425	38	154	13	45	0.2	0.39	nd	28	22	41	6.8	22	160	1.41	0.58
230	BAGARIAN	53B-3AP4	8.55	410	38	154	13	40	0.6	0.35	nd	24	22	44	5.2	23	150	1.56	0.78
231	MEHSAMPUR	44N-3DP3	8.45	445	38	167	13	48	nd	0.42	0.04	44	19	35	5.1	17	190	1.11	0.25
232	BHOJOWALI	44N-3D9	8.30	1332	19	333	143	192	36	0.3	nd	28	58	193	8	25	310	4.78	-0.08
233	LADDA	44N-3DP4	8.35	820	25	269	61	45	73	0.37	nd	52	39	73	6.9	27	290	1.86	-0.56
234	BUGRA	44N-3DP2	8.60	550	25	231	13	54	4.8	0.49	nd	16	9.7	106	2.7	17	80	5.16	3.02
235	GHANAURI KALAN	44N-3D7	8.65	520	63	167	13	40	14	0.32	nd	28	24	64	6.8	24	170	2.14	1.47
236	BARNALA	44N-3CP1	8.65	520	50	256	27	82	9.05	0.61	nd	16	27	126	5	14	150	4.46	2.84
237	LONGOWAL		8.68	1638	88	615	75	158	7.36	0.99	nd	28	34	304	50	18	210	9.13	8.82
238	SUNAM	44N-4DP1	8.52	350	25	154	13	21	nd	0.32	0.05	32	22	17	4.6	25	170	0.57	-0.05
239	CHURAL KALAN	44O-1DP3	9.00	1175	113	423	27	176	15	0.3	0.03	16	36	265	5.5	26	190	8.41	6.94
	SAS NAGAR																		
240	HANDESARA	53B-3CP3	8.29	753	0	375	39	41	1.6	0.54	0.008	21	19	125	10	16	133	4.76	3.54
241	ANTALA	53B-3D5	8.26	954	0	163	121	100	76	0.69	0.028	36	43	98	2.6	15	267	2.61	-2.66
242	JOLLY	53B-2D9	7.88	924	0	369	60	78	34	0.35	0.026	43	31	123	1.5	14	235	3.49	1.35
243	ISARPUR, Pz	53B-2DP3	8.20	658	0	320	44	21	1.3	0.67	nd	26	18	100	1.5	12	139	3.69	2.47
244	CHHATT	53B-2DP2	7.70	818	0	236	92	42	62	0.37	nd	77	32	40	7.3	16	325	0.97	-2.61
245	BANUR	53B-2C2	7.57	1578	0	405	170	128	117	0.28	nd	81	71	148	3.1	14	495	2.90	-3.24
246	TANGORI	53B2-2C15	7.92	531	0	248	16	49	5.1	0.28	0.008	39	26	28	17	15	203	0.85	-0.02
247	DHERI	53B-2C7	8.08	863	0	514	21	46	14	0.24	0.019	119	31	35	9.3	22	426	0.74	-0.06
248	HALUKA	53B2-2C14	7.71	1041	0	338	89	82	47	0.19	nd	88	28	80	22	16	336	1.90	-1.15

249	CHANNALON	53B1-C3	8.05	508	0	157	43	30	44	0.17	0.008	60	12	23	7.1	15	197	0.71	-1.41
250	KAKRALI	53B1-C11	7.72	368	0	157	14	30	13	0.16	0.015	36	14	17	4.9	13	149	0.61	-0.37
	TARANTARAN																		
251	HARIKE	44I-4D1	8.81	918	59	429	28	35	9	0.77	0.011	11	40	155	9.8	29	192	4.87	5.16
252	DHOTIAN	44M-3A5	8.21	485	0	290	5.3	20	6.8	0.56	nd	51	31	5.8	6.7	21	256	0.16	-0.34
253	BHAGUPUR	44I-4D6	8.76	862	53	175	78	30	77	2.02	nd	13	9	170	8.5	24	69	8.87	3.25
254	GOINDWAL	44M-3A6	8.48	428	18	200	25	1	1.6	0.64	nd	19	18	46	7.1	23	123	1.82	1.45
255	KALSIA KALAN	44I-3C6	8.45	475	12	229	5.3	43	7.7	0.55	nd	19	40	21	9.9	28	213	0.63	-0.08
256	CHOGWAN	44I-2C2	8.65	992	42	242	57	120	65	0.41	0.024	17	41	134	24	25	213	4.01	1.15
257	GANDIWIND		8.72	1155	53	531	27	62	3.3	1.4	nd	15	18	238	5.9	26	112	9.81	8.24
258	BHIKHIWIND	44I-	8.80	1588	47	616	92	92	43	0.71	nd	13	36	305	8.7	29	181	9.88	8.05
259	RATTOKE	44I-4C4	8.35	1001	6	423	74	78	1.0	0.28	0.024	17	16	203	4.2	20	107	8.49	4.97
260	CHOLA SAHIB	44I-3D4	8.26	947	0	550	11	52	nd	0.71	0.008	13	38	153	8.2	31	187	4.84	5.24
261	SAHABPURA		8.78	891	42	393	14	65	7.3	1.29	nd	11	12	190	5.8	24	75	9.43	6.30
262	KHANDUR SAHIB	44M-3A2	8.65	688	30	163	42	104	nd	0.15	nd	17	7.8	130	2.7	18	75	6.55	2.18
UT CHANDIGARH																			
1	MALOYA		8.21	509	0	187	41	43	0.5	0.22	0	32	17	43	16	14	149	1.53	0.07
2	SECTOR 44-D		7.9	606	0	254	28	62	0.4	0.5	0	43	18	64	0.7	12	181	2.07	0.54
3	BURAIL		8.4	815	12	326	58	34	19	0.25	0.011	28	38	32	104	25	224	0.93	1.22