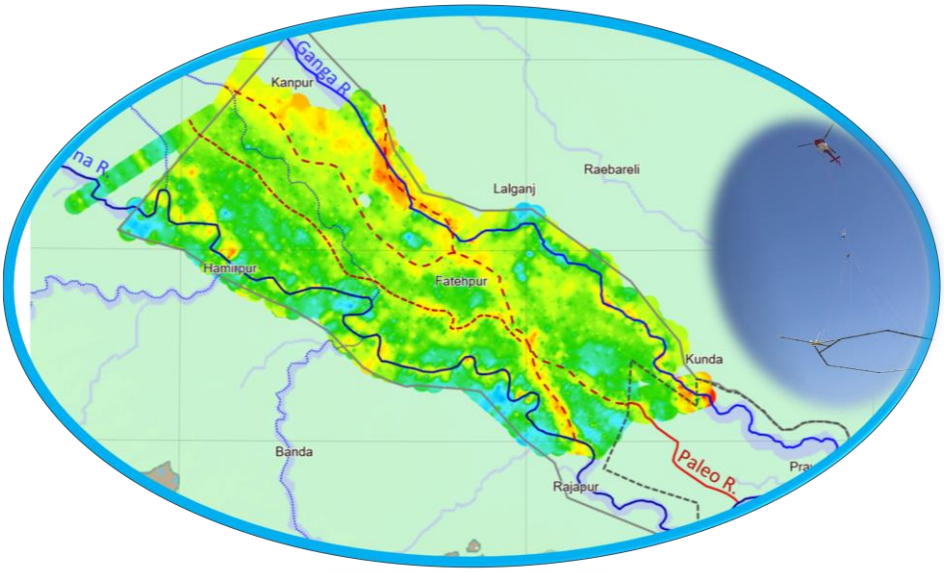
Final Report on

AQUIFER MAPPING WITH FOCUS ON PALEOCHANNELS IN PARTS OF GANGA YAMUNA DOAB IN KAUSHAMBI-KANPUR STRETCH



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AQUIFER MAPPING WITH FOCUS ON PALAEO-CHANNELS IN PARTS OF GANGA YAMUNA DOAB IN KAUSHAMBI-KANPUR STRETCH

Funded by

सत्यमेव जयते

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Table of Contents

1. INTRODUCTION 7
1.1 ABOUT STUDY AREA 11
2. OBJECTIVES 14
3. MATERIAL AND METHOD 15
3.1 Helicopter based airborne electromagnetic and magnetic surveys 16
Magnetometer 17
SkyTEM 312 17
3.2 Processing of the SkyTEM data 20
3.2.1 Airborne magnetic data 20
3.2.2 Airborne electromagnetic data 20
3.3 Inversion 21
4. SURVEY PLANNING & DATA ACQUISITION 25
5. RESULTS AND DISCUSSION 28
5.1 Airborne Magnetic results 28
5.2 Airborne TEM Results 30
5.2.1 Depth of Investigation 31
5.2.2 Mean Resistivity Map 33
6. Tracking the inferred paleochannel further north westward in inter-fluve region 40
7. 3D Mapping of Principal Aquifers system 50
8. Establishing linkages between aquifer system including paleochannel with river system 57
9. Validation by Ground and Borehole geophysics 62
10. Locating sites suitable for development of a plan for Managed Aquifer Recharge 73
11. SUMMARY 102
11.1 Paleochannel 103
11.2 River-Aquifer Linkages 105
12. Way forward 107
13. Acknowledgement 108
14. References 109

LIST OF FIGURES

FIGURE 1: ELEVATION MAP OF GANGA RIVER BASIN. THE BLOCK-A REPRESENT THE CURRENT PILOT AREA, WHERE HELIBORNE GEOPHYSICAL MAPPING HAS REVEALED 45 KM LONG PALEO CHANNEL. BLOCK-B IS THE PROPOSED AREA AS EXTENSION OF BLOCK-A TO BE SURVEYED TO TRACK ENCOUNTERED PALEO CHANNEL WEST WARD. (LOCATIONS OF PRAYAGRAJ, KAUSHAMBI AND KANPUR MAY BE SHOWN.) 9
FIGURE 2. AEM RESISTIVITY MAP ON HORIZONTAL PLAIN SHOWING RIVER GANGA, YAMUNA, AND NEWLY DISCOVERED PALEO CHANNEL. 10
FIGURE 3. BLOCK A AND A+ ARE SURVEYED AREA THAT HAVE REVEALED 45 KM LONG BURIED PALEOCHANNEL IN GANGA-YAMUNA DOAB BETWEEN PRAYAGRAJ AND KANPUR DISTRICTS. BLOCK B IS EXTENDED SURVEY AREA WEST WARD UP TO KANPUR TO TRACE THE EXTENSION OF NEWLY DISCOVERED PALEO CHANNEL NEAR PRAYAGRAJ. 11
FIGURE 4. WATER LEVEL MAP FOR THE YEAR 2008 AND 2017 SHOWN AS DEPTH BELOW GROUND LEVEL. 12
FIGURE 5. INSTRUMENT SETUP OF HELIBORNE GEOPHYSICAL SYSTEM TOWED BELOW HELICOPTER CONTAINING DUAL MOMENT SKYTEM 312 WITH ALL ACCESSORIES AND MAGNETOMETER. 16
FIGURE 6. INSTRUMENT SETUP FOR THE SKYTEM SYSTEM USED. HE 1 AND 2 ARE LASER ALTIMETERS, TL 1 AND 2 ARE INCLINOMETERS, GPS 1 AND 2 ARE GPS SENSORS, TX IS THE TRANSMITTER. 17
FIGURE 7. GREEN AND RED DOTS ARE RAW DATA FROM THE TWO LASER ALTIMETERS. BROWN DOTS ARE THE RESULTING ALTITUDE AFTER FILTERING THE DATA. THE TIME WINDOW HOLDS APPROXIMATE 2KM OF DATA. 19
FIGURE 8. AEM MEASURED RESPONSE FOR VERY EARLY TIME, LOW AND HIGH MOMENTS 22
FIGURE 9. INVERSION WITH COIL RESPONSE CORRECTION. THE TOTAL FORWARD RESPONSE (BLUE CURVE) CONSISTING OF THE NORMAL FORWARD RESPONSE (GREEN CURVE) PLUS A CONTRIBUTION FROM THE COIL RESPONSE FUNCTION (RED CURVE), IS COMPARED TO THE MEASURED SIGNAL (BLACK CURVE). SMALL ADJUSTMENTS OF THE INVERSION PARAMETERS (THAT DETERMINE THE NORMAL FORWARD RESPONSE) AND THE LEVEL OF THE COIL RESPONSE FUNCTION ARE PERFORMED BEFORE EACH COMPARISON UNTIL THE TOTAL FORWARD RESPONSE IS SUFFICIENTLY CLOSE TO THE MEASURED SIGNAL. 23
FIGURE 10. SCHEMATIC MODEL OF SPATIALLY CONSTRAINED INVERSION 24
FIGURE 11. SURVEY FLIGHT AND TIE LINE DISTRIBUTION AND INFILL LINES AT VARYING SPACINGS. FLIGHT LINES ARE ALSO ADDED OVER RIVER GANGA AND YAMUNA FOR THEIR RIVER BED CHARACTERIZATION. RESTRICTED ZONE MARKED DUE TO DEFENSE INSTALLATION AND URBANIZATION 26
TABLE 2. DETAILS TOTAL DATA ACQUIRED TO EXECUTE THE PROJECT 26
FIGURE 12. MAGNETIC MAPS WITH INFERRED MAGNETIC LINEAMENT MARKED WITH DASH-DOTTED LINE AND IMPACT OF BUNDELKHAND CRATON: TOTAL MAGNETIC INTENSITY (TMI) MAP AFTER IGRF CORRECTION (UPPER) AND REDUCED TO POLE (RTP) MAGNETIC ANOMALY MAP. 29
FIGURE 13. AEM LOW AND HIGH MOMENT RAW AND AVERAGE PROCESSED DATA IN DB/DT FORM FOR ALL CHANNELS. 31
FIGURE 14. AEM FIELD RESPONSE: A) DB/DT RAW DATA, B) DB/DT AVERAGE DATA NORMALIZED WITH NIA, C) INVERTED RESISTIVITY MODEL SHOWING FORMATION RESISTIVITY WITH DEPTH AT POINT 'A' MARKED IN FIGURE 13 AND AEM RESISTIVITY INVERTED SECTION CORRESPONDING TO FULL 10 MINUTES PROFILE AS SHOWN IN FIGURE 13. 32
FIGURE 15. DEPTH OF INVESTIGATION (DOI) MAP OF AEM SURVEY RESULT 33
FIGURE 16. MEAN RESISTIVITY MAP (MRM) AT 0-10 M DEPTH BETWEEN KAUSHAMBI AND KANPUR DISTRICTS 34
FIGURE 17. MEAN RESISTIVITY MAP AT 40-50 M DEPTH BETWEEN KAUSHAMBI AND KANPUR DISTRICTS 35
FIGURE 18. MEAN RESISTIVITY MAP AT 90-100 M DEPTH BETWEEN KAUSHAMBI AND KANPUR DISTRICTS 36
FIGURE 19. MEAN RESISTIVITY MAP AT 140-150 M DEPTH BETWEEN KAUSHAMBI AND KANPUR DISTRICTS 37
FIGURE 20. MEAN RESISTIVITY MAP AT 190-200 M DEPTH BETWEEN KAUSHAMBI AND KANPUR DISTRICTS 38
FIGURE 21. MEAN RESISTIVITY MAP AT 240-250 M DEPTH BETWEEN KAUSHAMBI AND KANPUR DISTRICTS 39
FIGURE 22. MEAN RESISTIVITY MAP AT 290-300 M DEPTH BETWEEN KAUSHAMBI AND KANPUR DISTRICTS 39
FIGURE 23. MEAN RESISTIVITY MAP AND INFERRED PALEOCHANNEL AT 10-15 M DEPTH BETWEEN KAUSHAMBI AND KANPUR DISTRICTS 40

FIGURE 24. MEAN RESISTIVITY MAP AND INFERRED PALEOCHANNEL AT 15-20 M DEPTH BETWEEN KAUSHAMBI AND KANPUR DISTRICTS 41
FIGURE 25. MEAN RESISTIVITY MAP AND INFERRED PALEOCHANNEL AT 20-25 M DEPTH BETWEEN KAUSHAMBI AND KANPUR DISTRICTS 42
FIGURE 26. MEAN RESISTIVITY MAP AND INFERRED PALEOCHANNEL AT 25-30 M DEPTH BETWEEN KAUSHAMBI AND KANPUR DISTRICTS 43
FIGURE 27. MEAN RESISTIVITY MAP AND INFERRED PALEOCHANNEL AT 30-35 M DEPTH BETWEEN KAUSHAMBI AND KANPUR DISTRICTS 44
FIGURE 28. MEAN RESISTIVITY MAP AND INFERRED PALEOCHANNEL AT 35-40 M DEPTH BETWEEN KAUSHAMBI AND KANPUR DISTRICTS 45
FIGURE 29. MEAN RESISTIVITY MAP AND INFERRED PALEOCHANNEL AT 40-45 M DEPTH BETWEEN KAUSHAMBI AND KANPUR DISTRICTS 46
FIGURE 30. MEAN RESISTIVITY MAP AND INFERRED PALEOCHANNEL AT 45-50 M DEPTH BETWEEN KAUSHAMBI AND KANPUR DISTRICTS 47
FIGURE 31. MEAN RESISTIVITY MAP AND INFERRED PALEOCHANNEL AT 15-25 M DEPTH BETWEEN KAUSHAMBI AND KANPUR DISTRICTS WITH INFERRED PALEOCHANNEL 48
FIGURE 32. MEAN RESISTIVITY MAP AND INFERRED PALEOCHANNEL AT 25-50 M DEPTH BETWEEN KAUSHAMBI AND KANPUR DISTRICTS 49
FIGURE 33. GRID MAP OF PROFILE LINES ALONG WHICH TOP, AND BOTTOM OF AQUIFER SURFACES ARE EXTRACTED. 50
FIGURE 34. DEMONSTRATIVE GRID SECTIONS GS16 (UPPER) AND GS40 WITH DIGITIZED TOP AND BOTTOM OF AQUIFER SURFACES. 51
FIGURE 35. SURFACE ELEVATION MAP (A-TOP, & B-BOTTOM) OF PRINCIPAL ALLUVIUM AQUIFER-1. 52
FIGURE 36. SURFACE ELEVATION MAP (A-TOP, & B-BOTTOM) OF PRINCIPAL ALLUVIUM AQUIFER-2. 54
FIGURE 37. SURFACE ELEVATION MAP (A-TOP, & B-BOTTOM) OF VINDHYAN AQUIFER. 55
FIGURE 38. PROFILES LAYOUT ALONG ($G_{AA'}$ $Y_{AA'}$) AND ACROSS (CP1, CP2 & CP3) THE GANGA AND YAMUNA RIVERS. 57
FIGURE 39. RESISTIVITY SECTION ($G_{AA'}$) ALONG THE GANGA RIVER REVEALING HYDROGEOLOGICAL LINKAGES OF RIVER WITH UNDERLYING PALEOCHANNEL AND AQUIFER. 58
FIGURE 40. RESISTIVITY SECTION ($G_{AA'}$) ALONG THE YAMUNA RIVER REVEALING HYDROGEOLOGICAL LINKAGES OF RIVER WITH UNDERLYING AQUIFER. 59
FIGURE 41. RESISTIVITY SECTION (CP1) RUNNING ACROSS THE YAMUNA AND GANGA RIVERS, REVEALING HYDROGEOLOGICAL LINKAGES OF RIVERS WITH BURIED PALEOCHANNEL AND UNDERLYING AQUIFER SYSTEM.. 59
FIGURE 42. RESISTIVITY SECTION (CP2) RUNNING ACROSS THE YAMUNA AND GANGA RIVERS, REVEALING HYDROGEOLOGICAL LINKAGES OF RIVERS WITH BURIED PALEOCHANNEL AND UNDERLYING AQUIFER SYSTEM. 60
FIGURE 43. RESISTIVITY SECTION (CP3) RUNNING ACROSS THE YAMUNA AND GANGA RIVERS, REVEALING HYDROGEOLOGICAL LINKAGES OF RIVERS WITH BURIED PALEOCHANNEL AND UNDERLYING AQUIFER SYSTEM. 61
TABLE 3. DETAILS OF BOREHOLE DATA UTILIZED- OLD WELLS OF CGWB AND NEWLY SHALLOW DRILLED WELLS BY NGRI. 62
FIGURE 44. LOCATION MAP OF CGWB OLD WELLS, NEWLY DRILLED SHALLOW WELLS AFTER AEM SURVEY BY CSIR-NGRI, AND ALSO RECENT CORE DRILLING WELLS (<50 M) PROFILE LAYOUT (VP1,…, VP17) FOR VALIDATION OF AEM RESULTS BY ERT, GTEM AND BOREHOLE GEOPHYSICAL (N16, N64 & GAMMA) LOGS. 64
FIGURE 45. AEM RESISTIVITY ALONG PROFILE VP1 RUNNING ACROSS INFERRED PALEOCHANNEL AND ITS COMPARISON WITH RESISTIVITY OBTAINED BY BOREHOLE GEOPHYSICAL (N64) RESISTIVITY LOGS. 65
FIGURE 46. AEM RESISTIVITY ALONG PROFILE VP2 RUNNING ACROSS INFERRED PALEOCHANNEL AND ITS COMPARISON WITH RESISTIVITY OBTAINED BY: GTEM (UPPER); ERT (MIDDLE), AND BOREHOLE GEOPHYSICAL (N64) LOGS. 66

FIGURE 47. AEM RESISTIVITY ALONG PROFILE VP3 RUNNING ACROSS INFERRED PALEOCHANNEL AND ITS COMPARISON WITH RESISTIVITY OBTAINED BY BOREHOLE GEOPHYSICAL (N64) LOGS. 67
FIGURE 48. AEM RESISTIVITY ALONG PROFILE VP4 RUNNING ACROSS INFERRED PALEOCHANNEL AND ITS COMPARISON WITH RESISTIVITY OBTAINED BY: ERT (UPPER) AND GTEM INVESTIGATIONS. 67
FIGURE 49. AEM RESISTIVITY ALONG PROFILE VP5 RUNNING ACROSS INFERRED PALEOCHANNEL AND ITS COMPARISON WITH RESISTIVITY OBTAINED BY: ERT (UPPER) AND GTEM INVESTIGATIONS. 68
FIGURE 50. AEM RESISTIVITY ALONG PROFILE VP6 RUNNING ACROSS INFERRED PALEOCHANNEL AND ITS COMPARISON WITH RESISTIVITY OBTAINED BY: ERT (UPPER) AND GTEM INVESTIGATIONS. 68
FIGURE 51. AEM RESISTIVITY ALONG PROFILE VP7 RUNNING ACROSS INFERRED PALEOCHANNEL AND ITS COMPARISON WITH RESISTIVITY OBTAINED BY: ERT (UPPER) AND GTEM INVESTIGATIONS. 69
FIGURE 52. AEM RESISTIVITY ALONG PROFILE VP8 RUNNING ACROSS THE INFERRED PALEOCHANNEL AND ITS COMPARISON WITH RESISTIVITY OBTAINED BY: BOREHOLE RESISTIVITY (LONG NORMAL N64) LOGS. 69
FIGURE 53. AEM RESISTIVITY ALONG PROFILE VP9 AND VP10 RUNNING ACROSS THE INFERRED PALEOCHANNEL AND ITS COMPARISON WITH RESISTIVITY OBTAINED BY: BOREHOLE RESISTIVITY (LONG NORMAL N64 AND GAMMA) LOGS. 70
FIGURE 55. AEM RESISTIVITY ALONG PROFILE VP13 (UPPER) AND VP14 RUNNING ACROSS THE INFERRED PALEOCHANNEL AND ITS COMPARISON WITH: BOREHOLE RESISTIVITY (LONG NORMAL N64 RESISTIVITY AND GAMMA) LOGS. 71
FIGURE 56. AEM RESISTIVITY ALONG PROFILE VP15 (UPPER), VP16 (MIDDLE) AND VP17 RUNNING ACROSS THE INFERRED PALEOCHANNEL AND ITS COMPARISON WITH: GEM & ERT RESISTIVITY, BOREHOLE RESISTIVITY (LONG NORMAL N64 RESISTIVITY AND GAMMA) LOGS. 72
FIGURE 57. DEMONSTRATIVE AEM SECTION GS16 & GS40 SHOWING MAR SITES AND ITS HYDROGEOLOGICAL CONNECTIVITY WITH UNDERLYING AQUIFER SYSTEM. 73
FIGURE 58. MAR SITES DIGITIZED IN CLUSTERS OF POINTS SUPERIMPOSED OVER MEAN RESISTIVITY MAP OF 0-10 M DEPTH. EACH CLUSTERS WITH GROUP OF POINTS INDICATES ONE SITE. 74

1. INTRODUCTION

The great significance of the Ganga River basin (Fig. 1) can be appreciated by the fact that it sustains about 40% of the population of India (NGRB, 2015). The densely populated Ganga-Yamuna Doab (GYD) area of about 1,00,000 sq. km in Uttar Pradesh holds complex hydrological system and faces a variety of surface and groundwater related problems (Gorton C., 2017; 19. Mishra and Mishra, 2007; Tiwari et al., 2009; Rodell et al., 2009; Chandra et al., 2011; Mukherjee et al., 2018). The Ganga Plain is well known for multi-layered aquifer system and blessed with Himalayan rivers with glacial source. It currently faces dwindling of ground water level due to inadequate recharge and over exploitation. People are forced to deepen the depth of hand pumps and pumping wells to extract groundwater for their domestic, industrial and agricultural needs. Lowering of the groundwater level is resulting into drying (especially during summers) of many branches of rivers that are not directly fed by glaciers (Mukherjee et al., 2018).

Ganga and Yamuna rivers that act as life line to the region, are most severely affected by the anthropogenic pollution caused by municipal untreated sewerage disposal, urban solid waste, biomedical hazardous waste, etc. Paleo channel study at Ganga-Yamuna Doab near Prayagraj has established that river Ganga has got connectivity with the adjoining and underlying principal aquifer at places (Chandra et al., 2021). The river Yamuna, which is highly polluted and connected to the underlying aquifer near Prayagraj (UP), can potentially induce contaminant migration into the surrounding aquifer system.

The Ganga Basin is a tectonically active region and has suffered various episodes neotectonics activities in the past (Singh and Rastogi, 1973, Bajpal, 1989, Mohindra and Parkash, 1994, Singh, 2001, Parkash et al 2000, Agarwal et al 2002). Major tectonic trends from Peninsular shield into Ganga plain led to classify it into seven tectonic zones viz., Monghyr-Saharsa ridge, East Uttar Pradesh shelf, Gandak depression, Faizabad ridge, West Uttar Pradesh shelf, Sarda depression, and Delhi-Haridwar ridge (Singh, 2004; Sinha et al., 2005). The Ganga and Yamuna rivers, though running parallel with an intermediate distance of about 50 km or more in upper Ganga plain, most likely have subsurface connectivity at places all along its path,

especially at places of disturbances leading to the possibility of exchange of contaminations through underlying aquifer.

Lowering of water table not only reduces the quantum of groundwater resources availability, but also forces the utilization of the old water that might be enriched with more dissolved solids (Bagher, et al., 2010; Pophare et al., 2014). Besides this, lowering of the water table may also induce activation of arsenic release into the groundwater due to change in hadrochemical environment. For example, even though arsenic rich mineral is present in the subsurface, it may not release arsenic into the groundwater unless and until there is a reducing environment. The researchers have established that the excessive groundwater extraction, may be the vital reason for creating a zone of aeration in subsurface containing arseno-pyrite. Under aerobic condition, arseno-pyrite decomposes and releases arsenic that mobilizes to the subsurface water. This mobilization is further enhanced by the compaction of aquifers caused by groundwater withdrawal (Safuddin and Karim, 2001). Therefore, there is a strong need of increasing the groundwater recharge to arrest the groundwater depletion and also to rejuvenate the river system for safe and secured water availability.

The government of India has embarked upon a comprehensive plan called “NAMAMI GANGE” to clean up and rejuvenate the Ganga River. To have a comprehensive knowledge, perspective planning and management for an integrated land and water management in this area, it is essential to have precise understanding of aquifer geometry and the dynamics of multi-layered aquifer system of Ganga Plain with network of rivers, its tributaries and river-aquifer linkages on a regional basis. The CGWB, Ministry of Jal Shakti (then Ministry of water Resource), Govt., of India has started a flagship program on Aquifer Mapping and Management in the year 2012. Under this program, CSIR-NGRI has carried out heliborne geophysical mapping (AQUIM) at pilot scale in six major representative hydrogeological settings during 2013-2015 and very encouraging and promising results were obtained. The project has also set guidelines for terrain wise optimal data density for aquifer mapping.

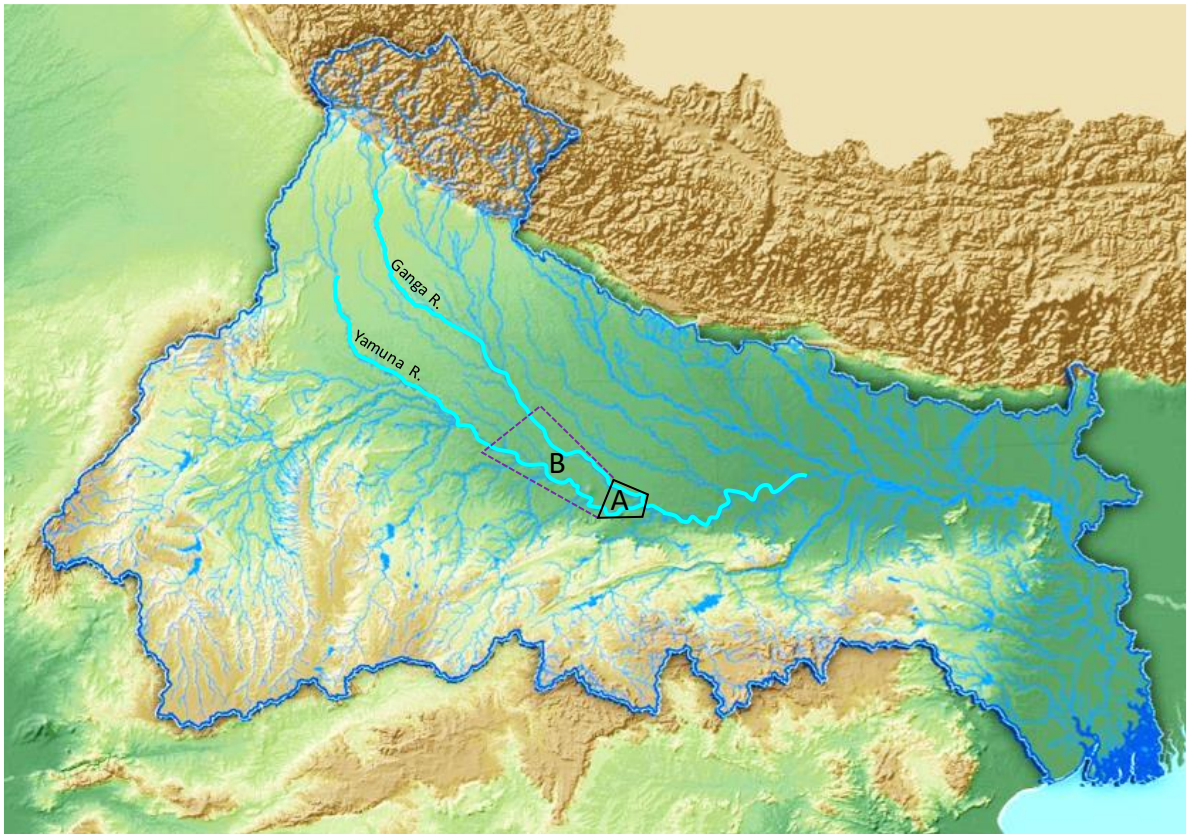


Figure 1: Elevation map of Ganga River Basin. The Block-A represent the current pilot area, where Heliborne Geophysical mapping has revealed 45 km long Paleo channel. Block-B is the proposed area as extension of Block-A to be surveyed to track encountered paleo channel west ward. (Locations of Prayagraj, Kaushambi and Kanpur may be shown.)

Based on above experience, another pilot program of paleochannel mapping and establishing its linkages with principal aquifers was conceptualized. Central Ground Water Board, MoJS, Govt. of India accepted the proposal and it was decided to initiate with a small pilot area around the Prayagraj close to the confluence of rivers Ganga and Yamuna between Prayagraj and Kaushambi districts. The project initiated with signing memorandum of agreement (MoA) with CGWB on 28th December 2015 with objective of mapping of aquifer with special reference to paleochannel in parts of Ganga-Yamuna Doab between Prayagraj and Kaushambi districts. It was also expected that the investigation will be extended towards upstream site on the success of this project. The CSIR-NGRI has carried out Heliborne geophysical survey employing multi-moment transient electromagnetic and magnetic surveys. Heliborne geophysical survey was initially carried out within the CGWB approved block-A with

1200 sq.km area (Fig. 2). Besides high-resolution 3D aquifer maps down to 500 m depth, it has revealed 4 km wide and 14 km long resistive linear channel and was inferred as buried paleo channel. To confirm the finding at larger scale, heliborne survey was extended towards Kaushambi city in the west (see A^+ area in Fig 2). The extended survey confirmed that it is not coincidental and localized feature but a large-scale feature continuing up to 45 km till western limit of the survey area (Fig. 2).

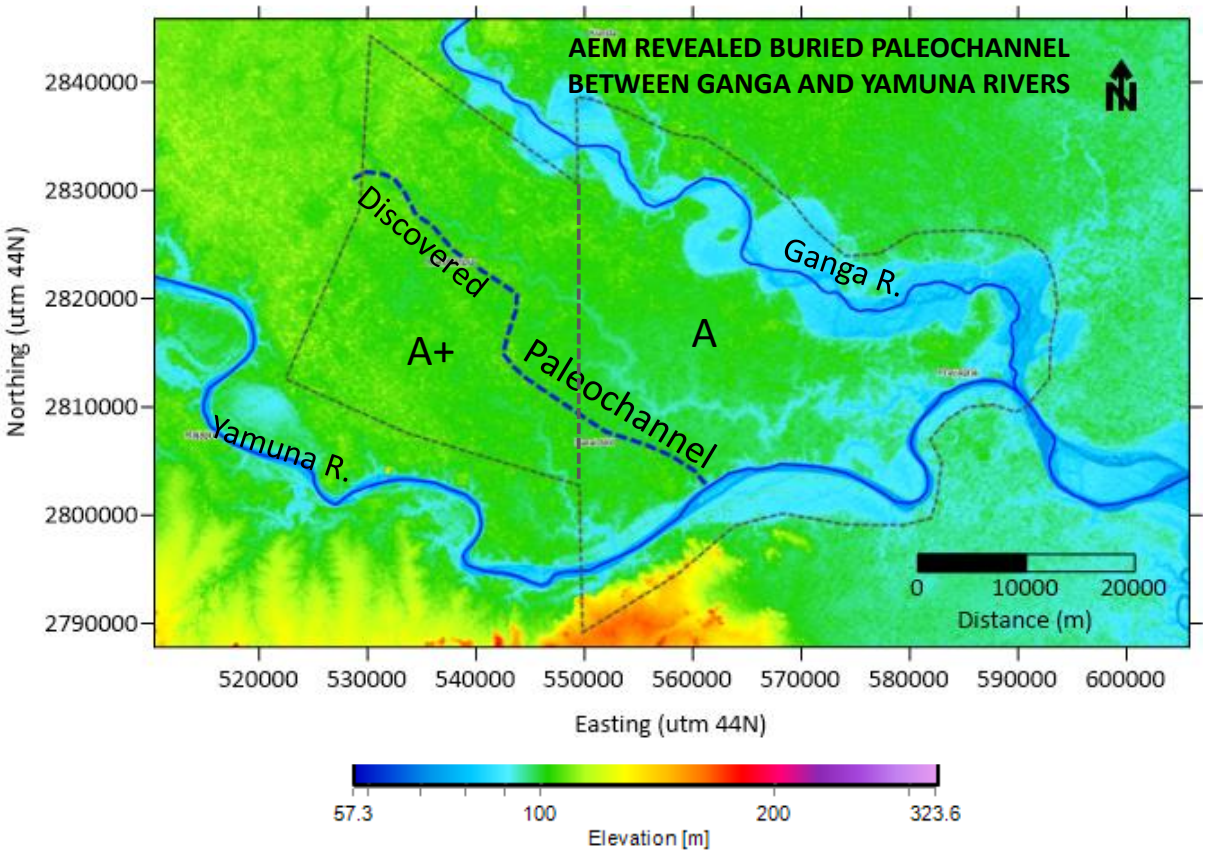


Figure 2. AEM resistivity map on horizontal plain showing river Ganga, Yamuna, and newly discovered paleo channel.

Consequent upon the new discovery of paleo channel (Fig. 2) and ability of AEM survey to identify the subsurface connectivity including 3D aquifer settings, the study area was extended further westward to trace the extension of the paleochannel including the hydrogeological linkages of river and aquifers settings. Knowledge on the subsurface connectivity between Ganga and Yamuna rivers is very crucial in planning of Ganga cleaning as well as in protecting the safe groundwater resources.

Therefore, the study area was extended up to Kanpur in continuity from Kaushambi as shown in Block-B in Figure 3 with the scope of work as described under chapter 2 i.e. objectives. It covers around 50 km wide zone over Ganga and Yamuna rivers totaling to 8,500 sq.km area between Kaushambi and Kanpur districts.

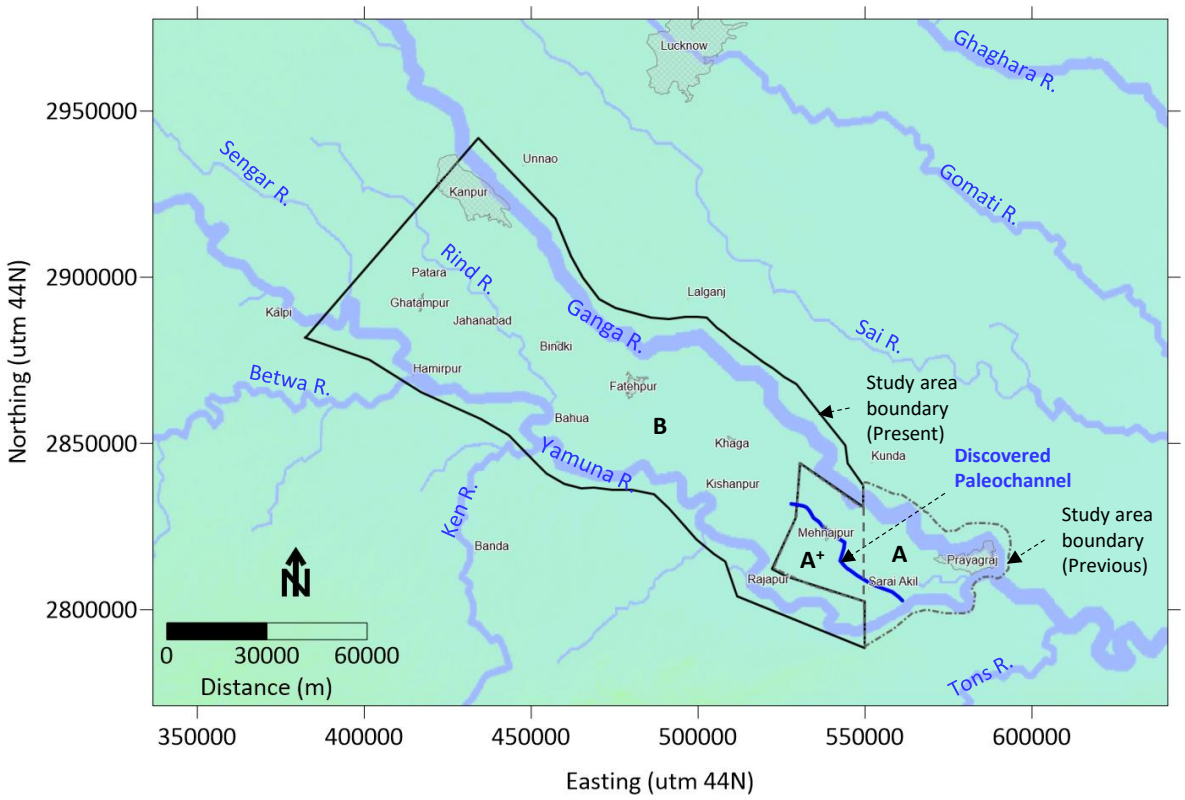


Figure 3. Block A and A+ are surveyed area that have revealed 45 km long buried paleochannel in Ganga-Yamuna doab between Prayagraj and Kanpur districts. Block B is extended survey area west ward up to Kanpur to trace the extension of newly discovered paleo channel near Prayagraj.

1.1 ABOUT STUDY AREA

Most of the region is covered with thick alluvial sediments deposits resting over formation belonging to Vindhyan Super Group, which is exposed in south of the study area. These alluvial are eroded and transported from Himalaya in the north and north-west as well as Vindhyan Super Group from south. The Vindhyan Super Group and Bundelkhand craton are exposed south of the study area and go under the cover of alluvia that increase in thickness towards north. The study area is located in the Ganga

river basin, which is an active foreland basin and is the largest established alluvial tract in the world formed by the Indus, the Ganga and the Brahmaputra rivers (Sinha et al., 2005; Tandon et al., 2008). The evolution of Ganga foreland basin was initiated by the collision of Indian plate with the Eurasian plate in Early Eocene (~50 Ma ago) (Garzanti et al., 1987; Singh, 1996; Singh, 2003; Ding et al., 2005; Green et al., 2008; Najman et al., 2010; Clift et al., 2012; DeCelles et al., 2014)

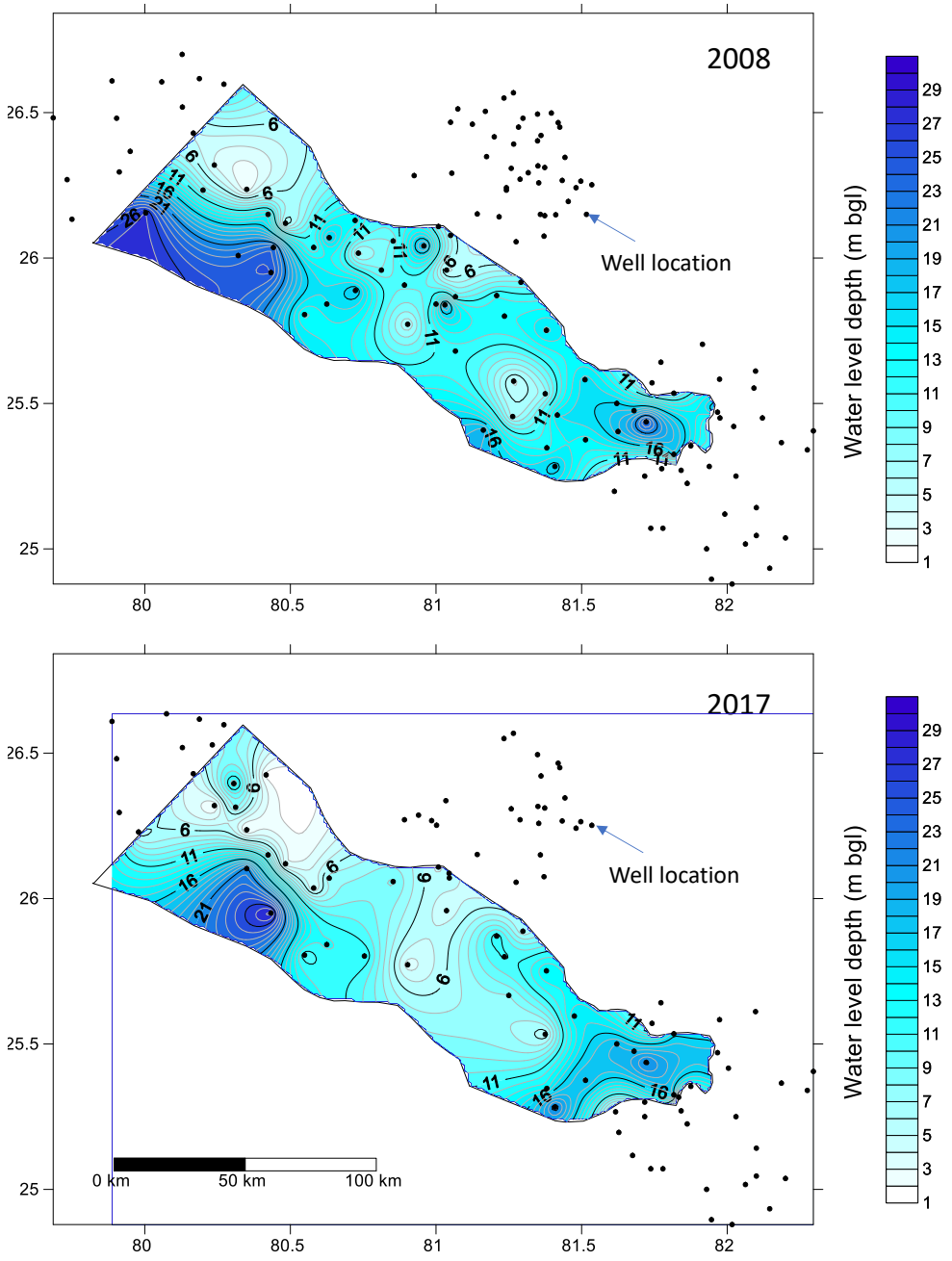


Figure 4. Water level map for the year 2008 and 2017 shown as depth below ground level.

Topographic elevation is relatively flat (~100 m) for most of the study area and reaches up to a maximum of ~ 250 m south of Yamuna river. The Ganga shows a broad channel course with short wavelength of meandering, whereas, Yamuna shows a sharp channel with long meandering wavelength. It is associated with the morph-fluvial characteristics and underlying formation beneath these rivers. Figure 4 also shows recently discovered paleochannel by AEM surveys near Prayagraj passing through Sarai Akil and Manjhanpur.

Water level map is prepared for the year 2008 and 2017 showing depth below the ground surface and elevation (Fig. 4). Average annual rainfall for Uttar Pradesh was recorded around 1050 mm and 1200 mm in 2007 and 2017 respectively. Unfortunately, number of observation points for year 2008 and 2017 are not the same and hence difference in spatial pattern of water level is obvious. In general, water level is found varying from around 3 to 30 m below the ground surface and around 75 to 130 m elevation above mean sea level. With the above distribution pattern, major direction of groundwater flow appears to be from north-west to south east. As there was increase in rainfall from 2007 to 2017, there is rise in water level.

2. OBJECTIVES

Major objectives of the project are:

- ☐ Tracking the inferred paleochannel further northwestward in the inter-fluve region
- ☐ 3D Mapping of Principal Aquifers system
- ☐ Establishing linkages between aquifer system including paleochannel with river system
- ☐ Locating sites suitable for development of a plan for Managed Aquifer Recharge

3. MATERIAL AND METHOD

Study starts with compilation of the existing data base in the area followed by Heliborne geophysical (Magnetic and dual moment TEM) surveys over the Ganga – Yamuna Doab region, starting from Kaushambi to Kanpur districts. The heliborne geophysical data was planned to be acquired along 5000-line km flight lines with varying spacing starting initially with coarse grid and followed by finer grid in interesting anomalous zones. After analysing the AEM data QC result, infill flight lines were added in zone of interest as well as hydro geologically complex zones to increase the resolution. AEM data was also acquired all along the Ganga and Yamuna rivers for the purpose of high resolution river-bed characterization with special reference to see the hydrogeological linkage of river with underlying aquifer system. Tie lines cutting across various flight lines profiles in orthogonal direction runs either side of the ganga and Yamuna rivers. Major steps are as follows:

- ☐ Compilation of existing data on geophysical, hydrogeological and geomorphological studies in the region
- ☐ Reconnaissance study to visualize the ground conditions, HT power line network, cultural noise and prepare the survey plan.
- ☐ Heliborne Geophysical surveys over coarse grid flight line and followed by infill flight lines over interesting areas
- ☐ Concurrent ground geophysical, geological and hydrological investigations
- ☐ Selection of drill sites, verification through ground based studies and drilling borehole and logging.
- ☐ Building conceptual hydrogeological models from geophysical and borehole data.
- ☐ Translating AEM data into lithological model and extracting aquifer maps.

3.1 Helicopter based airborne electromagnetic and magnetic surveys

The most advanced AEM (SkyTEM312) and Geometrics Caesium Vapour type 822A magnetometer are employed respectively for TEM and magnetic data acquisition (Fig 5). The AEM system is configured in a standard two-moment setup (low moment 'LM' and high moment 'HM') to obtain a full dB/dt decay curve (sounding curve). The system instrument setup with the positioning of the various components placed over octagon frame with transmitter and receiver coils are shown in figure 6. The origin is defined at the centre of the transmitter coil. The receiver coil and the receiver instrument are modelled using first order low-pass filters.

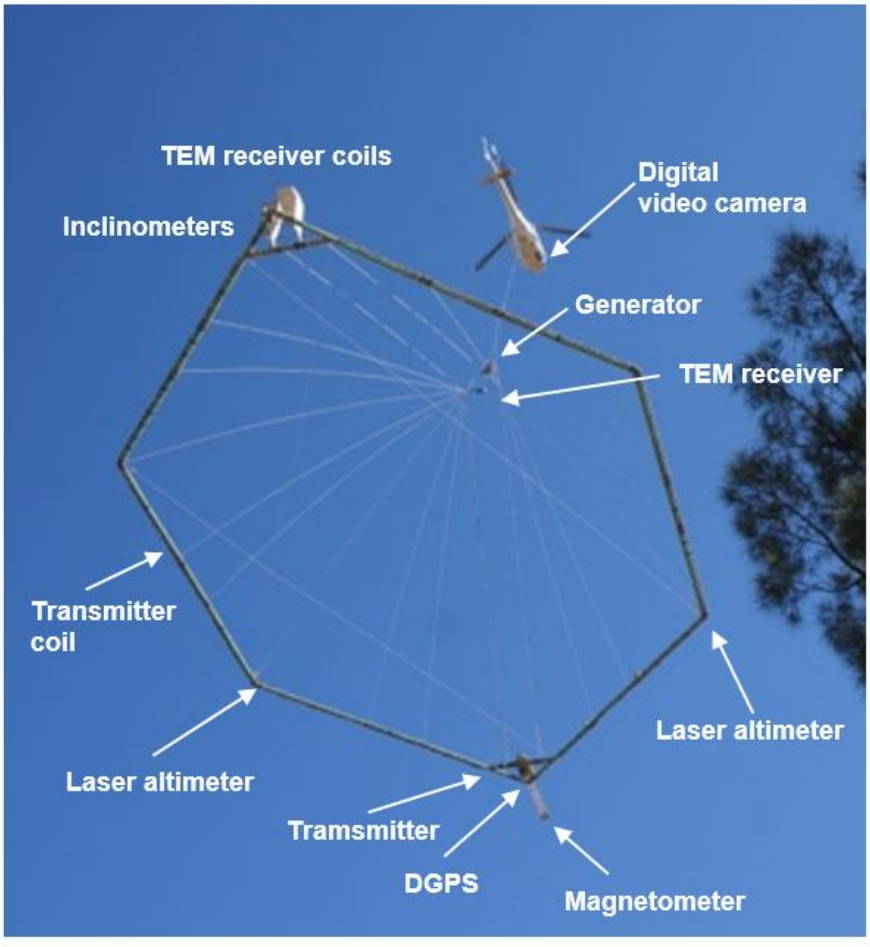


Figure 5. Instrument setup of Heliborne geophysical system towed below helicopter containing dual moment SkyTEM 312 with all accessories and magnetometer.

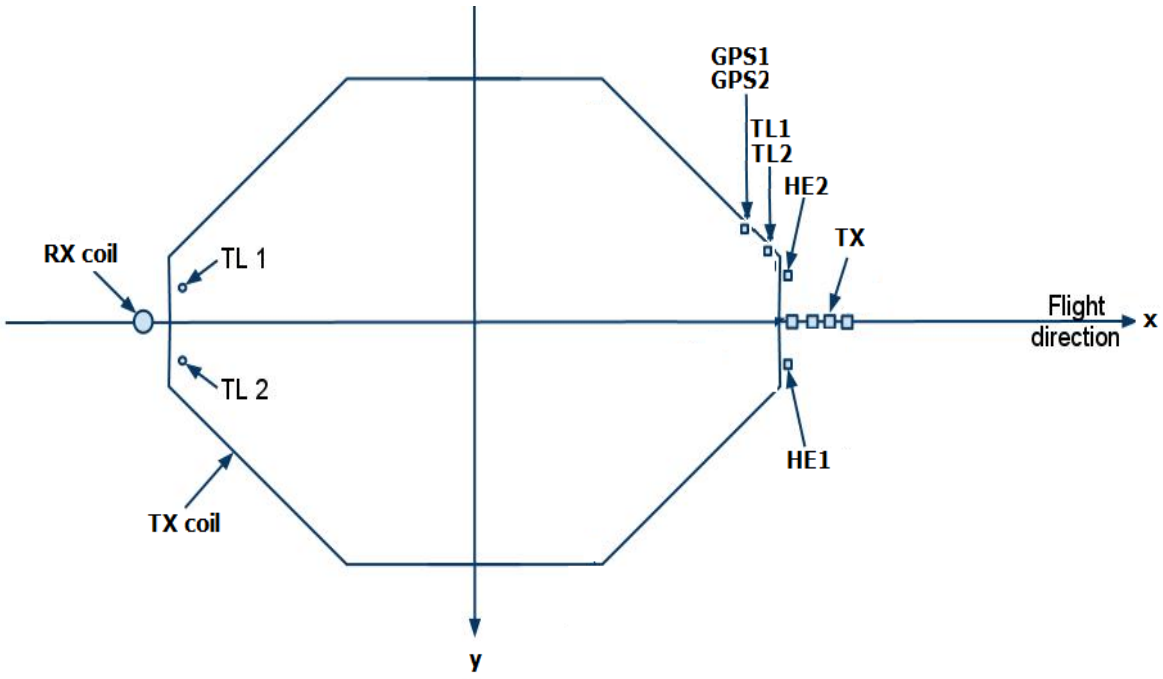


Figure 6. Instrument setup for the SkyTEM system used. HE 1 and 2 are laser altimeters, TL 1 and 2 are Inclinometers, GPS 1 and 2 are GPS sensors, Tx is the transmitter.

Magnetometer

Magnetometers i.e. Geometrics Caesium Vapour type 822A having sensitivity of 0.1 nT are used for measuring total magnetic field one with AEM system attached with transmitter loop and other kept at base station. Sampling interval of measurement is defined by 25 Htz repetition frequency synchronized with AEM. It records data during TEM off time. Digital data include the date, an absolute value of the magnetometer and GPS time with accurate synchronization to the airborne data acquisition system

SkyTEM 312

Table 1. Details features of SkyTEM312 system

Total weight	630 kg
Length carrier frame	28 m

Width carrier frame	16.5 m
Length tow cable	35 m
Carrier frame	Rigid aerodynamic composite
Nominal terrain clearance	35 – 60 m above any obstacles or hazards)
Capability of production speed on survey lines	60-150 kph
Max airspeed ferry	10 m/s – if gusty wind or demanding terrain conditions the max wind will be reduced
Operational temperature	-30°C to +45°C
Transmitter	
Moments	Dual (low and high)
Transmitter area	341 m^2
Transmitter current	~5 Amp (LM) and ~120 Amp (HM)
Peak moment	~3,000 NIA (LM) & ~500,000 NIA (HM)
Rep. frequency	275 Hz (LM) & 25 Hz (HM)

To ensure no changes to the system during the mapping, repeated measurements were performed by hovering on a specific spot in the vicinity of the landing ground. This is done every time the helicopter takes off or returns from a flight. A high altitude test conducted near the test area to identify the system response. The test was performed by measuring at an altitude where the ground response is negligible. Each production flight includes bias tests performed on the way to and from the production

lines. Where cloudiness permitted, they were performed at altitudes of 300 m or more. The bias tests are similar to the high-altitude test and serve to identify changes in the system response between flights. These data have been further used to model very early time records that enables to get information within top 2 m depth level.

The position of the frame is measured with two independent GPS receivers, which record data continuously with an uncertainty of ~3 m. The roll and the pitch of the frame are measured and used to correct the altitude and voltage data. It is presumed that the frame is rigid so that the tilts of the transmitter and receiver are identical. During the processing, a running mean is calculated for the roll and the pitch. The distance between the transmitter coil and the ground is measured with two independent lasers. Figure 7 shows an altitude data example over open country and a minor forest area.

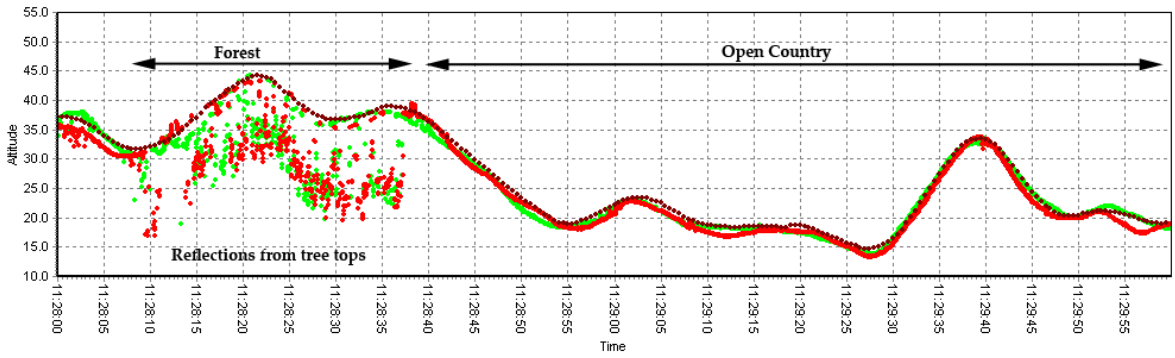


Figure 7. Green and red dots are raw data from the two laser altimeters. Brown dots are the resulting altitude after filtering the data. The time window holds approximate 2km of data.

The aim of the altitude data processing is to remove reflections that do not come from the ground - typically reflections from tree tops. The processing is based on the fact that reflections from tree tops etc. result in apparently lower altitude. Altitude processing is done using an algorithm that filters out data by repeatedly making a polynomial fit to the data while removing data that are some meters below this polynomial. The reflections from treetops are removed. The automatic filtering is followed by a manual inspection and correction. In the end the individual soundings are assigned the correct elevation by using a DEM taken from SRTM data.

3.2 Processing of the SkyTEM data

3.2.1 Airborne magnetic data

Processing of the magnetic data involves the application of traditional corrections to compensate for diurnal variation effects prior to gridding. Levelling was performed on each block separately. Geosoft magnetic data processing tools are applied as follows:

- Processing of static magnetic data acquired on magnetic base
- Pre-processing of airborne magnetic data
    - Stacking of data to 10 Hz.
    - Moving positions to the center of the system.
- Processing and filtering of airborne magnetic data
- Standard corrections to compensate the diurnal variation
- IGRF correction
- Gridding

3.2.2 Airborne electromagnetic data

The software package Aarhus Workbench was used for the processing of the SkyTEM data. The aim of processing was to prepare data for the geophysical interpretation. The processing primarily includes filtering and averaging of data as well as culling and discarding of distorted or noisy data. The data is stored in a database. The settings for the different processing steps are also stored.

Processing can be divided into four steps:

1. Import of raw data into a fixed database structure. The raw data appear in the form of .dat-, .sps- and .geo-files. Dat-files contain the actual transient data from the receiver. Sps-files contain GPS positions, tilts, altitudes, transmitter currents etc. and the geo-file contains system geometry, low-pass filters, calibration parameters, turn-on and turn-off ramps, calibration parameters, etc.

2. Automatic processing: First, an automatic processing of the four data types is used. These are GPS-, altitude-, tilt- and TEM data. This automatic processing is based on a number of criteria adjusted to the survey concerned.
3. Manual processing: Inspection and correction of the results of the automatic processing for the data types in question.
4. Adjustment of the data processing based on preliminary inversion results.

All data is recorded with a common time stamp. This time stamp is used as key when linking data from different data types. The time stamp is given as the GMT time. In the following a short description of the processing of the different data types is shown.

3.3 Inversion

Inversion and evaluation of the inversion result are done using the Aarhus Workbench software package. The underlying inversion code is developed by the Hydro Geophysics Group, Aarhus University, Denmark (Christensen et al., 2011). The information about the near-surface geology is contained in the early part of the sounding curve (figure 8). In order to improve the resolution of the near-surface geology, it is important to be able to obtain useful data as early as possible on the sounding curve. The signal from the very early times also contains a signal from the instrument itself. This interfering signal is called the coil response as it is caused by the coupling of the primary field to the receiver coil. Normally, gates are discarded where the coil response is more than about 5% of the measured signal. Usually, this means that only gates from approximately 11-12 µs after turn-off can be used. With the coil response inversion concept, the signal is adaptively compensated for the coil response signal so that the coil response affected gates in the interval 2-11 µs may also be included in the interpretation.

The size of the coil response signal is determined by making measurements at very high altitude (> 600 m) and high altitude (> 300 m) tests before and after every flight. Here the signal from the ground makes out just a tiny proportion of the measured signal, which instead is dominated by random background noise and coil response. If data are averaged, the random background noise will be stacked out, and the coil

response signal can be quantified. With system response, very early time data has been model that starts from 2 - 4 µs. At 300 m altitude, the primary field response is measured which is used for modelling of the very early response.

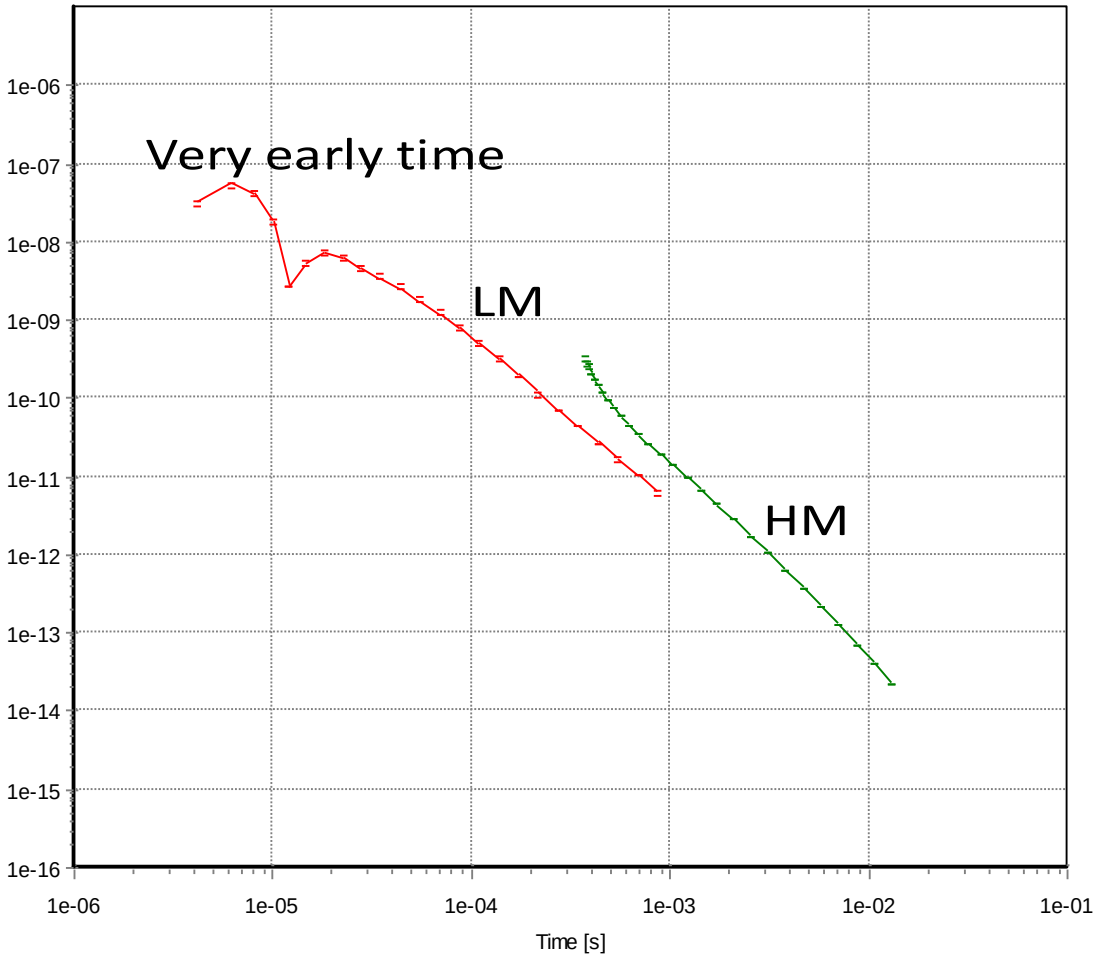


Figure 8. AEM measured response for very early time, low and high moments

The coil response signal is not constant for a full survey. There may be slight variations in the level during each flight, and the level can also be displaced if the receiver coil is repositioned a few millimetres due to a hard landing. The shape of the coil response signal, however, is assumed to be constant. With this in mind, the coil response signal simply cannot be subtracted from the measured signal and applied to the early time

gates. Instead, a coil response function is introduced with the coil response inversion concept which, during the inversion, adaptively compensates for the coil response. Inversion with coil response correction is progressing similar to the normal inversion. The total forward response, consisting of the normal forward responses plus a contribution from the coil response function, is compared with the measured signal shown in figure 9. Small adjustments of the inversion parameters and the level of coil response function are performed before the next comparison. This continues until the total forward response is sufficiently close to the measured signal to consider the inversion completed.

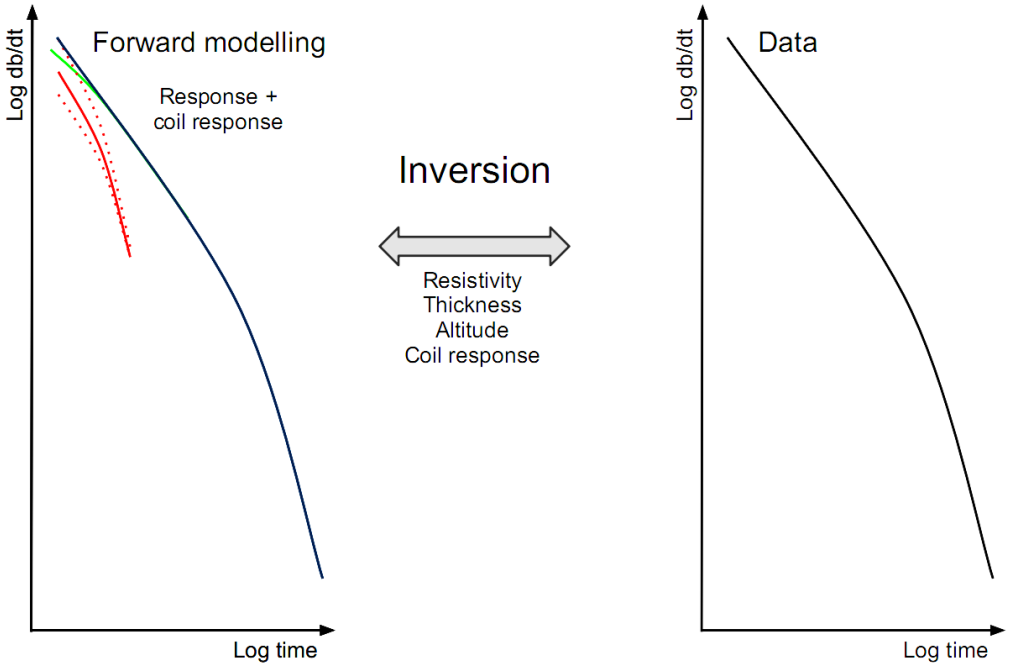


Figure 9. Inversion with coil response correction. The total forward response (blue curve) consisting of the normal forward response (green curve) plus a contribution from the coil response function (red curve), is compared to the measured signal (black curve). Small adjustments of the inversion parameters (that determine the normal forward response) and the level of the coil response function are performed before each comparison until the total forward response is sufficiently close to the measured signal.

The coil response function is introduced based on the following assumptions:

- The shape of the coil response function is fixed and identical to the coil response signal at high altitude. The level of coil response function is variable.

- Major variations in the level of coil response function from flight line to flight line can occur.
- Only minor variations in the level of coil response function from sounding to sounding is present.

Within the Aarhus Workbench those assumptions can be applied by using coil response settings that a) sets the level of the coil response with a loose prior constraint to the level of the high altitude test. b) Sets a tight lateral constraint to the level of the coil response along the flight line. If the inversion needs to shift the level of the coil response function along an entire flight line, it can do so as long as the level from sounding to sounding does not change too much.

The spatially constrained inversion (SCI) uses constraints between the 1D-models, both along and across the flight lines, as shown in Figure 10. The inversion is a 1D full non-linear damped least-squares solution in which the transfer function of the instrumentation is modelled. The transfer function includes turn-on and turn-off ramps, front gate, low-pass filters, and transmitter and receiver positions. The flight altitude contributes to the inversion scheme as a model parameter with the laser altimeter readings as a constrained prior value.

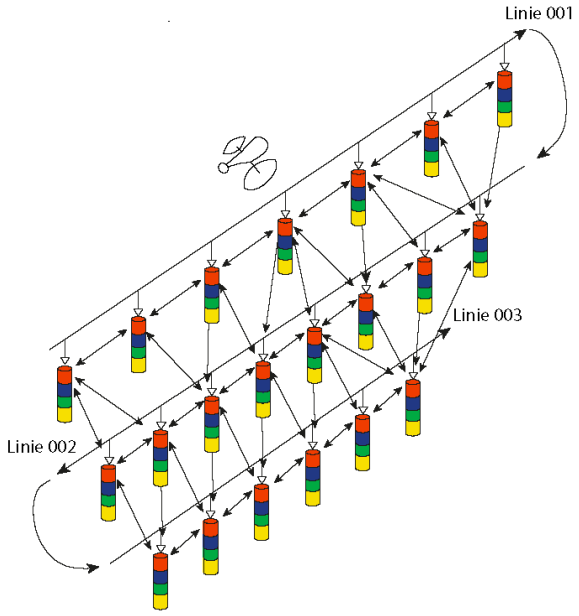


Figure 10. Schematic model of spatially constrained inversion

4. SURVEY PLANNING & DATA ACQUISITION

Heliborne Geophysical (magnetic and dual moment transient electromagnetic) data has been acquired along the flight and tie lines shown in Fig. 11. We collected data at varying flight line distance totaling to ~5200 LKM during 2nd March - 31 March 2021. Initially acquired along the coarse grid flight lines i.e. at every 3 km distance running across the Ganga-Yamuna river in NE-SW directions. Some orthogonal tie lines are also planned with a spacing of ~15 km (almost five times the flight line spacing). The acquired heliborne geophysical data of each flight was analyzed on daily basis, where after initial correction for altitude, noise removal, laterally constrained inversion were performed. Based on the data QC result of the AEM data along the coarse grid flight and tie lines, additional infill lines were added in the zone of interest for high-resolution information. AEM data also acquired all along the Ganga and Yamuna rivers to characterize its river bed with special reference to hydrogeological linkages or connectivity with underlying and or surrounding aquifer system.

The study area has been challenging from the point of low altitude flying and data acquisition due to several high-tension power lines network, sometimes located quite close to each other. In addition to the HT power lines, there are dense network of low tension, domestic and industrial power lines, metalled roads, and railway tracks, number of villages, towns / cities, etc. These set up not only create challenge of low altitude flying but also data quality.

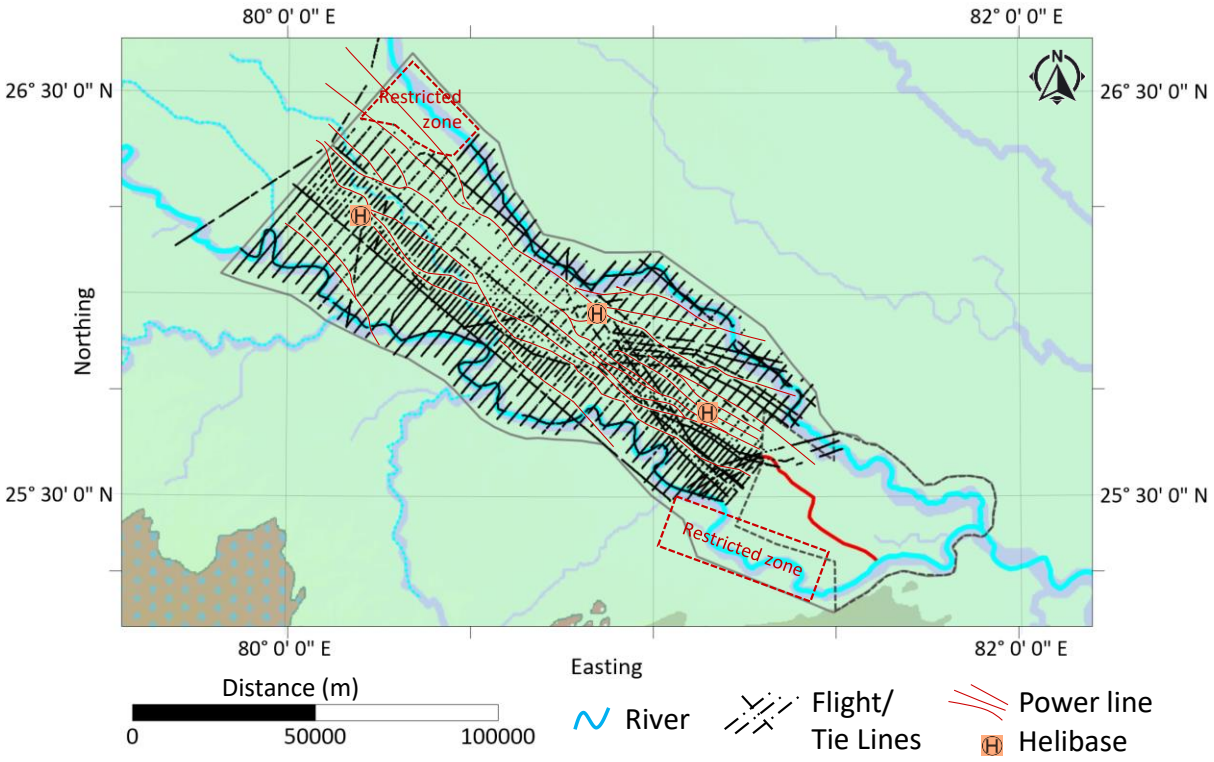


Figure 11. Survey flight and tie line distribution and infill lines at varying spacings. Flight lines are also added over river Ganga and Yamuna for their river bed characterization. Restricted zone marked due to defense installation and urbanization

Table 2. Details total data acquired to execute the project

#	Project Activities	Completed	Remarks
1	Heliborne Geophysics (TEM and Magnetic)	5,200 Line km	Acquired during March 2-31, 2021
2	Ground base Geophysical (ERT and TEM)	ERT: 10.28 Line km GTEM: 50 sites	Acquired after Heliborne geophysical surveys in Nov-Dec 2021
3	Validation by Shallow drilling and Logging	10 sites	December 2021 and March, 2022

4	Deep Drilling ~10 wells (300 m depth), geophysical logging, pumping test and groundwater flow modeling	Lithologs of old wells (by CGWB)	Received from CGWB)

5. RESULTS AND DISCUSSION

5.1 Airborne Magnetic results

Total magnetic field intensity (TMI) and reduced to pole (RTP) magnetic anomaly maps were prepared after all the corrections and shown in figure 12. TMI has shown around 700 nT variation that starts from 46998 to 47704 nT. The Vindhyan formation and Bundelkhand craton exposed in south of the study area, under thin cover of alluvium in the study area, have observed relatively low TMI. The TMI is found in increasing order of magnitude towards north west, where depth of Vindhyan formation increases. Granite or granitoids that form the Bundelkhand craton, are usually observed with low TMI values. The TMI distribution pattern showed strong directionality striking ENE-WSW revealing impact of the Upper Vindhyan and Bundelkhand Craton. Based on the special distribution pattern of magnetic values, a lineament is inferred and termed as magnetic lineament. It would be interesting to see its characteristics with special reference to hydrogeological significance at shallow level. The AEM resistivity will be used to characterize these lineaments, if visible impact is at shallow level.

The RTP magnetic anomaly map shows anomaly varying from -350 nT to +100 nT. The inferred magnetic lineaments in TMI is also superimposed over RTP magnetic anomaly map. Broadly the inferred lineaments coincide with transition of magnetic anomaly indicating line of structural discontinuity, which is also supported by river meandering directions and displacement (Fig. 12).

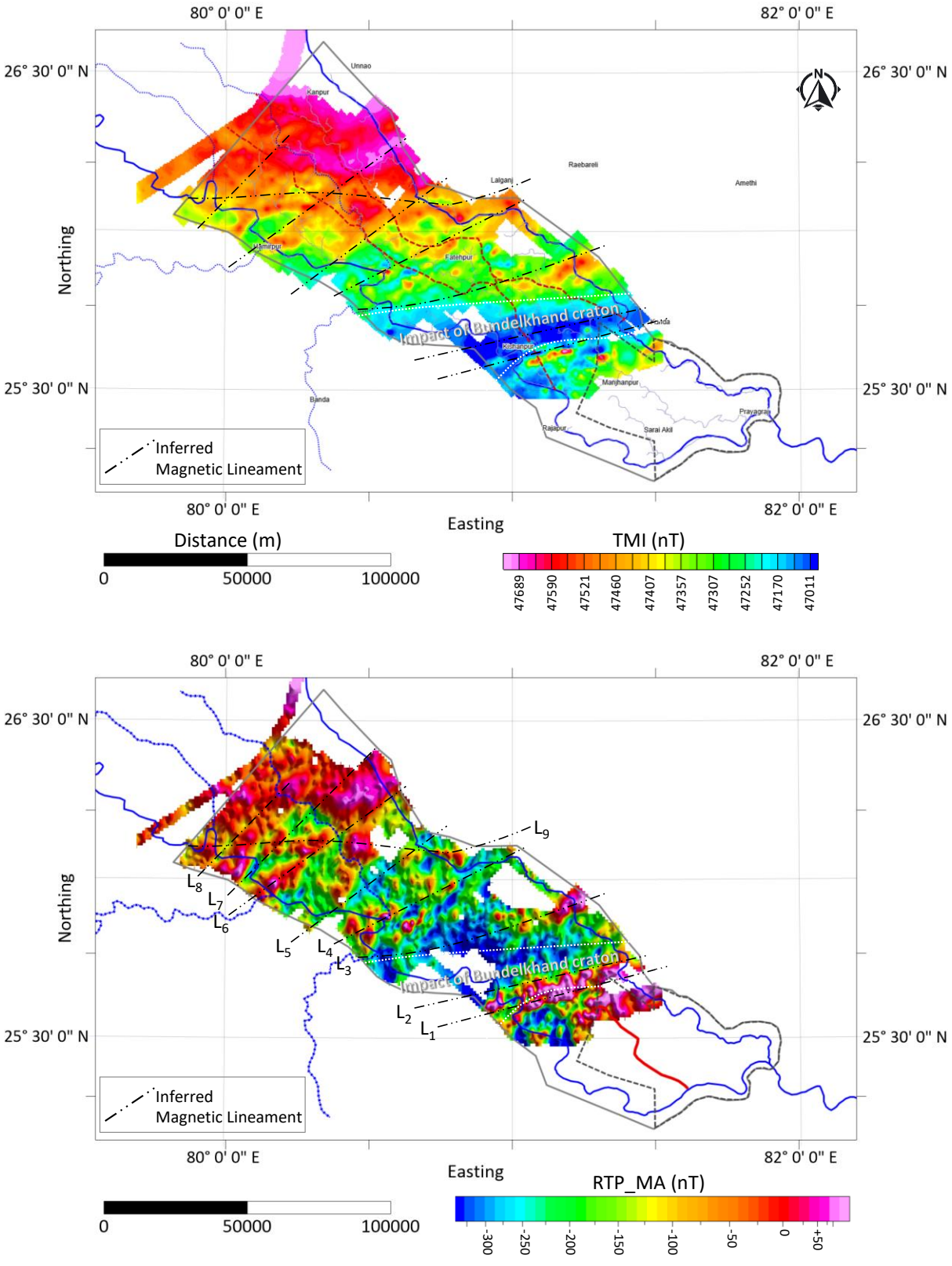


Figure 12. Magnetic maps with inferred magnetic lineament marked with dash-dotted line and impact of Bundelkhand craton: total magnetic intensity (TMI) map after IGRF correction (upper) and reduced to pole (RTP) magnetic anomaly map.

5.2 Airborne TEM Results

The overall survey results were found very satisfying in a challenging area especially due to dense network of power lines including number of HT power lines (Fig. 11). The acquired geophysical data, after pre-processing and filtering the noisy data, is found of very good quality. Figure 13 shows AEM data i.e. dB/dt field response -raw and processed average low and high moments data of all channels for 10 minutes duration covering roughly 1.2 km distance. The dB/dt field response is normalized with their moment. The low moment (LM) data is used from 3 to 24 gates starting from 4 to 600 μS and HM data from 11-38 gates i.e. 400 μS to 10 milli second (ms) thus there is overlap time of ~200 μS between Low and high moment data records. The data at late gates are obvious with more noise, where S/N ratio have been improved by using trapezoidal filter (Fig. 13).

The data level is found decreasing with increase in the flying heights. The noisy data has been culled over to remove the coupling effects. The AEM-low moment data has been subjected to filtering of the primary field response from helicopter. It resulted into utilization of low moment data from 4 μs (termed as super low moment “SLM”) that provides information from the top soil. The high moment EM data with late gates provide deeper information roughly from ~20 m to 500 m depth in favourable conditions. Combining LM (including SLM) and HM data provides seamless information from soil to 500 m depth.

The figure 14 shows raw and average dB/dt response at point ‘A’ and its inverted resistivity model with depth and resistivity section corresponding to full profile of 10 minutes corresponding to figure 13. The inverted model very well resolved layer top a few meter to more than 200 m depth. It has identified around 6 layers within top 200 m depth. The resistivity section (Fig. 14d) also shows data residual mostly lying within 1.5 indicating very well resolved inverted model. The inverted resistivity model below DOI is masked (80%) with white colour. The model below line of DOI need not to be taken for its translation or interpretation.

5.2.1 Depth of Investigation

Depth of investigation (DOI) is defined as the depth at which about 90% of the sensitivity to the subsurface layers occurs. The DOI is quantified based on a recalculated sensitivity (Jacobian) matrix of the final model [Christiansen and Auken, 2012].

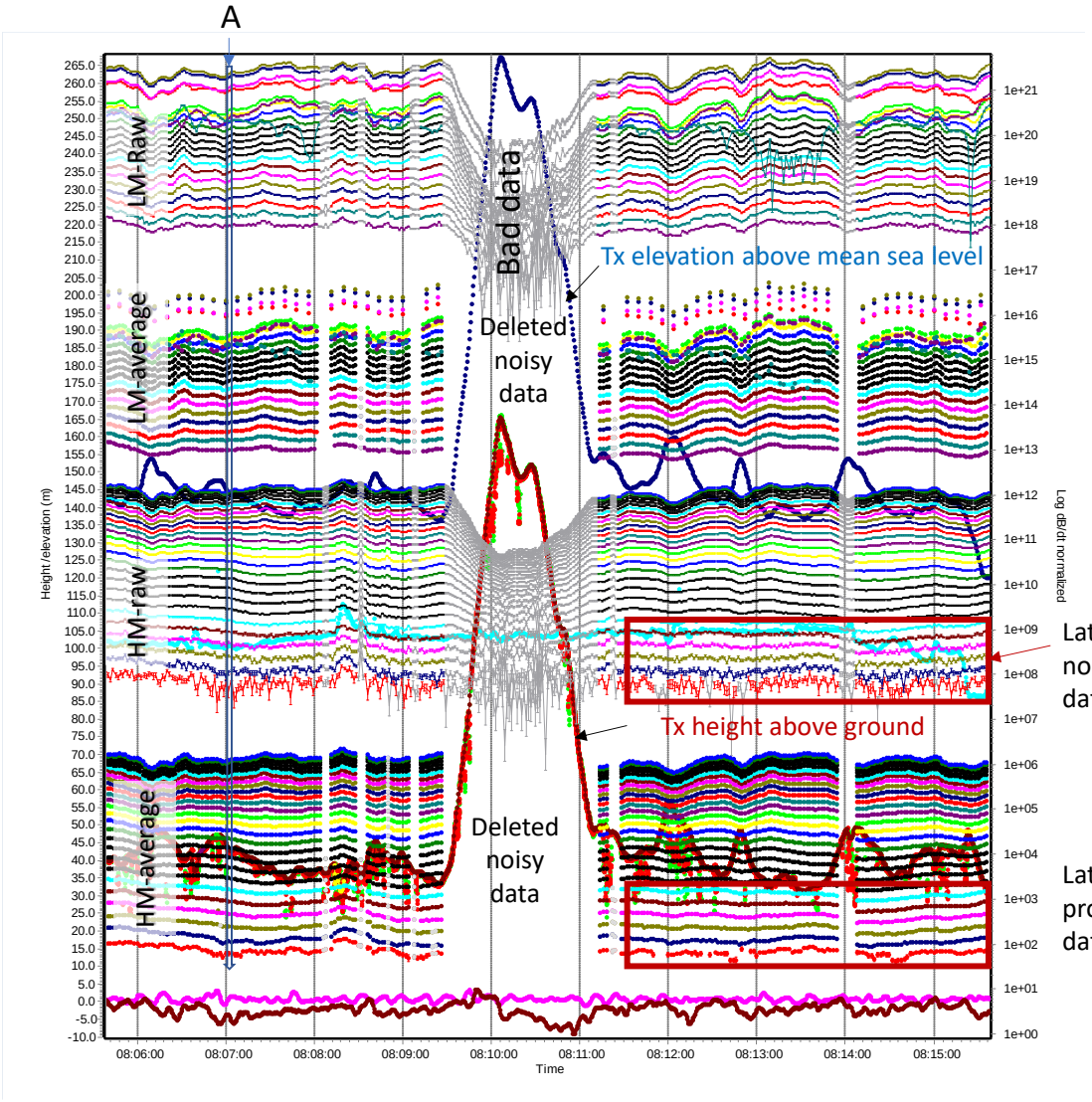


Figure 13. AEM low and high moment raw and average processed data in dB/dt form for all channels.

The DOI is found varying from ~300 m depth to ~450 m depth below ground surface except a few small patches of low DOI in north and north west part of the area (Fig. 15). Low DOI is also found along a few narrow linearly elongated zones, which appear to be more influenced by power lines. Due to high level of cultural noise, late gate

signals are, probably more influenced by noise being closer to the HT power lines, resulting into low DOI.

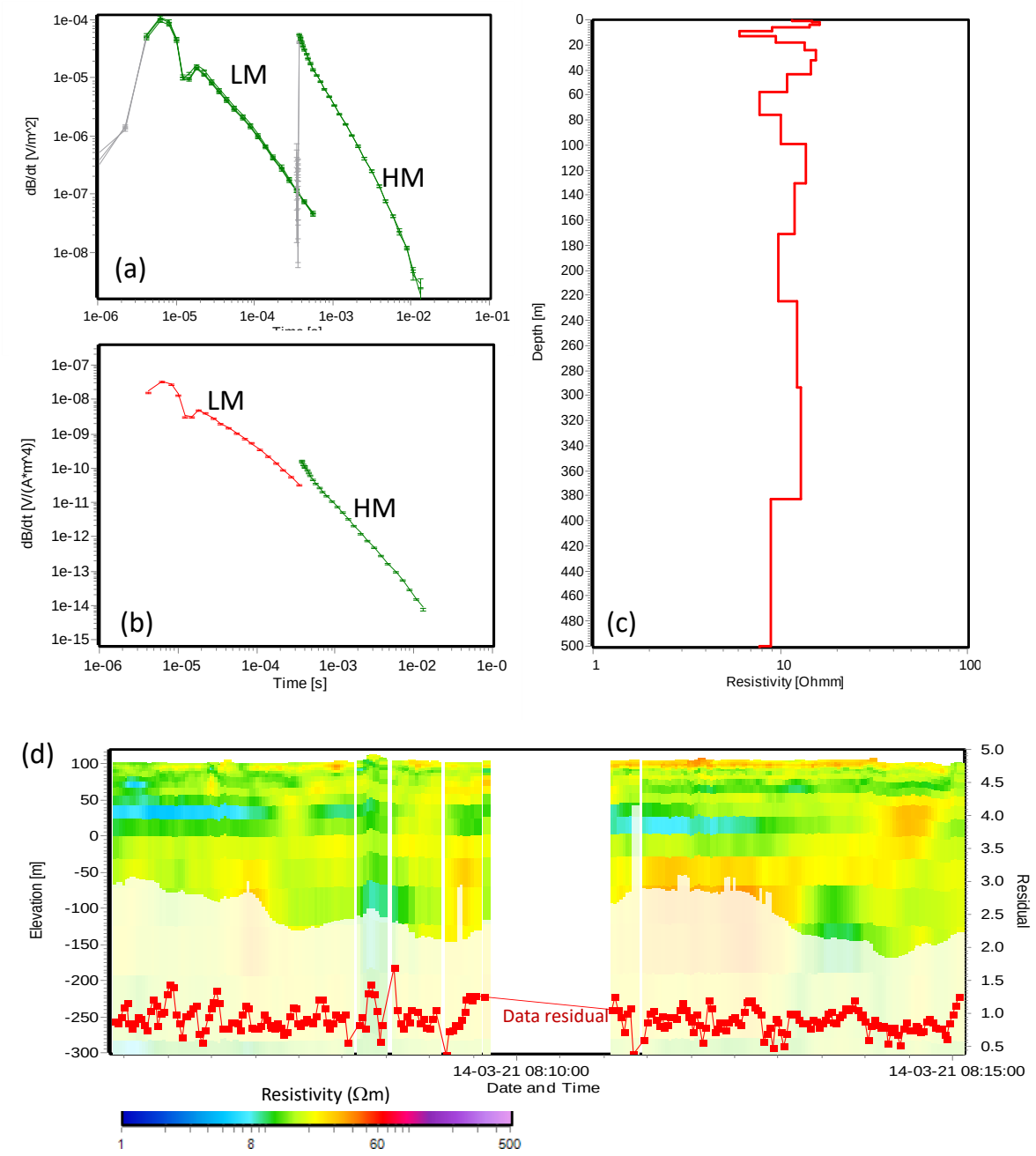


Figure 14. AEM field response: a) dB/dt raw data, b) dB/dt average data normalized with NIA, c) inverted resistivity model showing formation resistivity with depth at point 'A' marked in figure 13 and AEM resistivity inverted section corresponding to full 10 minutes profile as shown in figure 13.

The depth of investigation is restricted at places of thick conductive zones caused either by thick piles of clays and/or salinity. In such conditions, depth of investigation

is restricted at lesser depth as the strong induction from the shallow layer acts as shadow to deeper layer.

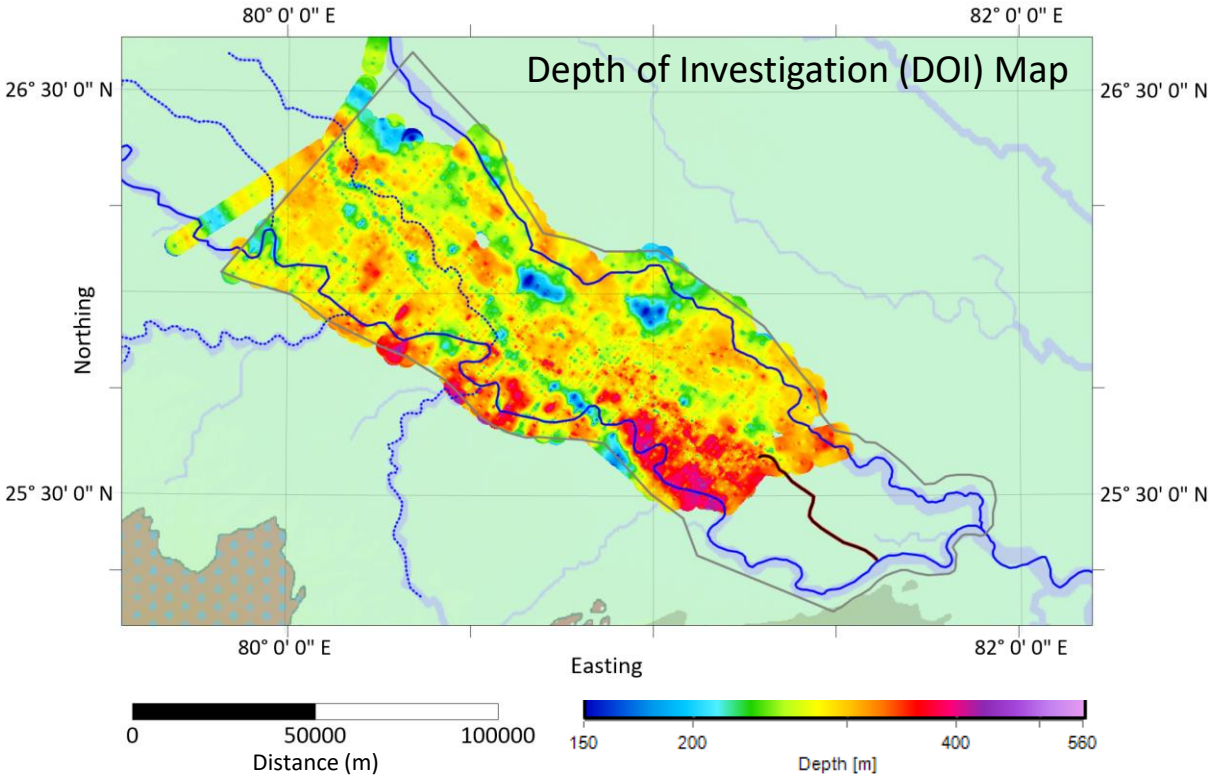


Figure 15. Depth of investigation (DOI) map of AEM survey result

5.2.2 Mean Resistivity Map

Mean resistivity map (MRM) has been prepared at 10 m depth intervals to visualize spatial distribution pattern of resistivity with depth. The model falling below DOI has not been considered while creating MRM maps. MRM of 10 m thickness are presented at every 50 m interval for visualization of resistivity distributions. The measured resistivity is cumulative effect of physics and chemistry of the formation. Resistivity range and its distribution pattern with prior knowledge of geological settings helps in mapping precisely the geological and hydrogeological settings. For example, resistivity of alluvium varies from around 5 to 500 Ωm or more, which can be further sub classified as clay or silt dominance (5-20 Ωm) or sand dominance including pebble and boulders (15-500 Ωm or more). Drier the sediment, higher the resistivity. However, in presence of water (resistivity of water: ~15-20 Ωm), measured effective

resistivity decreases to the lower value. In case of deteriorated groundwater quality (increase in salinity), effective resistivity may further decrease to lower value falling below 1 Ωm. The Vindhyan formation and Bundelkhand craton is expected to pose contrastingly higher resistivity than the alluvial sediments. The above-mentioned criterion will be used to analyze the resistivity distribution pattern.

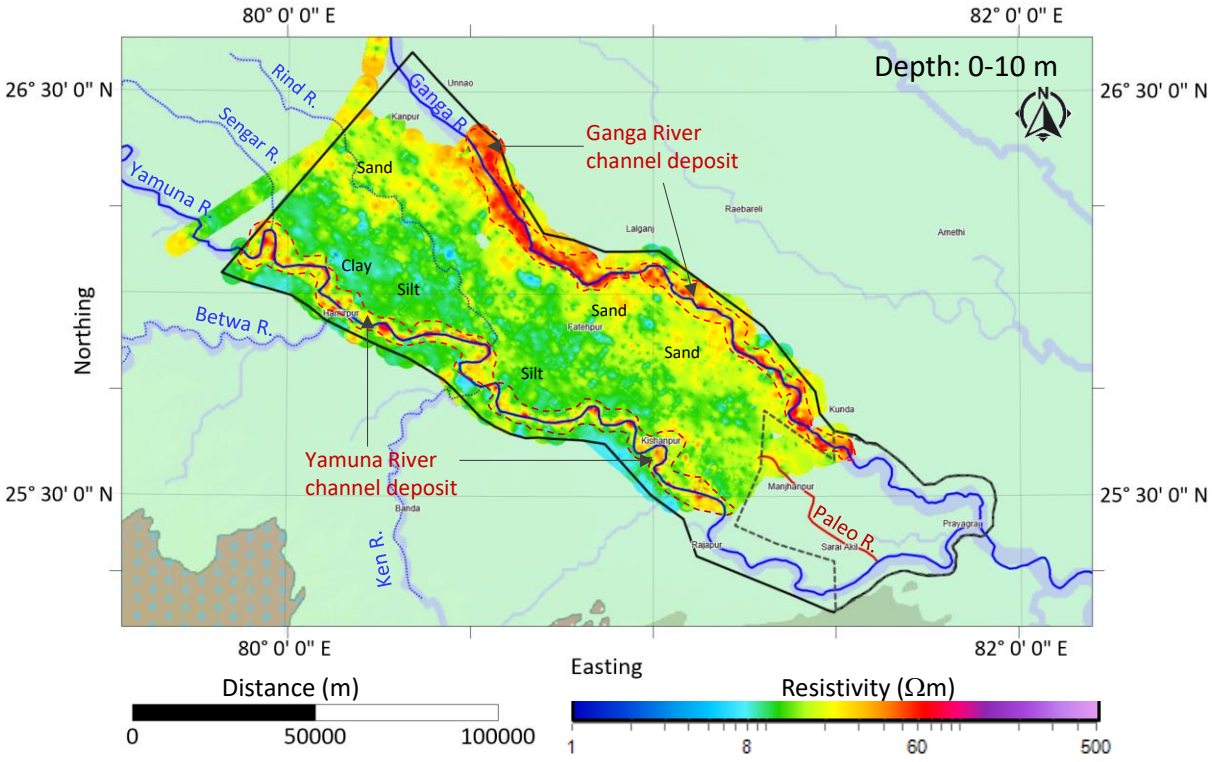


Figure 16. Mean resistivity map (MRM) at 0-10 m depth between Kaushambi and Kanpur districts

Figure 16 shows mean resistivity map of 0-10 m depth. High resistivity (40-100 Ωm) patches all along the Ganga and Yamuna rivers exhibit sand deposits or in other words river channel deposits. The northern half of the area associated with Ganga River is dominated by sand deposits, whereas adjoining southern area associated with Yamuna River is dominated by clay/silt sediments. Ganga River holds greater channel deposits than the Yamuna River. Tributaries of Yamuna i.e. Sengar and Rind, seasonal rivers, do not show noticeable channel deposit.

The mean resistivity map of 40-50 m depth reveals clay deposits all along the Ganga river except a few places (Fig. 17) . This indicates that the bottom of present day

Ganga River is within 40 m depth. Similar observation is also found associated with Yamuna River. In the central portion, resistive zone between Ganga and Yamuna rivers qualify as potential aquifer. Besides this, its meandering pattern and connection with Ganga and Yamuna rivers indicate that they might be most probably paleochannel. A small patch of relatively high resistivity is observed in south east corner that show presence of Vindhyan.

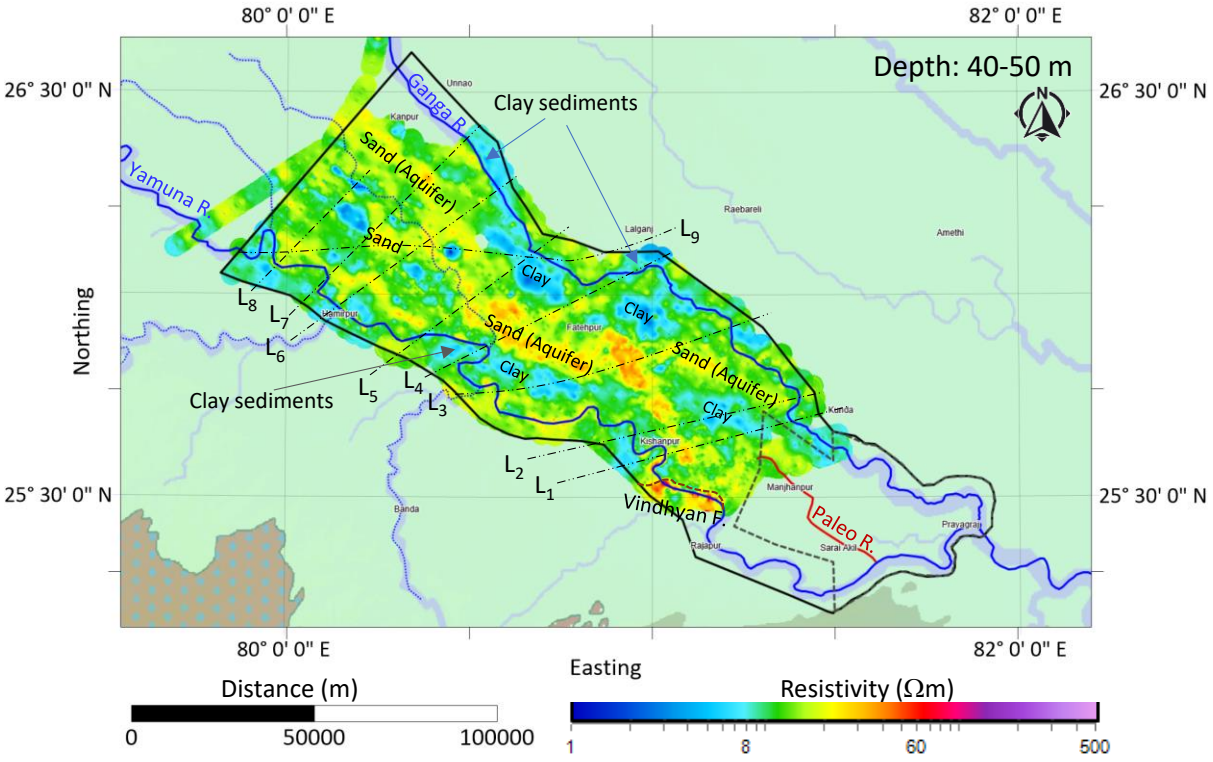


Figure 17. Mean resistivity map at 40-50 m depth between Kaushambi and Kanpur districts

Magnetic lineaments inferred from magnetic map are also plotted to study if its impact can be seen at shallow level. We observe noticeable shift/difference in resistivity pattern as well as river positions associated with most of the magnetic lineaments. Yamuna and Ganga both the rivers are observed around 15 km shift towards north-east, which is found associated with L_4 magnetic lineament. Such parallel shift are also observed with L_3 and L_2 also. Such parallel shift with almost similar magnitude in both the rivers on either end of lineaments indicate that they are most probably fault, displacing the associated blocks laterally on either side of the lineament and hence shift in the river course.

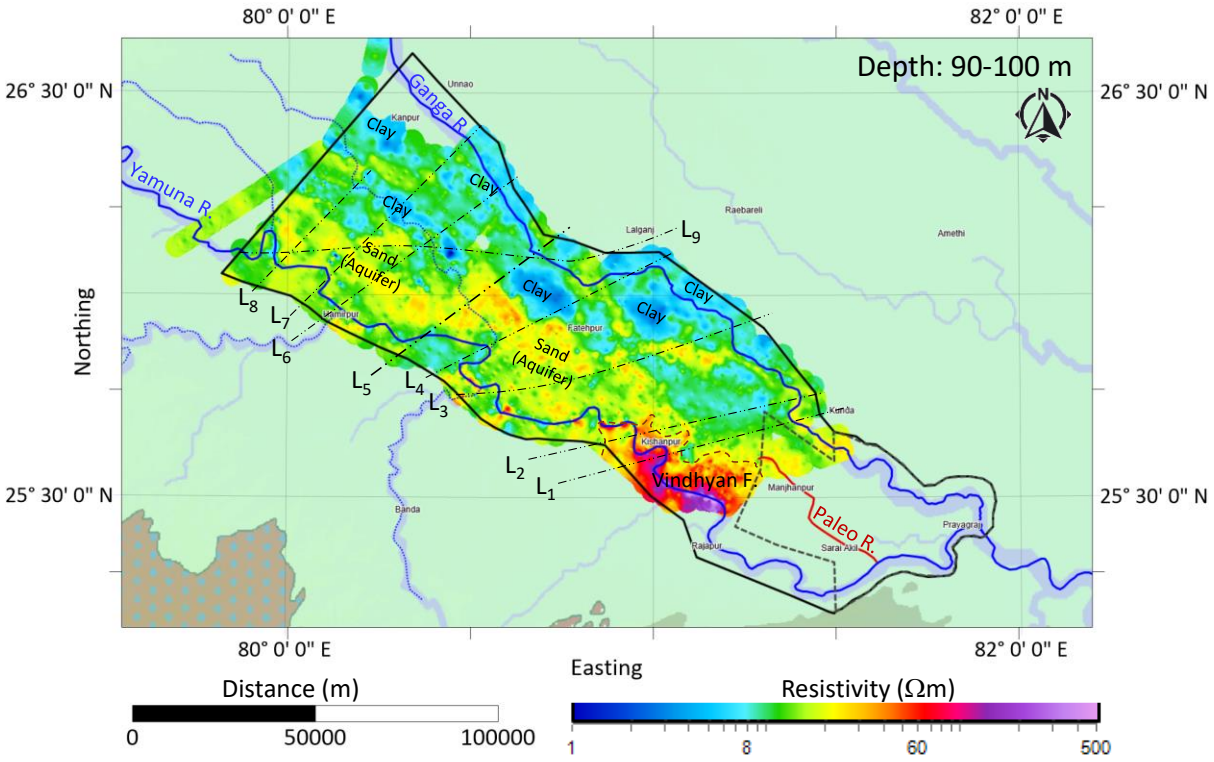


Figure 18. Mean resistivity map at 90-100 m depth between Kaushambi and Kanpur districts

Moving further down to 90-100 m depth, mean resistivity map shows dominant occurrences of sandy sediments in south western part associated with Yamuna River (Fig. 18). In contrast, zone associated with Ganga River in northern half is more occupied by clay/silt rich sediments. Significant displacement of rivers as well as in sediments are also seen continuing in similar pattern as at 40-50 m depth. Vindhyan formation is found progressing towards north with depth.

Mean resistivity map at 140-150m depth revealed Vindhyan formation extending up to 30 km towards north (Fig 19). Whereas in the western side, it is observed in close vicinity of the Yamuna River. Tectonic shift in sediments is found almost in similar pattern as upper level. The magnetic lineament L_3 appears to be induced by or influencing boundary of the Vindhyan formation. The lineament L4 divides resistivity and conductive zone on either its side. The zone close to Kanpur appears to be more dominated by clay rich deposits as well as salinity revealed by dominant conductive patches.

Zone associated with Ganga River is dominantly occupied by conductive from 50 m downward. The same time resistive dominance is seen with in the zone associated with Yamuna river with progressing extension of Vindhyan formation towards north from 50 m depth to downward. Such occurrences indicate that the sediment deposit in zone associated with Ganga River is of Himalayan origin. Sediments far from the source have smaller size and are observed with relatively low resistivity. Whereas zone associated with Yamuna River have sediment deposits from Vindhyan formation in south. Source formation being closure, large size grains are deposited that exhibit high resistivity.

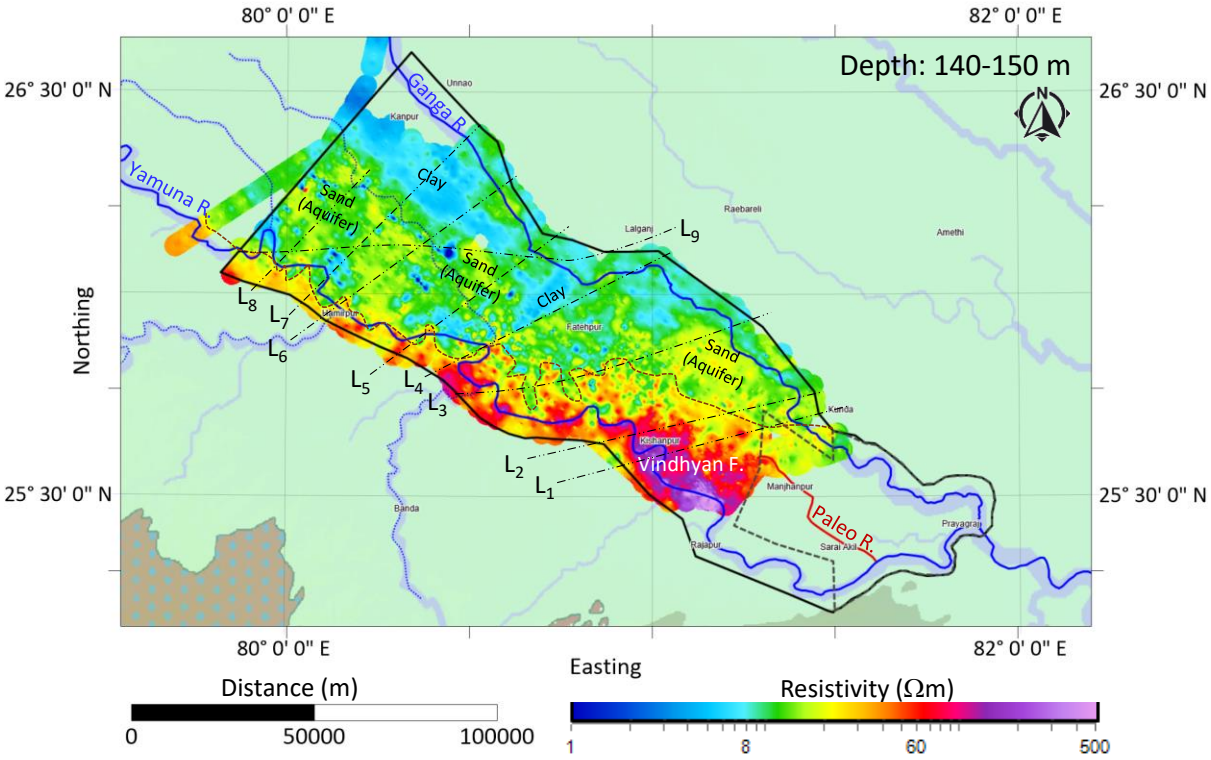


Figure 19. Mean resistivity map at 140-150 m depth between Kaushambi and Kanpur districts

Similar pattern is continued at deeper level at 200 m depth revealed by mean resistivity of 190-200 m depth (Fig. 20). Vindhyan formation further move north ward close to the present day Ganga River in the north-east of the area.

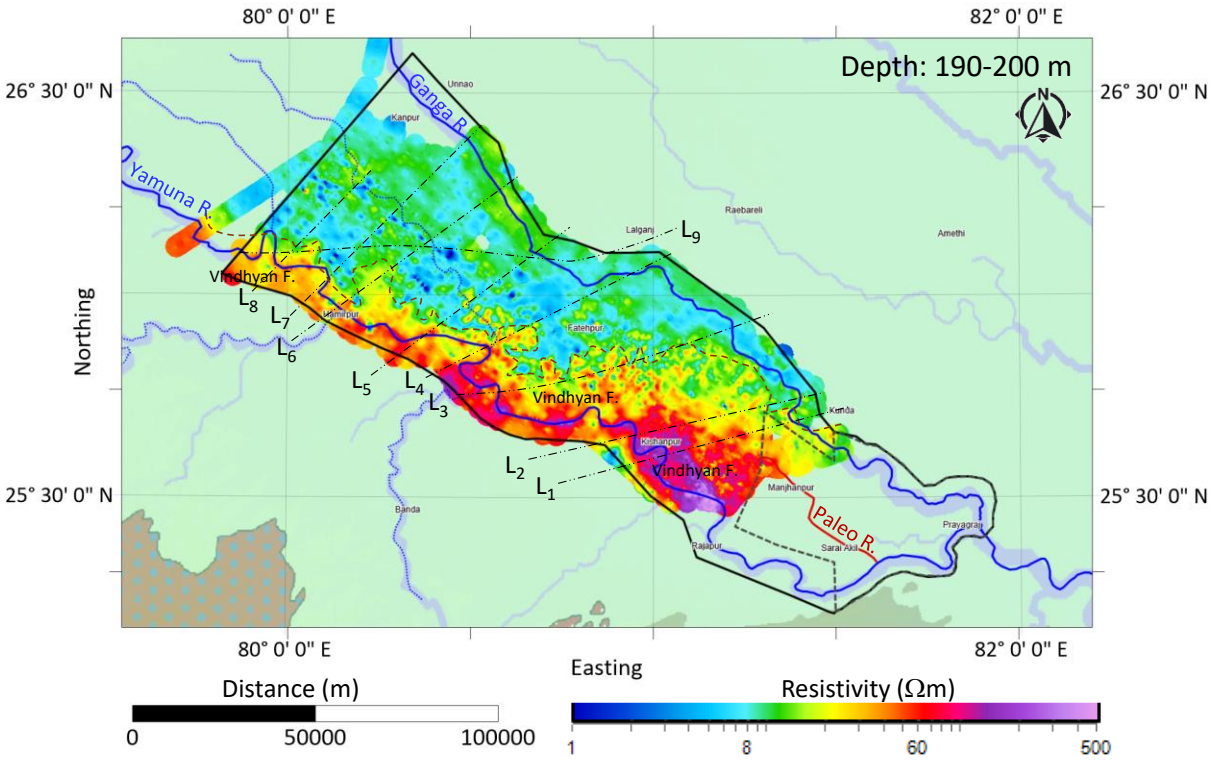


Figure 20. Mean resistivity map at 190-200 m depth between Kaushambi and Kanpur districts

Further moving to 240-250 m depth, mean resistivity map reveals that almost half of the study area from south are occupied by Vindhyan formation (Fig. 21). The magnetic lineaments not only show resistivity contrast within alluvial sediments but also in Vindhyan formations (Fig. 21 & 22).

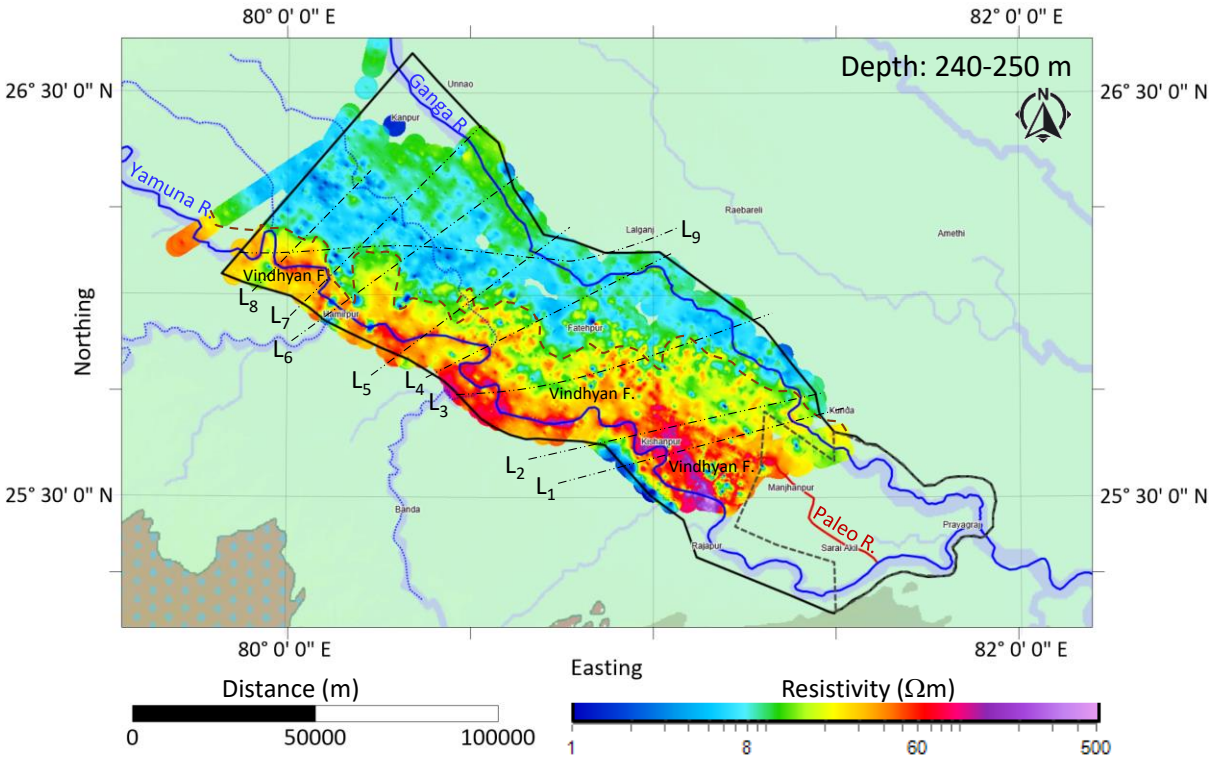


Figure 21. Mean resistivity map at 240-250 m depth between Kaushambi and Kanpur districts

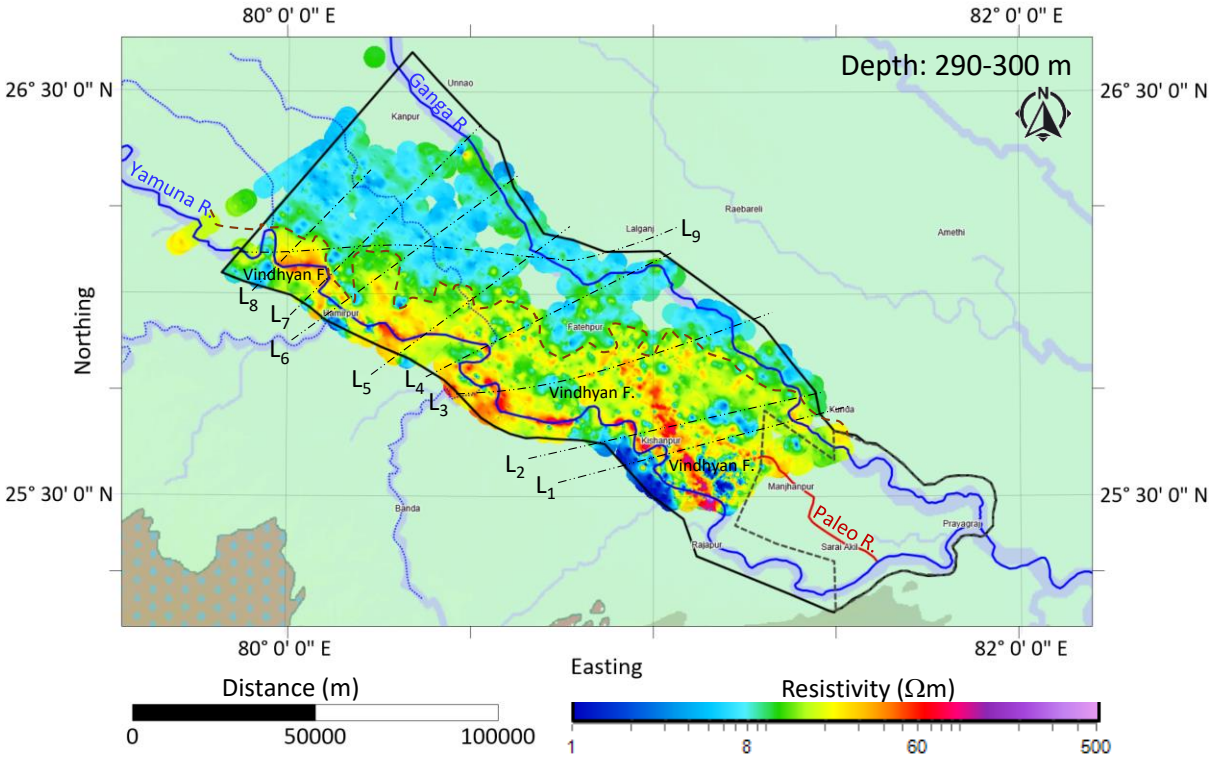


Figure 22. Mean resistivity map at 290-300 m depth between Kaushambi and Kanpur districts

6. Tracking the inferred paleochannel further north westward in inter-fluve region

Dimension of inferred paleochannel ($P_{1A}P_{1B}$) in Ganga-Yamuna doab between Prayagraj and Kaushambi districts is around 4-6 km wide and 15 m thick buried under 10-15 m thick soil cover. To track its extension further westward, mean resistivity map (MRM) between Kaushambi and Kanpur is prepared at 5 m interval within top 50 m depth.

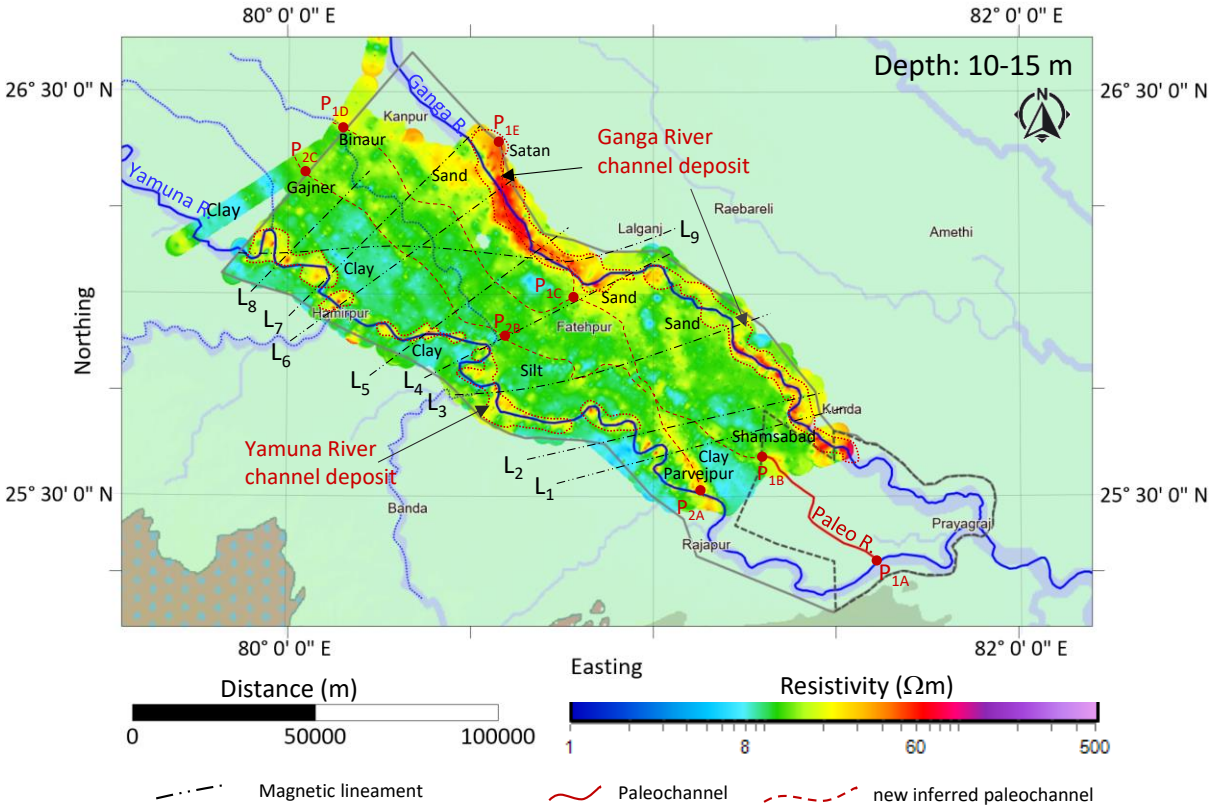


Figure 23. Mean resistivity map and inferred paleochannel at 10-15 m depth between Kaushambi and Kanpur districts

MRM at 10-15m depth shows a signature of paleochannel ($P_{1A}P_{1B}$ or P_{1AB}) extension westward in terms of relatively resistive zone from its surroundings (Fig. 23). The resistivity, though thin and patchy especially in central and western part, continued in meandering pattern till western and northern margin of the study area and in branches.

Besides the west ward extension of the inferred P_{1AB} paleochannel between Prayagraj and Kaushambi, an additional resistive (sandy) sediment deposits in linear pattern emerges that joins directly to Yamuna river at P_{2A} near Parvejpur. Patchy occurrences of inferred paleochannel extension improved significantly at 15-20 m depth showing strong connectivity (Fig.24). Extension of paleochannels P_{1AB} and newly emerged paleochannel are $P_{1B}P_{1C}P_{1D}$, $P_{1B}P_{1C}P_{1E}$ and $P_{2A}P_{2B}P_{2C}$ (Fig. 24). Full length of these inferred paleochannel can be mentioned in short hereafter as P_{1BD} located between Shamshabad (Kaushambi) and Binaur (Karnataka), P_{1BE} between Shamshabad and Satan villages, P_{2AC} between Parvejpur and Gajner villages. The branch of paleochannel P_{1CE} observed to be crossing the present Ganga River needs to be cross verified.

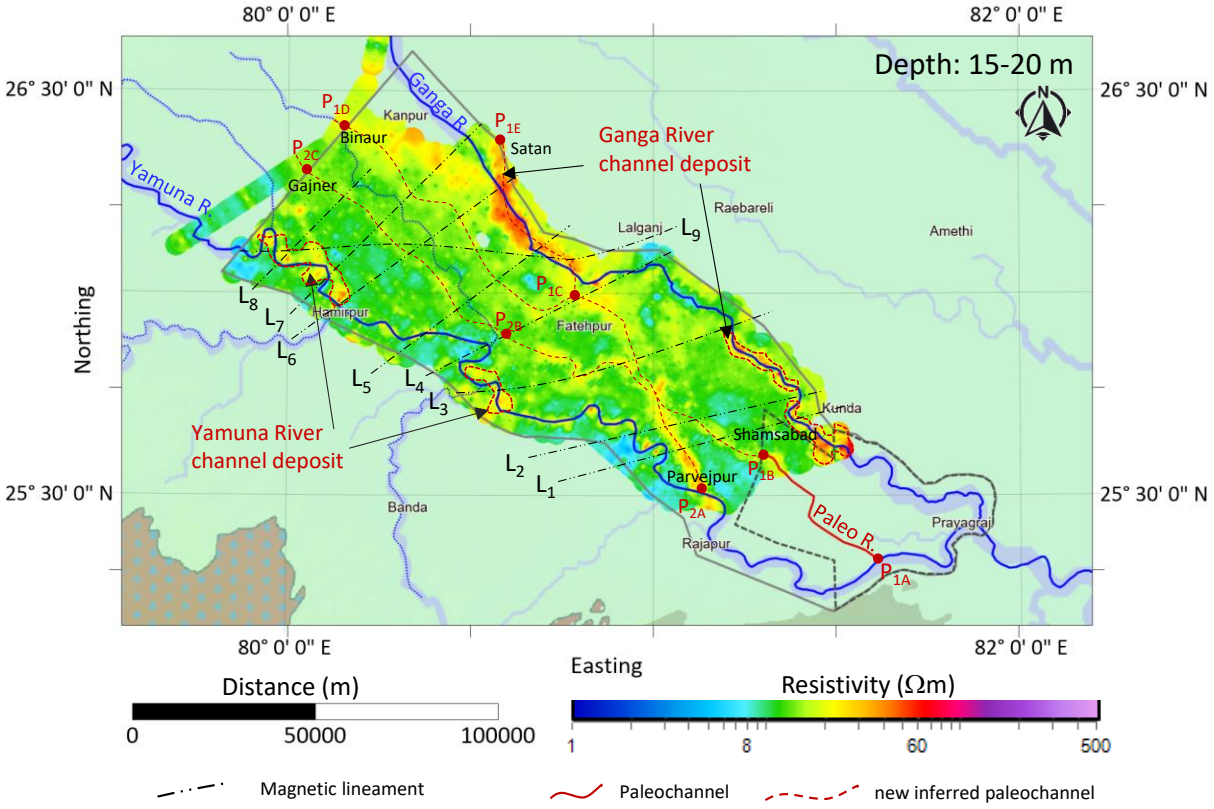


Figure 24. Mean resistivity map and inferred paleochannel at 15-20 m depth between Kaushambi and Kanpur districts

These paleochannels further improved in terms of their channel deposits moving further down to 25 m depth and reflected as increased resistivity (Fig. 25). Resistivity signature of paleochannel starts fading downward at 25-30 m (Fig. 26), most of the branches change their

course or disappear. For example, i) P_{1CE} shift as P_{1CG} and ii) branch of paleochannel flowing from Laghura towards Shashabad disappears (Fig. 27).

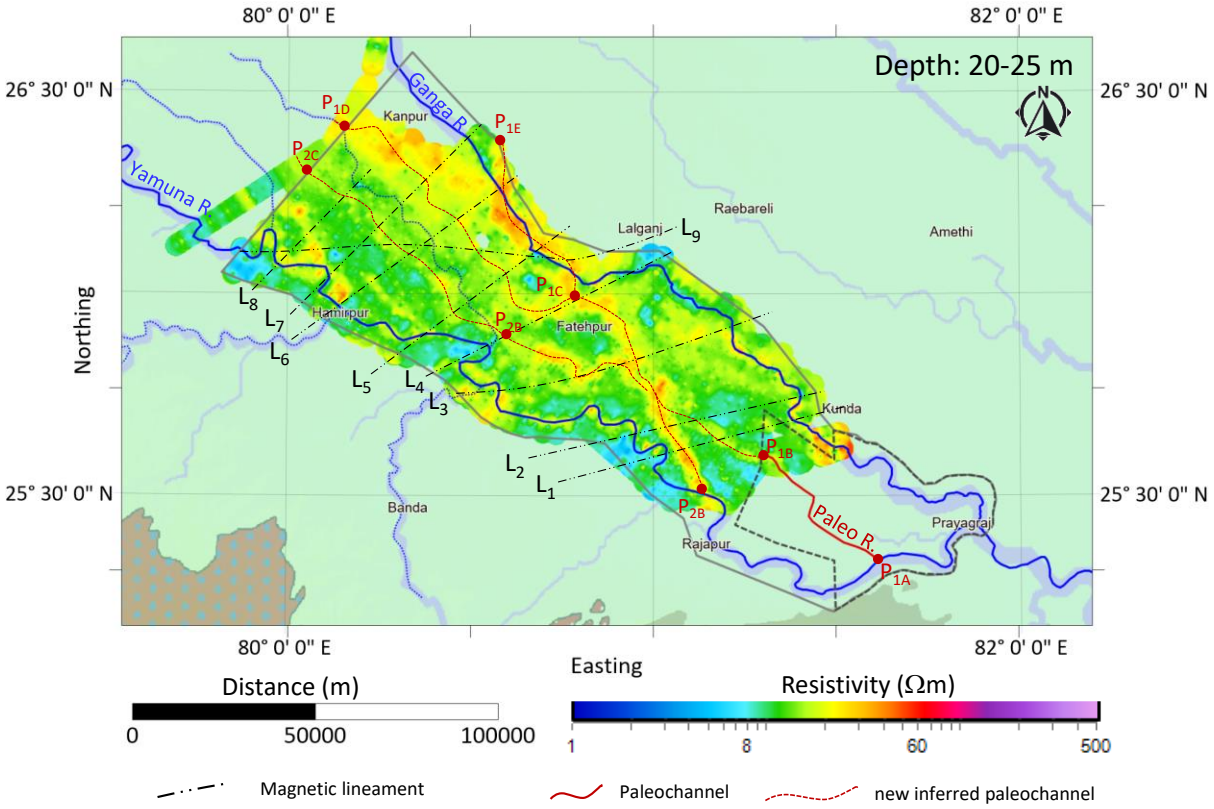


Figure 25. Mean resistivity map and inferred paleochannel at 20-25 m depth between Kaushambi and Kanpur districts

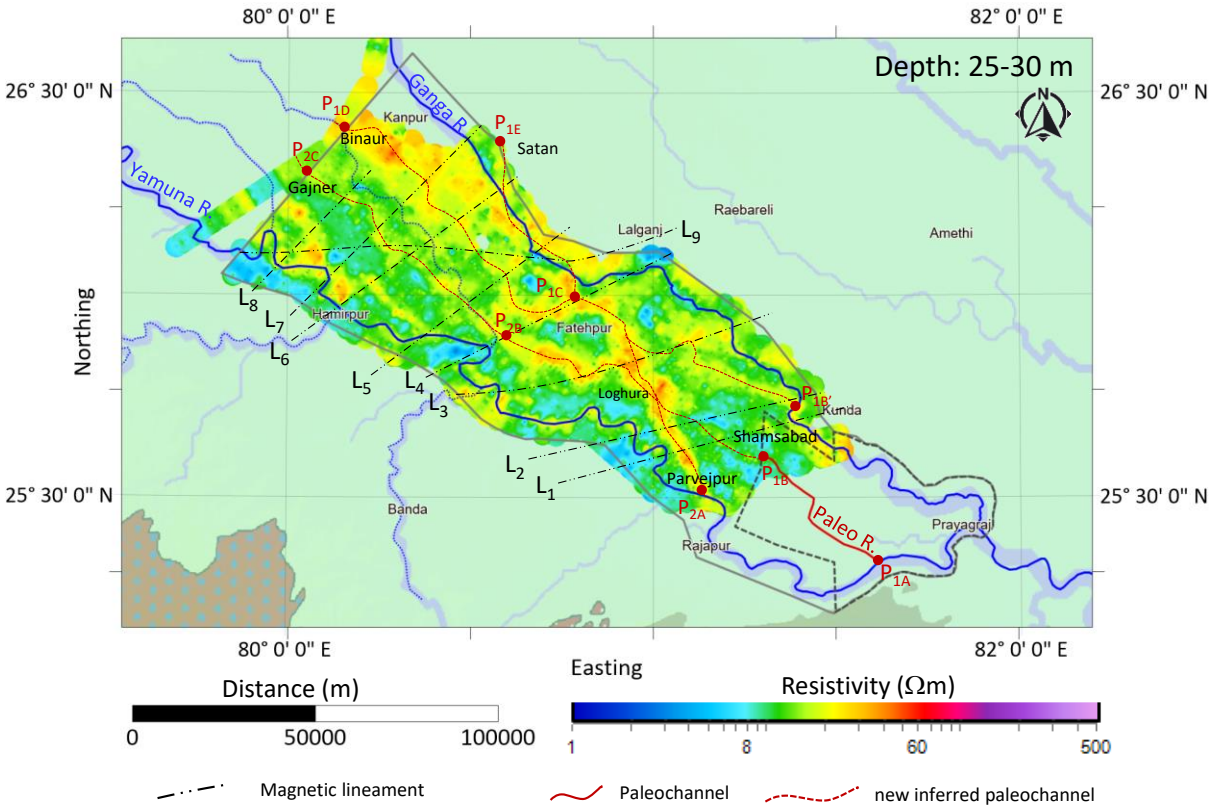


Figure 26. Mean resistivity map and inferred paleochannel at 25-30 m depth between Kaushambi and Kanpur districts

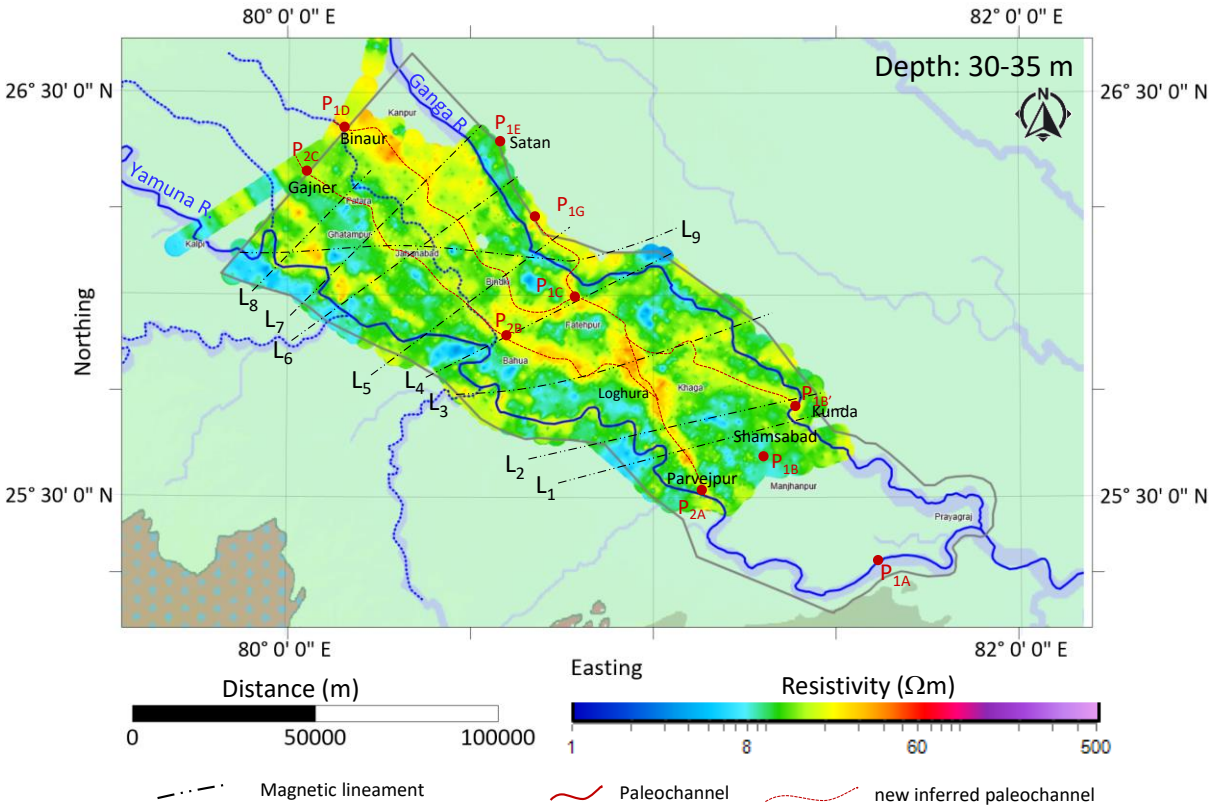


Figure 27. Mean resistivity map and inferred paleochannel at 30-35 m depth between Kaushambi and Kanpur districts

The paleochannel P_{1BC} starts fading between 25-35 m depth, almost at the same time period as it's another branch ($P_{1B'C}$) start appearing towards north that joins Ganga River near Kunda village. The Branch P1B'C appears very prominently down to 40 m. Thereafter, almost all the branches, starts slowly fading at deeper level (Fi. 28-30).

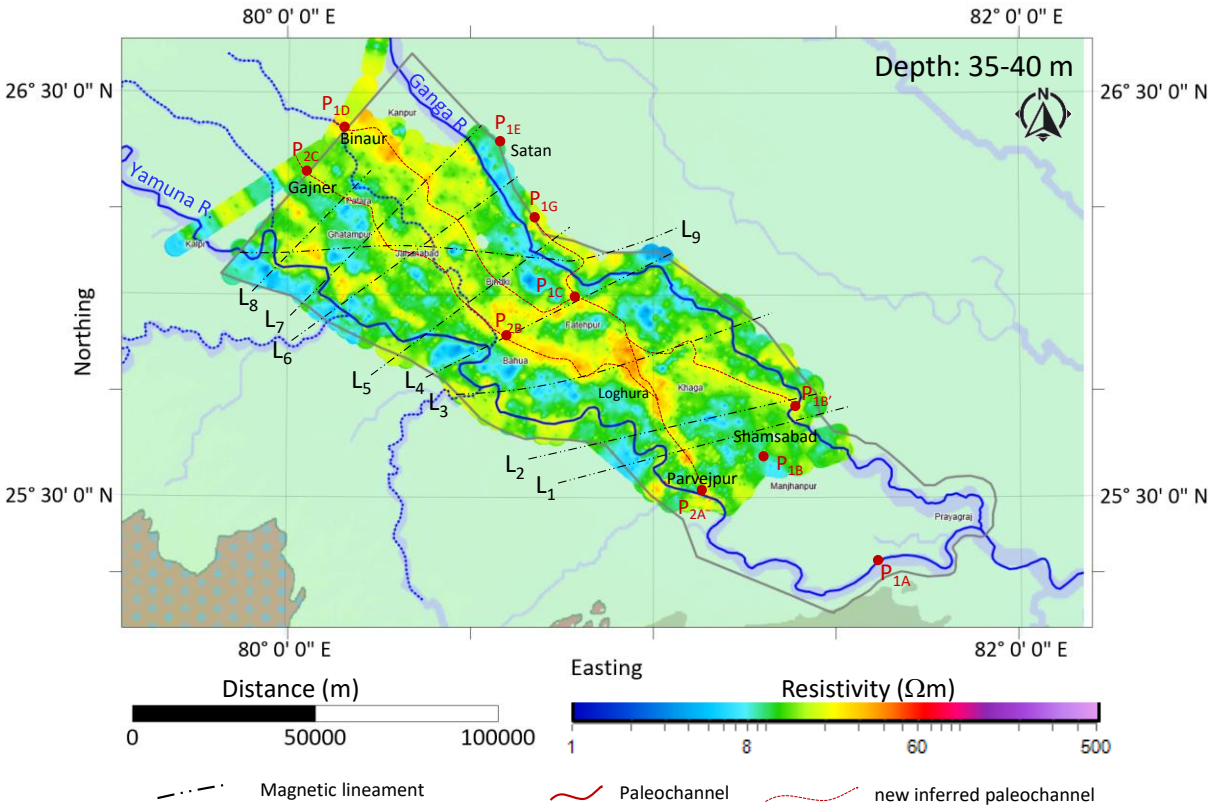


Figure 28. Mean resistivity map and inferred paleochannel at 35-40 m depth between Kaushambi and Kanpur districts

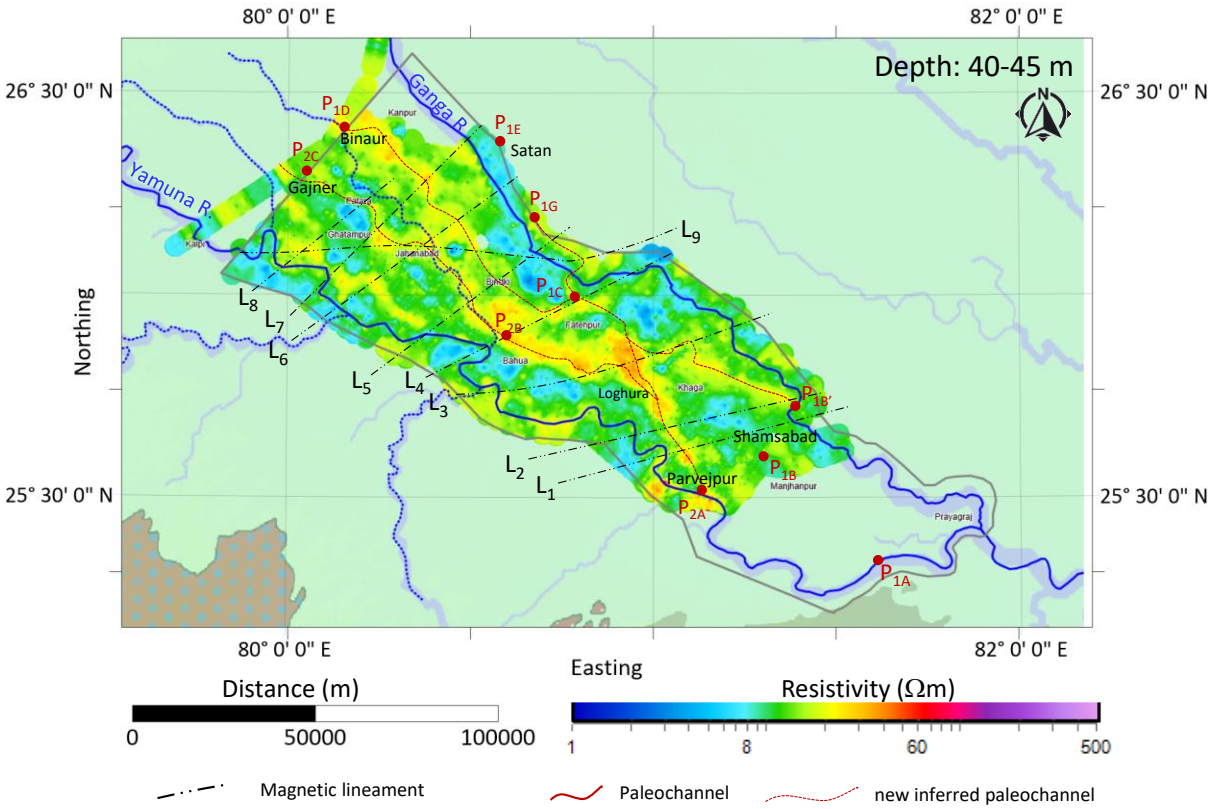


Figure 29. Mean resistivity map and inferred paleochannel at 40-45 m depth between Kaushambi and Kanpur districts

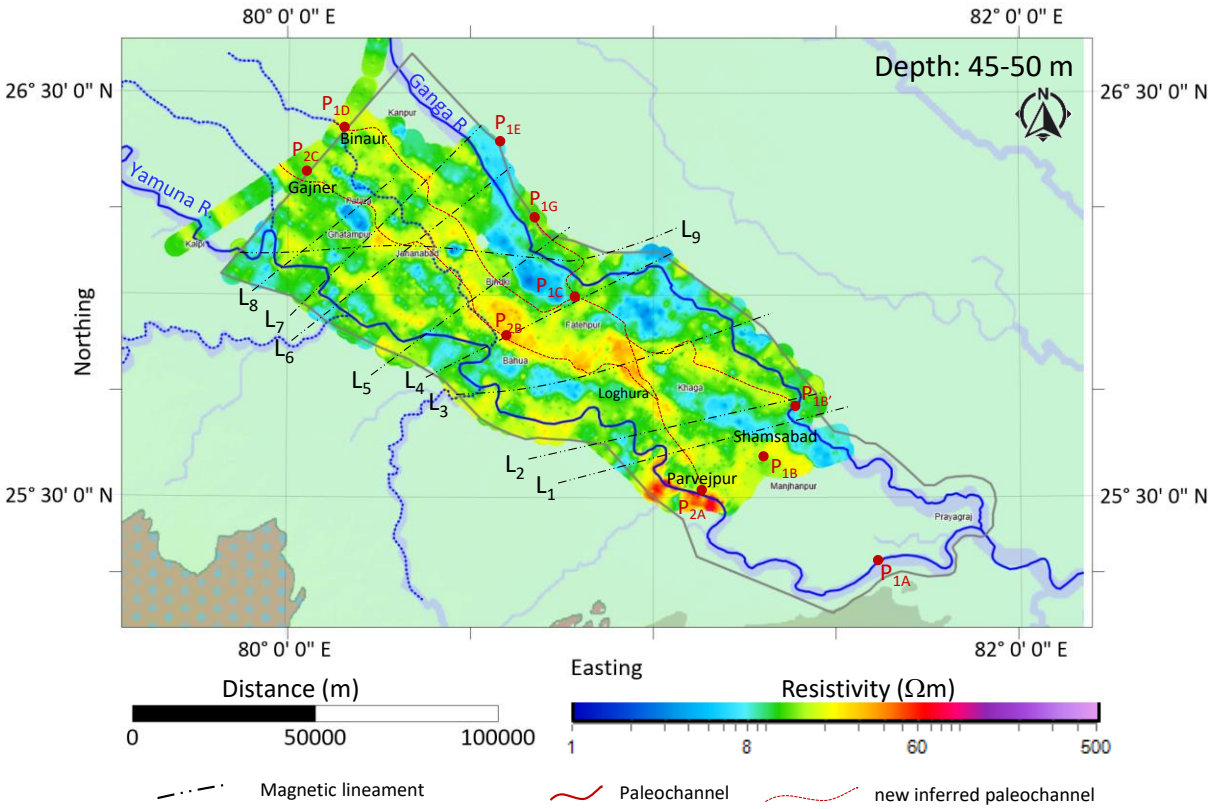


Figure 30. Mean resistivity map and inferred paleochannel at 45-50 m depth between Kaushambi and Kanpur districts

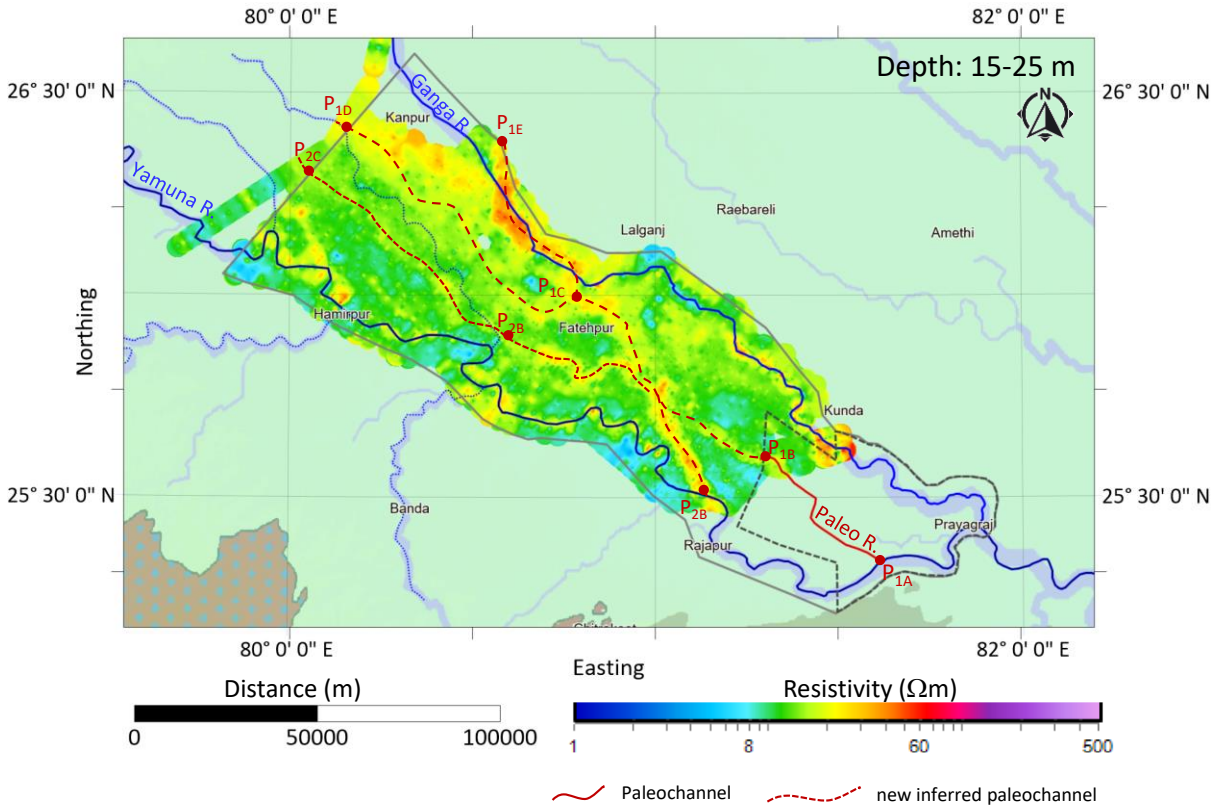


Figure 31. Mean resistivity map and inferred paleochannel at 15-25 m depth between Kaushambi and Kanpur districts with inferred paleochannel

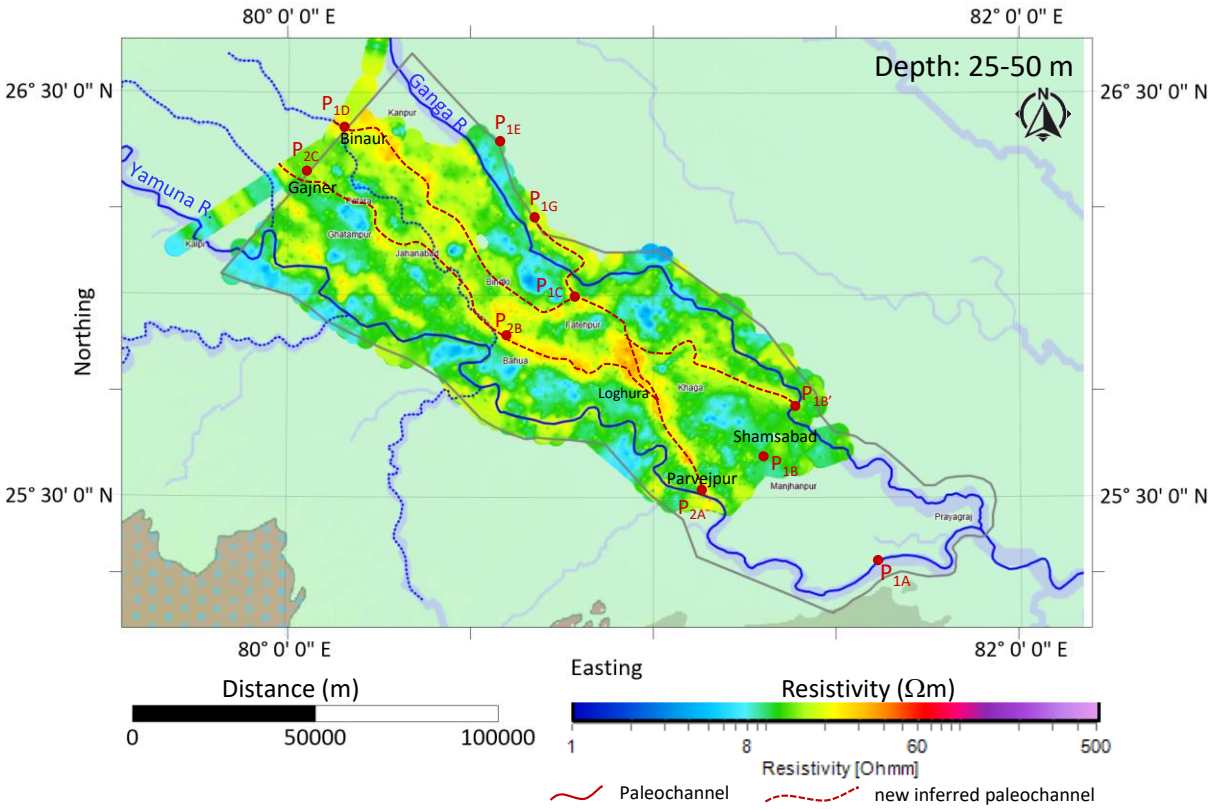


Figure 32. Mean resistivity map and inferred paleochannel at 25-50 m depth between Kaushambi and Kanpur districts

The inferred paleochannels can be divided broadly into two depth zones: 1) 15-25 m, 2) 25-50m. The depth zone-1 reveals extension of paleochannels that was discovered near Sarai Akil

7. 3D Mapping of Principal Aquifers system

AEM resistivity has been utilized to identify different litho units such as sand, silt, clay, Vindhyan formations, etc. depending on their range of resistivity. For example, sandy layers, in general, pose resistivity in range of 25-100 Ωm. These vans be further sub-categorized into fine to coarse grained sand. Larger the size of grains higher is the measured resistivity. However, quantum and quality of water further modify the resistivity. Silt and clay with finer particle size found with low resistivity (5-30 Ωm). It's not only the grain size, but clay and sand due to low permeability, its composition of organic and inorganic components also changes that significantly affects the resistivity. Groundwater salinity further lowers down the resistivity. Granular sediments i.e. gravel and sand (often mixed with kankar at least at shallow level) form aquifer in Ganga alluvium plain.

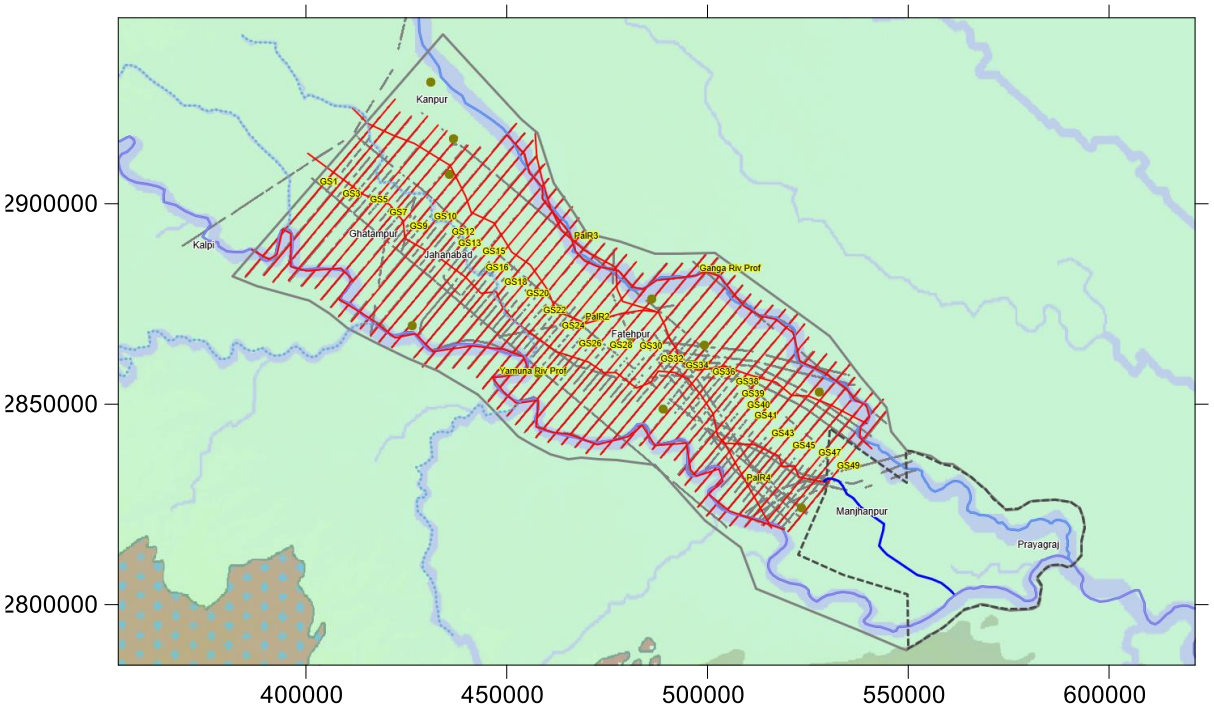


Figure 33. Grid map of profile lines along which top, and bottom of aquifer surfaces are extracted.

In general, multiple layers of porous and permeable sandy layers are found separated by low or impermeable silty/clayey layers. Dominance of such multi layers reflected,

often, as single layer at depth depending on resolution of methodology. Such sandy dominant layer is termed as principal aquifer. Alluvium resting over Vindhyan formations, consists of sandstone, limestone, and shale. The weathered fractures part of Vindhyan formation forms aquifer below the alluvial aquifer.

To extract top and bottom surfaces principal aquifer, AEM profiles are generated in grid pattern at least all along the major flight lines as well as lines passing through Ganga and Yamuna rivers including inferred paleochannels (Fig. 33). Top and bottom of aquifer surfaces are digitized along the all grid sections as demonstrated in section GS16 and Gs40 in figure 34.

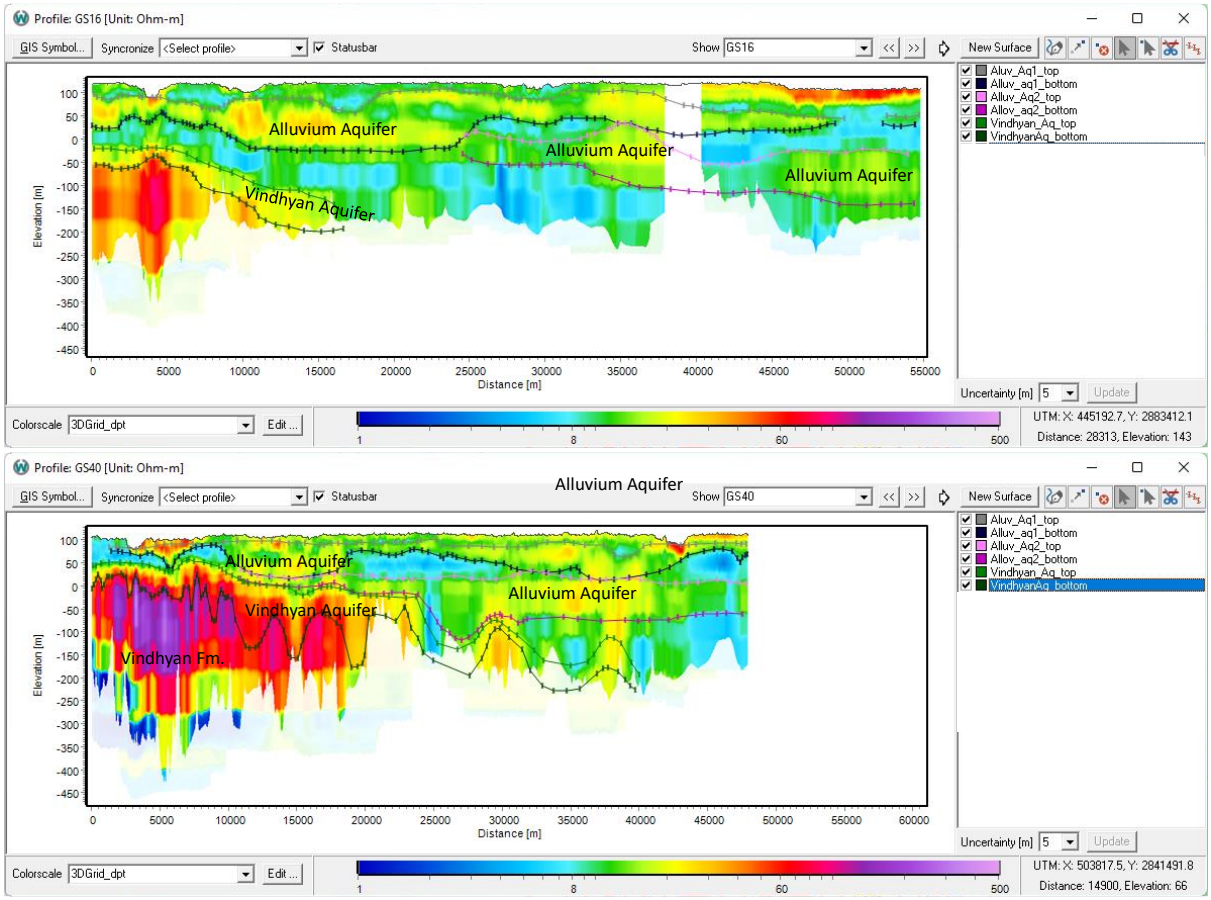


Figure 34. Demonstrative grid sections GS16 (upper) and GS40 with digitized top and bottom of aquifer surfaces.

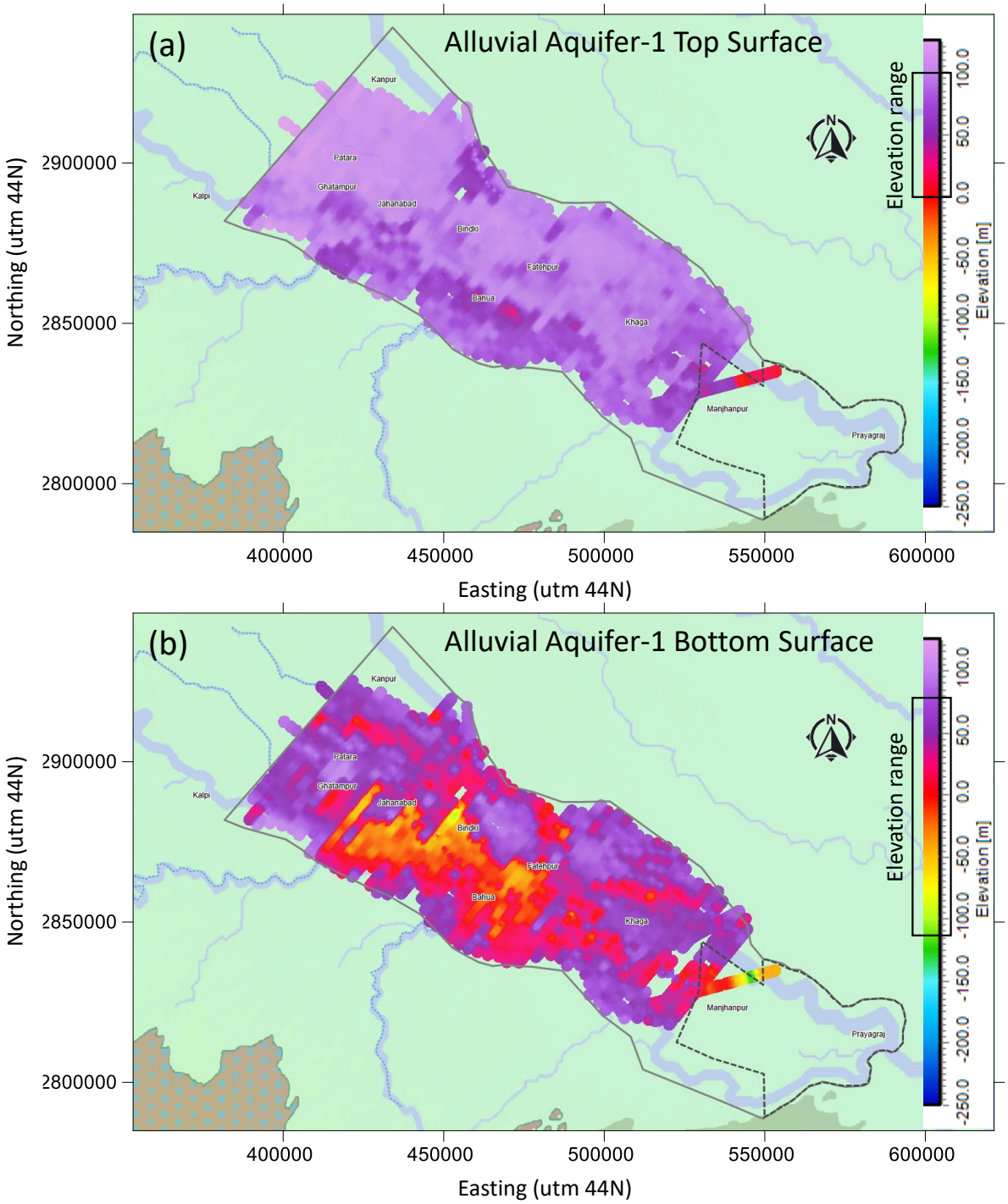


Figure 35. Surface elevation map (a-top, & b-bottom) of Principal Alluvium aquifer-1.

There are two principal aquifers in alluvium i.e. i) principal aquifer-1 at 40-100 m, & ii) 120-250 m depth below ground. Principal aquifer-1 is found more or less in unconfined conditions. Whereas, underlying alluvial principal aquifer-2 is connected with aquifer-1 at places, but broadly found in confined conditions. Principal aquifers in alluvium, in

general, have smooth surfaces. In contrast, there is a relatively undulating surface in underlying Vindhyan formation. Aquifer in Vindhyan formation are formed dominantly by secondary porosity due to weathering and fracturing, which often varies spatially due to various factors such as tectonic disturbances, susceptibility, etc.

After digitization of top and bottom level of principal aquifer, surfaces elevation map has been prepared using kriging interpolation with 3 km search radius. Surface elevation (m, above mean sea level) map of top and bottom of principal aquifer 1 & 2 are in Alluvial and underlying Vindhyan formation (Fig. 35-37)

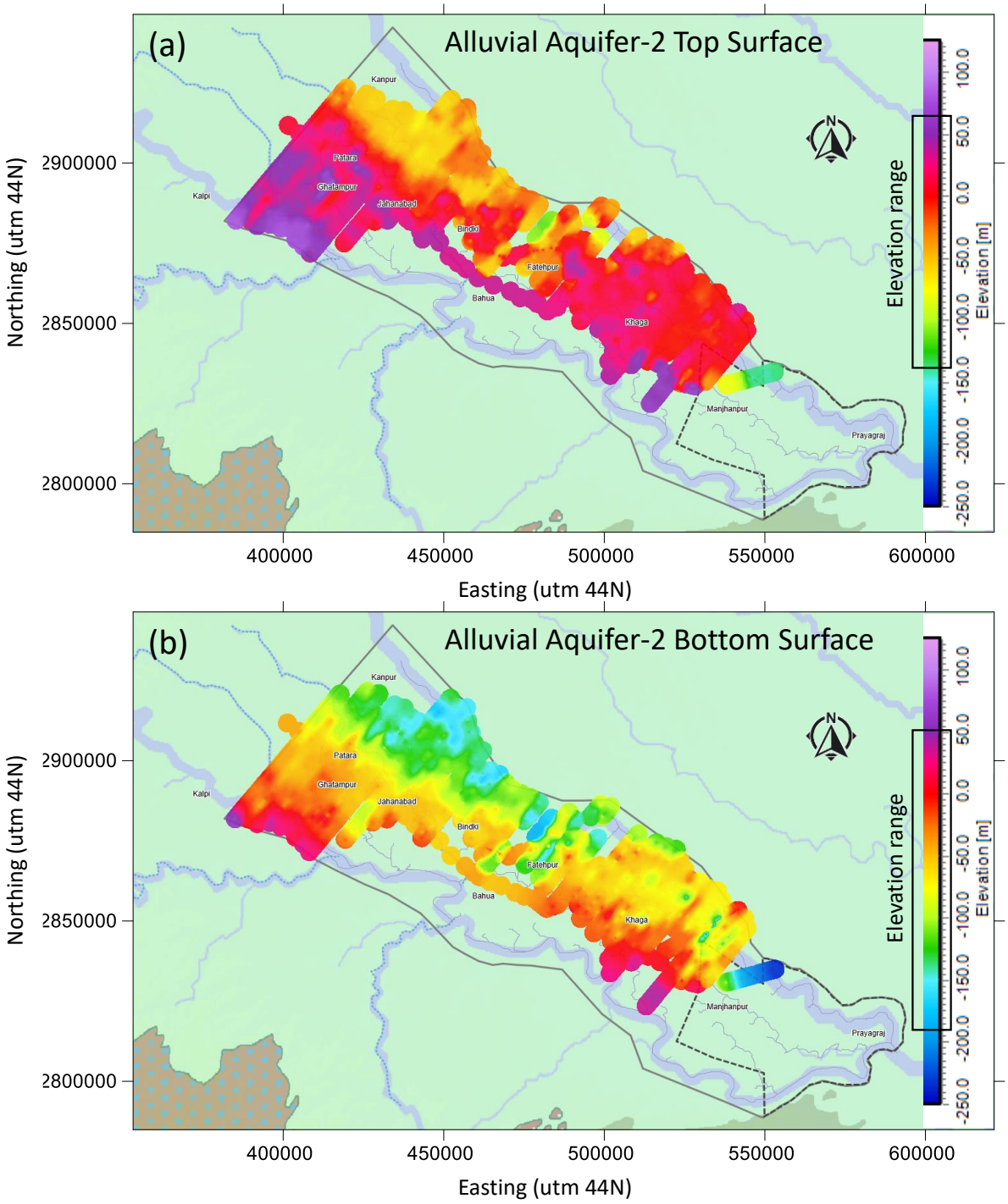


Figure 36. Surface elevation map (a-top, & b-bottom) of Principal Alluvium aquifer-2.

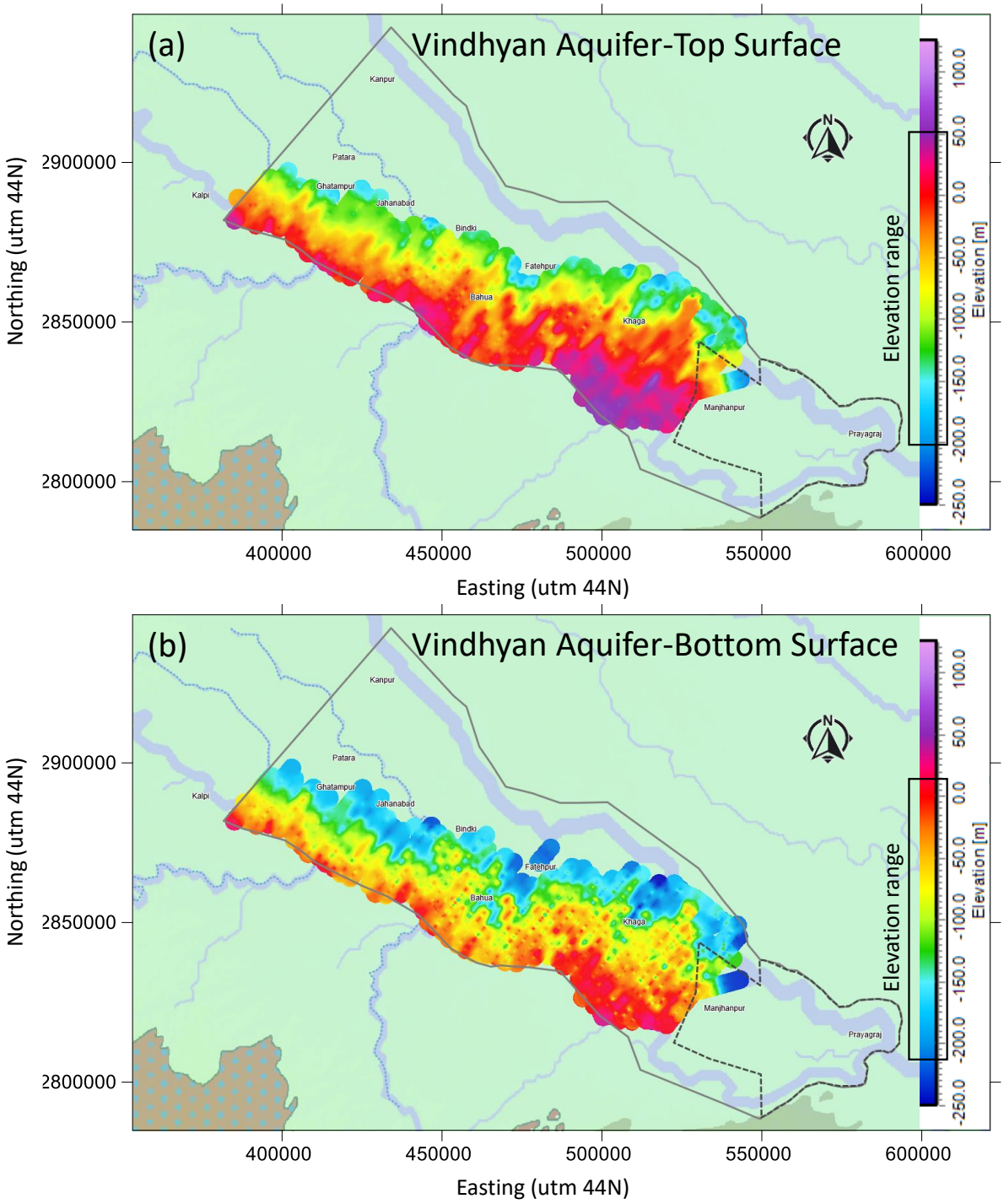


Figure 37. Surface elevation map (a-top, & b-bottom) of Vindhyan aquifer.

Vindhyan formation which is exposed to the surface in south of the study area, is found under alluvial cover in the study area. Vindhyan formation has contrastingly high resistivity than the overlying alluvium and hence become easy to identify based on resistivity depth distribution. Inferred Vindhyan formation is found dipping towards

north. The top surface elevation is contact of Vindhyan formation with overlying alluvium. Whereas the bottom of Vindhyan aquifer indicates interface between weathered-fractured and compact Vindhyan formation.

8. Establishing linkages between aquifer system including paleochannel with river system

Linkage here means hydrogeological connectivity that facilitate movement or exchange of water from one to another aquifer and vice versa. Previous study on paleochannel in Ganga-Yamuna doab between Kaushambi and Kanpur districts revealed hydrogeological linkages of Ganga and Yamuna rivers with underlying aquifer system at places. To further examine such linkages, resistivity cross sections have been created all along the Ganga and Yamuna rivers as well as few cross sections running across Ganga and Yamuna rivers that obviously pass through paleochannel inferred between these two rivers. The profile $G_{AA'}$ and $Y_{AA'}$ are respectively along Ganga and Yamuna rivers. The profile CP1, CP2 and CP3 run across the rivers (Fig. 38).

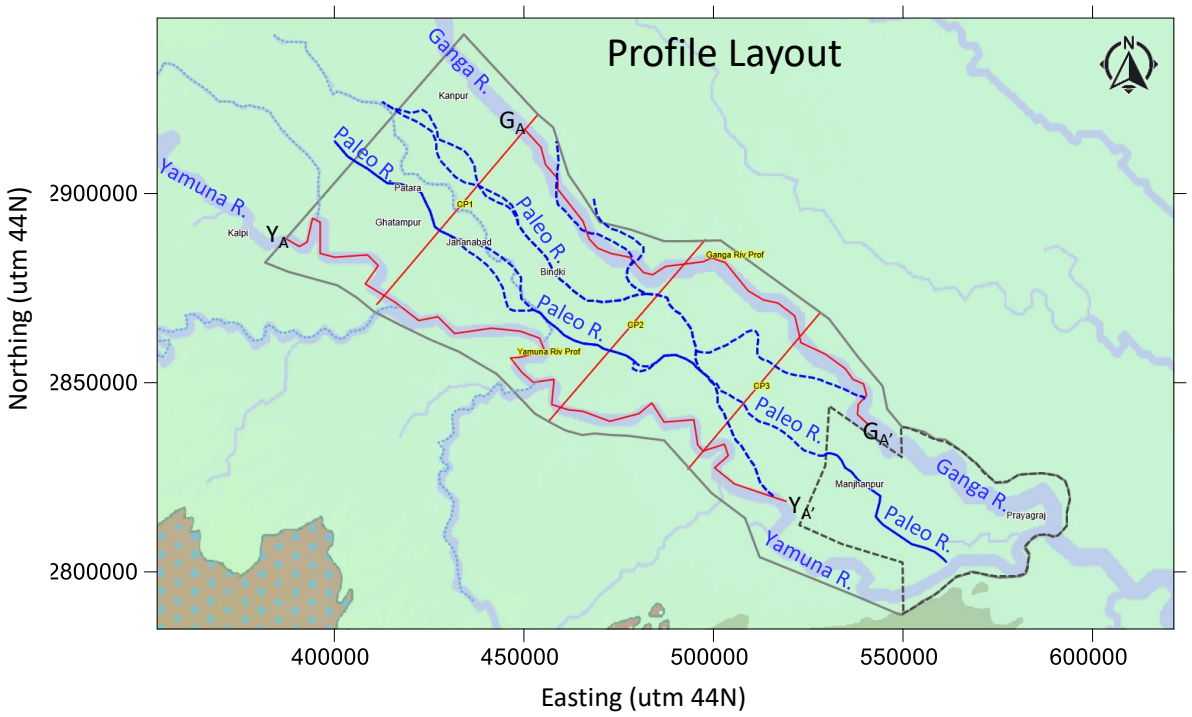


Figure 38. Profiles layout along ($G_{AA'}$ $Y_{AA'}$) and across (CP1, CP2 & CP3) the Ganga and Yamuna rivers.

Figure 39 presents resistivity section along Ganga river, where high resistivity (30-100 Ωm) associated with upper surface provide Ganga River channel deposits. Under the water flowing conditions, only large size and heavy sediments get settled down along the river. Depending on rate of sediment deposition, thickness of sediment pile increases with time, which is called as channel deposits. Such channel deposits display relatively high resistivity. Surface elevation of river ranges between 95-100 m amsl. There is significant elevation gap between river level and underlying principal aquifer, which is at around -20 to -140 m elevation above mean sea level. The river from 0 to 30 km from NW do not have any hydrogeological linkage with underlying principal aquifer. However, there is strong connection between 30-60 km profile distance through inferred paleochannel. The inferred hydrogeological linkages laterally and vertically are shown with dark blue coloured continuous line. Structural disturbances, inferred from aeromagnetic data that was discussed as magnetic lineament in previous chapter, are marked with dashed line. Dislocation of strata across such line characterizes them as probable fault lines. Hydrogeological linkages can be also observed to be guided by such structural disturbances.

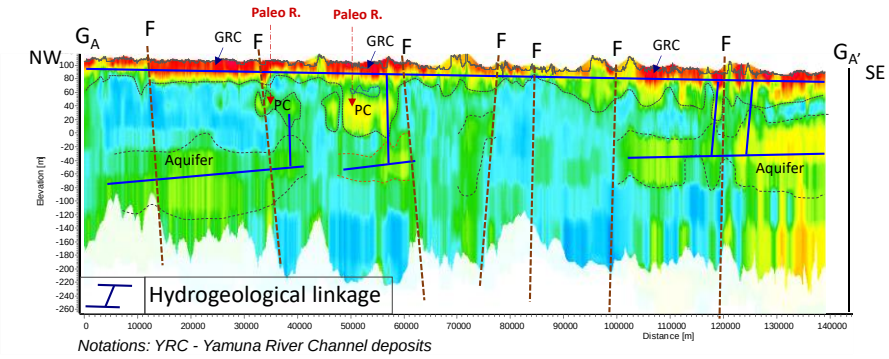


Figure 39. Resistivity section ($G_{AA'}$) along the Ganga River revealing hydrogeological linkages of river with underlying paleochannel and aquifer.

Similar exercise has also been carried out along roughly 210 km meandering course of Yamuna River, which has revealed greater degree of hydrogeological connectivity with underlying aquifer (Fig. 40). Clear signature of structural disturbances in Vindhyan formation in terms of resistivity variation can be seen. Structural disturbances are not only limited to the buried Vindhyan hard rock, but also in overlying alluvial litho units.

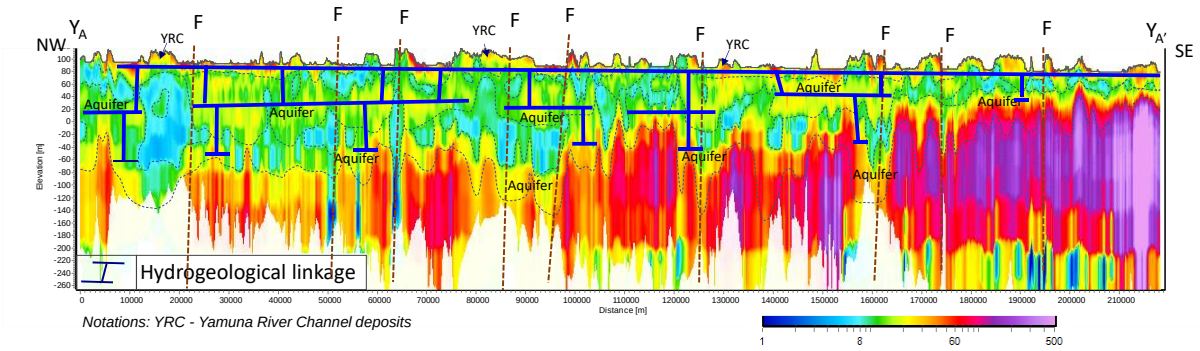


Figure 40. Resistivity section ($G_{AA'}$) along the Yamuna River revealing hydrogeological linkages of river with underlying aquifer.

The profile running across the Ganga and Yamuna rivers i.e. CP1, CP2 and CP3 have also revealed similar structural features and induced hydrogeological linkages of Ganga and Yamuna rivers and paleochannels with underlying aquifer (Fig. 41-43). Magnetic map with AEM resistivity has brought clear signature of structural discontinuity. The study also suggest that present rivers Ganga and Yamuna are controlled by fault (Fig 41-43).

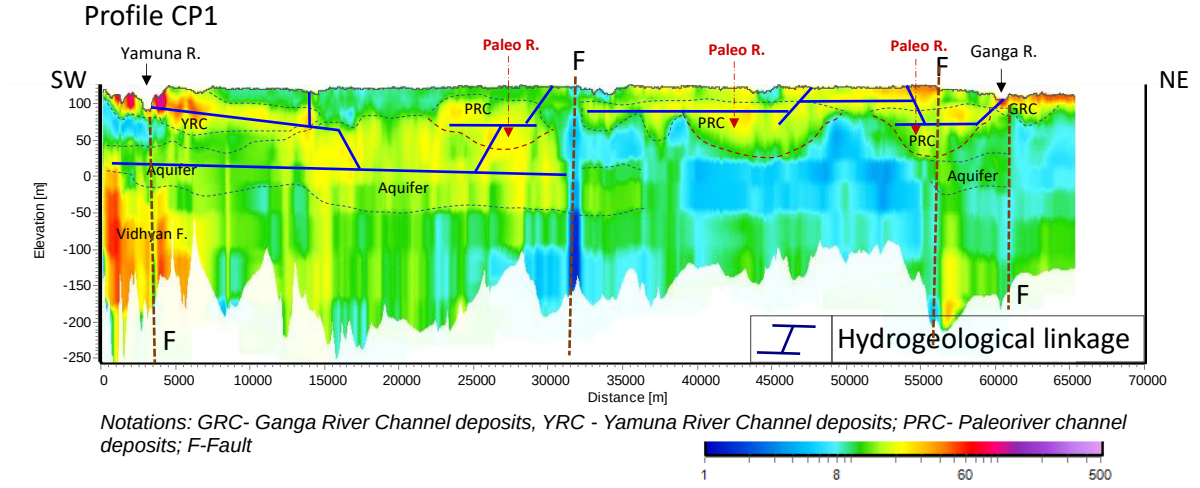


Figure 41. Resistivity section (CP1) running across the Yamuna and Ganga rivers, revealing hydrogeological linkages of rivers with buried paleochannel and underlying aquifer system..

Profile CP2 run passes through Fatehpur and crosses Ganga and Yamuna rivers, where they have suffered around 12 km shift towards north east. The commonality in direction and order of shifts indicates both the rivers have been affected by the

common factor, which again indicates towards tectonic disturbances. That means tectonic disturbances are not only causing vertical shift but also lateral. The inferred fault also explains sudden discontinuity within principal aquifer in alluvium as well as in Vindhyan formations. For example, dysconnectivity of principal aquifer at either side of the inferred fault located between 40 km and 45 km profile distance (Fig. 42).

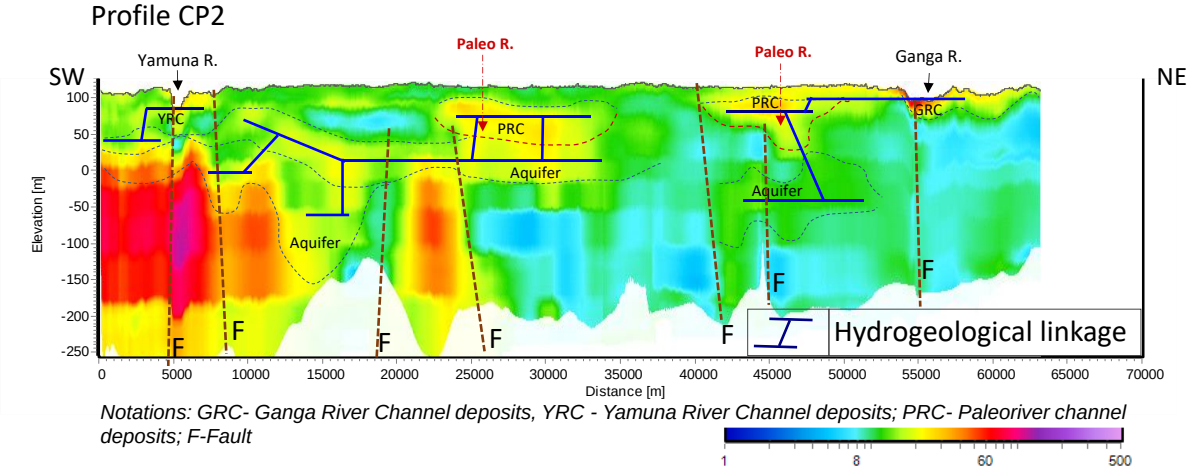


Figure 42. Resistivity section (CP2) running across the Yamuna and Ganga rivers, revealing hydrogeological linkages of rivers with buried paleochannel and underlying aquifer system.

The result also indicates that inferred buried paleochannel is also guided by the fault. Similar fault guided inferred buried paleochannel can be seen in profile CP3 also (Fig. 43). The commonality of buried fault below buried paleochannel reflected in all the three profiles indicates that inferred buried paleochannels were also controlled by fault. The faults that show their signature up to top surface in terms of elevation difference are probably younger. Thus, tectonic forces at different time interval are most probably responsible for changing river course and as a result abandoning few river courses, now paleochannel.

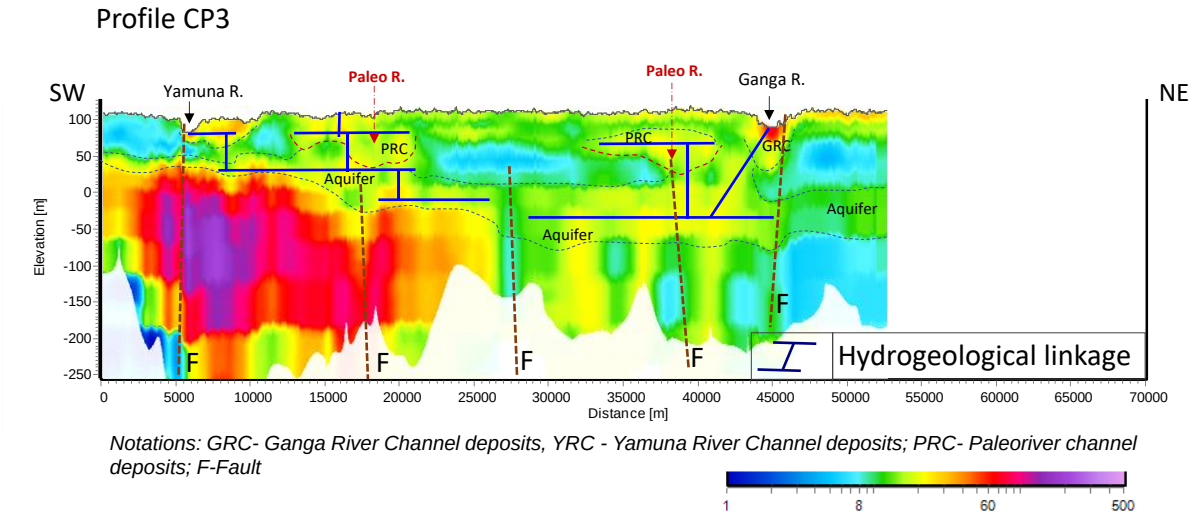


Figure 43. Resistivity section (CP3) running across the Yamuna and Ganga rivers, revealing hydrogeological linkages of rivers with buried paleochannel and underlying aquifer system.

9. Validation by Ground and Borehole geophysics

To validate the AEM results, ground geophysical surveys comprising electrical resistivity tomography (ERT) and Ground transient electromagnetic methods (GTEM) have been carried out targeting the inferred paleochannels. These surveys were carried out after the heliborne geophysical surveys. The ERT survey was carried out using IRIS Syscal Pro72 multi-electrode resistivity meter of 10 m unit electrode spacing where, Wenner-Schlumberger and multigradient arrays were used running across the inferred paleochannel. The GTEM was carried out using ABEM WalkTEM system using 40m x 40 m loop size and ~15 A current. The WalkTEM uses same dual moment transmission and recording technology as SkyTEM.

These observations are taken in such a way that the measurements were made over and either sides of paleochannels. This was followed by shallow drilling by CSIR-NGRI at 10 sites down to 50 m depth to confirm the AEM inferred paleochannels. Out of 10 wells, 2 shallow wells falling in present survey area are used for coring with intension to determine age of the inferred paleochannel. Other 8 shallow wells are done with rotary drilling to confirm inferred lithology of paleochannel revealed by AEM survey. The wells falling in previous study area are also presented in below table 3 and figure 44. For validation up to deeper levels, CGWB old wells drilled during 2020 are used.

As originally conceptualized, few deep boreholes are also recommended for deep drilling by CGWB to confirm major litholological settings including paleochannel and aquifer systems. The drillings are still awaited. CGWB has shared few boreholes result down to 200-300 m deep with borehole geophysical logs. Observation locations are shown in figure 44. The results of ERT, GTEM and geophysical logs of shallow and deep wells are utilized to compare with AEM resistivity for validations.

Table 3. details of borehole data utilized- old wells of CGWB and newly shallow drilled wells by NGRI.

Long	Lat	BH Name	Total depth of drilling	Drilling type & Agency	Location name (village, district)	Drilling Time (Month, Year)	Drilling sector
80.9902	25.9026	CW1	205.5	Rotary drilling, CGWB	Muraw, Fatehpur	February, 2020	Kaushambi-Kanpur (B)
80.2639	25.9440	CW2	205.72	Rotary drilling, CGWB	Dapsaura, fatehpur	March, 2020	
80.8868	25.7584	CW3	205.37	Rotary drilling, CGWB	Asothar, Fatehpur	April, 2020	
81.0594	25.8539	CW4	189.35	Rotary drilling, CGWB	Sanvat, Fatehpur	June, 2020	
80.8061	25.9221	CW5	273	Rotary drilling, CGWB	ITI Fatehpur	June, 2021	
80.8587	26.0056	CW6	305	Rotary drilling, CGWB	Basohani, Fatehpur	June, 2022	
81.2751	25.7956	CW7	300	Rotary drilling, CGWB	Mohammadpur Gaunti, Fatehpur	July, 2023	
80.5785	25.8372	CW8	169	Rotary drilling, CGWB	Mahakerra	August, 2024	
80.4895	26.1805	CW9	305	Rotary drilling, CGWB	Parsadepur, Devmai, Fatehpur	February, 2020	
80.6665	26.0221	CW10	262	Rotary drilling, CGWB	Umarghana, Malawan, Fatehpur	February, 2020	
81.5831	25.3594	NW1	41	Core drilling, CSIR-NGRI	Swaitha, Prayagraj	October, 2021	Prayagraj-Kaushambi (A)
81.5117	25.3981	NW2	44	Core drilling, CSIR-NGRI	Ichchhana, Kaushambi	October, 2021	
81.4314	25.4797	NW3	41	Core drilling, CSIR-NGRI	Agiyouna, Kaushambi	October, 2021	
81.3236	25.5900	NW4	40	Core drilling, CSIR-NGRI	Taibapur Shamashabad, Kaushambi	October, 2021	
81.4931	25.4578	NW5	43	Core drilling, CSIR-NGRI	Bandhawa Kalyan, Kaushambi	October, 2021	
81.4969	25.3636	NW6	48	Core drilling, CSIR-NGRI	Khopa, Kaushambi	October, 2021	
81.6519	25.5225	NW7	40	Core drilling, CSIR-NGRI	Ujihani Khalsa Kachha, Kaushambi	October, 2021	
81.4808	25.2739	NW8	23	Core drilling, CSIR-NGRI	Bhakanda Uparhar, Kaushambi	October, 2021	
81.0125	25.7122	NW9	39	Core drilling, CSIR-NGRI	Jagatpur, Fatehpur	October, 2021	Kaushambi-Kanpur (B)
80.6947	25.8708	NW10	40	Core drilling, CSIR-NGRI	Abu Mohamadpur, Fatehpur	October, 2021	
81.1455	25.6685	NW11	50	Rotary drilling, CSIR-NGRI	Basva, Fatehpur	March, 2020	
80.4250	26.0385	NW12	Did not drill, chosen other site (NW13) for better representation				
80.2464	26.1407	NW13	48	Rotary drilling, CSIR-NGRI	Bihupur, Fatehpur	March, 2020	
80.0905	26.2758	NW14	52	Rotary drilling, CSIR-NGRI	Aswakpur, Kanpur Nagar	March, 2020	
80.2831	26.3503	NW15	50	Rotary drilling, CSIR-NGRI	Jahanpur, Kanpur	March, 2020	
80.8480	25.9868	NW16	50	Rotary drilling, CSIR-NGRI	Hardaspur Sani, Fatehpur	March, 2020	
81.2402	25.7923	NW17	53	Rotary drilling, CSIR-NGRI	Hardaspur Sani, Fatehpur	March, 2020	
80.8137	26.0533	NW18	Did not drill, chosen other site (NW16) for better representation				
80.6930	25.9528	NW19	56	Rotary drilling, CSIR-NGRI	Aswa Tarapur, Fatehpur	March, 2020	
81.0951	25.5986	NW20	52	Rotary drilling, CSIR-NGRI	Maheshpur, Fatehpur	March, 2020	

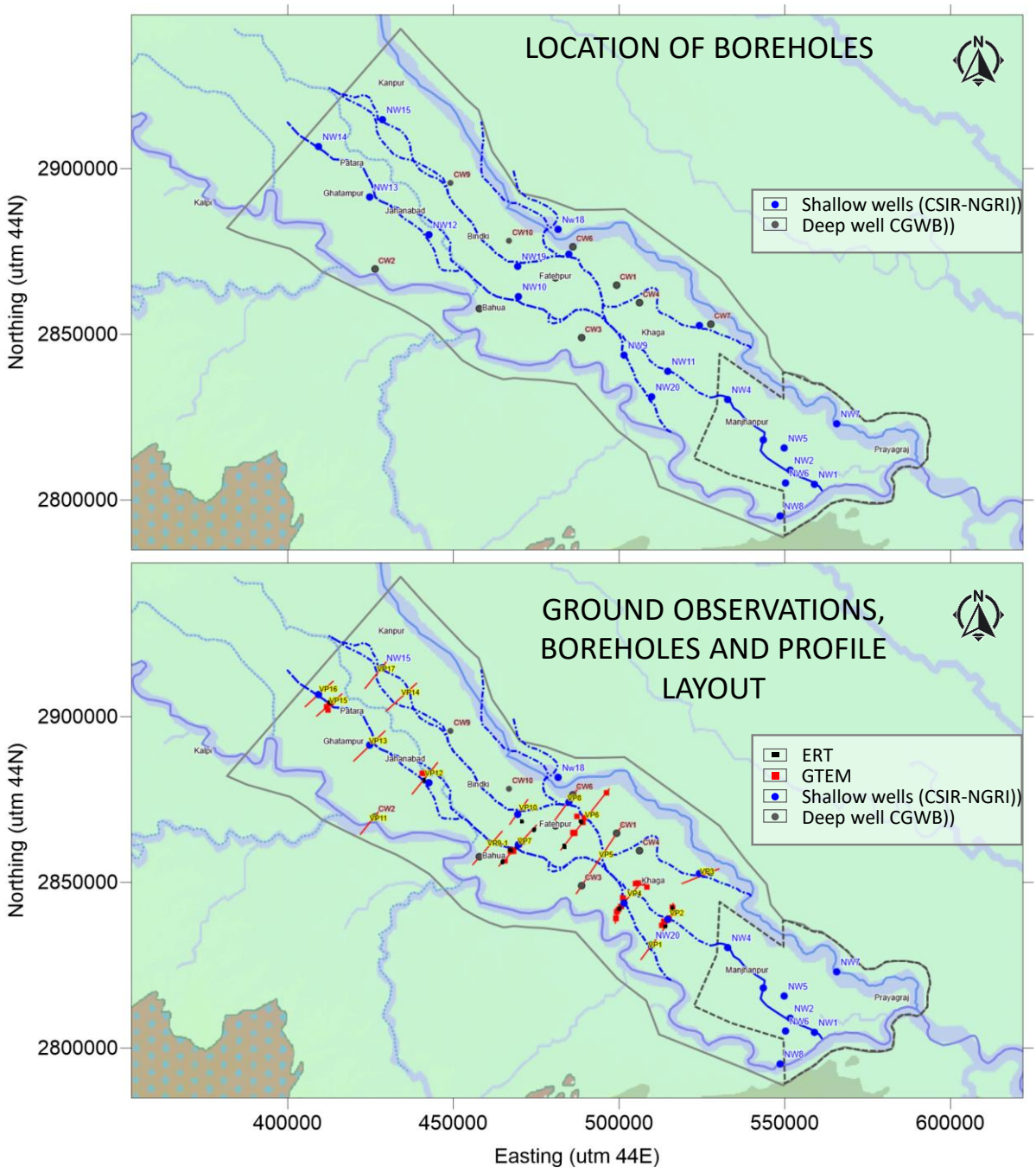


Figure 44. Location map of CGWB old wells, newly drilled shallow wells after AEM survey by CSIR-NGRI, and also recent core drilling wells (<50 m) Profile layout (VP1,…, VP17) for validation of AEM results by ERT, GTEM and borehole geophysical (N16, N64 & gamma) logs.

There are 17 cross sectional profiles named as VP1, VP2, …, VP17, created to provide resistivity with depth below ground surface. Hence, the top surface is shown at flat

level. Start of the profile is always from left (southern side i.e. pointing towards Yamuna River) to right (northern side pointing towards Ganga River).

The VP1 profile runs across the paleochannel near Shivpuri village. AEM resistivity and borehole (long normal N64) resistivity log are found in similar order at depths. The borehole logs also show additional thin (~2 m) resistive layer above the paleochannel separated by clay layer.

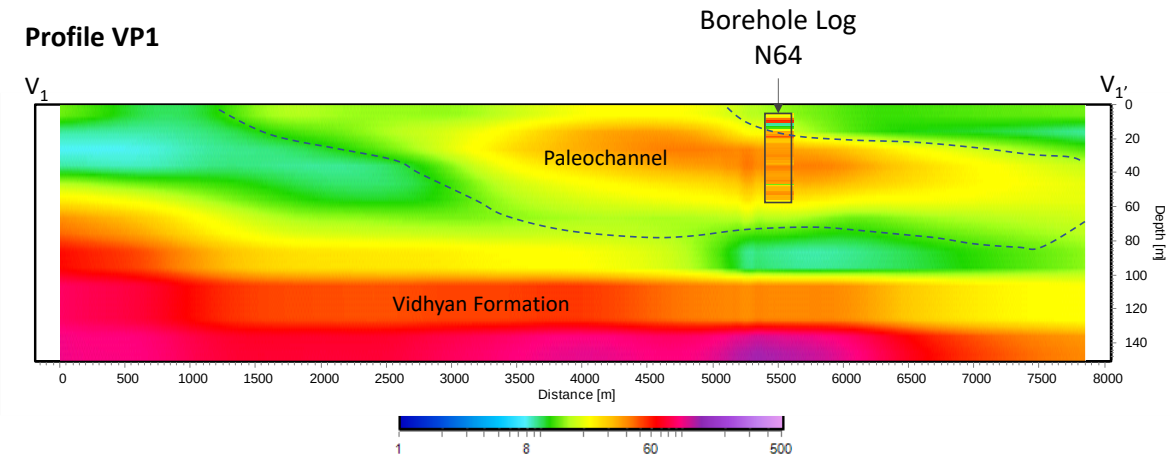


Figure 45. AEM resistivity along profile VP1 running across inferred paleochannel and its comparison with resistivity obtained by borehole geophysical (N64) resistivity logs.

Profile VP2 has associated ERT, GTEM and borehole electrical-log measurements. Comparative results are shown in figure 46. The pattern of resistivity with depth of ERT and GTEM follows similar pattern as of AEM at their common point. The GTEM resistivity has provided high resolution resistivity distribution with depth than the AEM derived resistivity. Such kind of differences are obvious due to changes in lateral / spatial averaging. AEM measurements are made with ~350 sq.m Tx loop using helicopter at speed of around 80 -100 km/h, where certain degree of lateral averaging is done to suppress the random noise and increase the signal. In contrast GTEM resistivity measurements are made with 40m x 40m Tx loop at one site in stationary positions. Thus, in case of laterally heterogeneous formation, such differences are obvious. The ERT data acquisition that inherently resolves resistive structure better than the EM, is made by sending current galvanically into the ground by means of two current electrodes. Therefore, difference in magnitude is an obvious expectation depending on ground conditions, degree of heterogeneity, etc. The GTEM resistivity bar model should not be consider below ~200 m depth for comparison purpose.

The ERT over paleochannel has shown relatively higher order of resistivity than the AEM, this could be caused due to different inherent sensitivity of the methodology to resistive body as well as spatial averaging. Borehole log normal (N64) resistivity has shown resistivity of paleochannel almost in matching order to the resistivity measured

by ERT survey. These results indicate that though difference between resistivity of paleochannel and its either side at shallow level might be reflected not very large, but there are significant differences in reality.

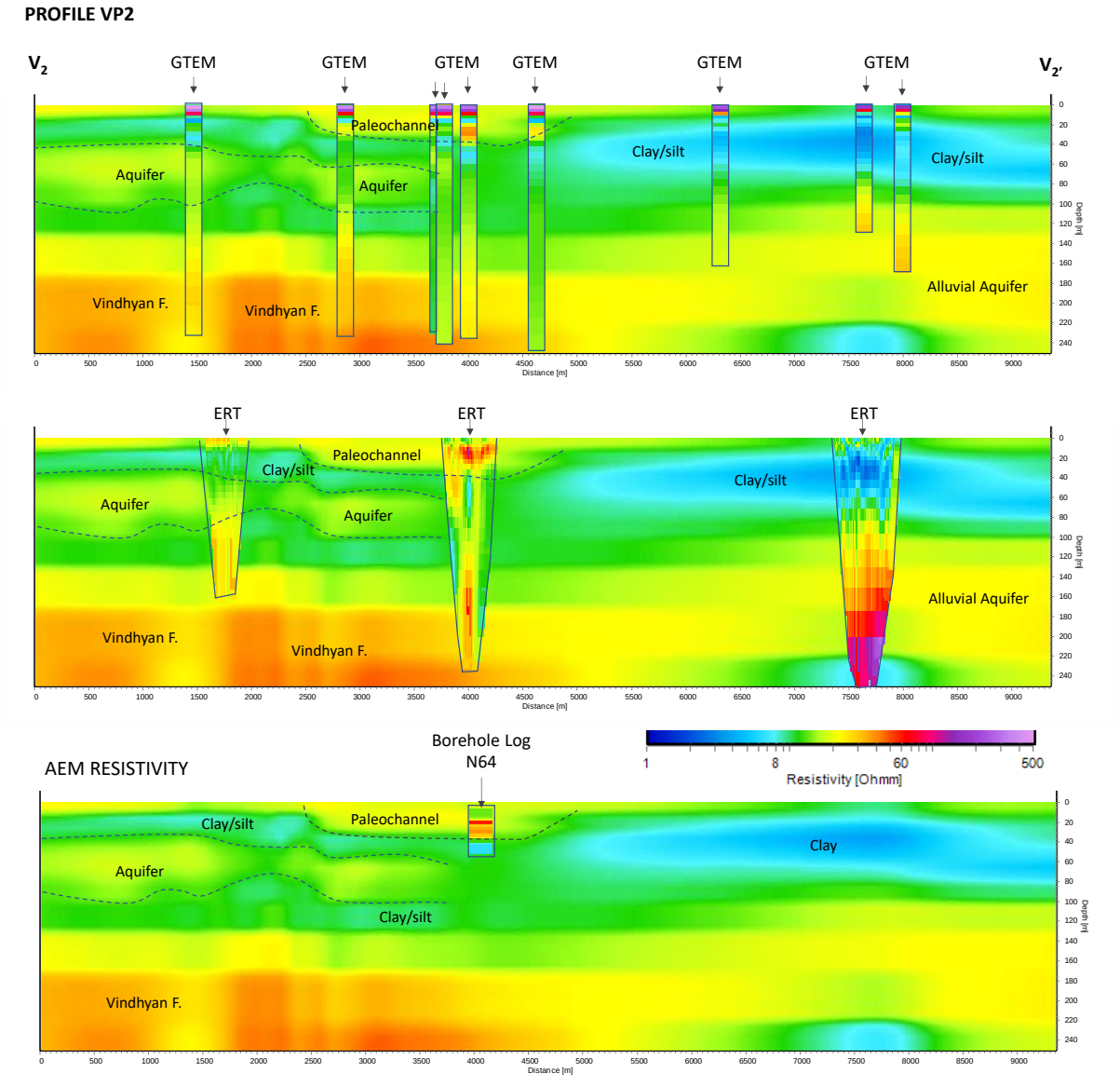


Figure 46. AEM resistivity along profile VP2 running across inferred paleochannel and its comparison with resistivity obtained by: GTEM (upper); ERT (Middle), and borehole geophysical (N64) logs.

The above understanding is further supported by other comparative studies along profiles viz., VP3, VP4, …, VP17 shown in figures 45- 54. The borehole resistivity logs are shown in bar model, where colour variations show changes in order of resistivity. Against the single resistive layer of inferred paleochannel along VP3, the borehole resistivity logs has shown two resistive layers separated by a thin conductive layer (Fig. 47). Besides this, conductive layers above and below the inferred paleochannel are found at the same depth level. The deep borehole at 9500 m profile distance also reveals multiple layering, where AEM provides dominant resistivity of multiple layering into a single average resistivity. Or in other words, the zone dominated by conductive

layers are represented by a single average conductive layer and vice versa. Thus zone down to 300-500 m depth are represented by 3-5 layers of resistive and conductive layers depending on the site specific settings.

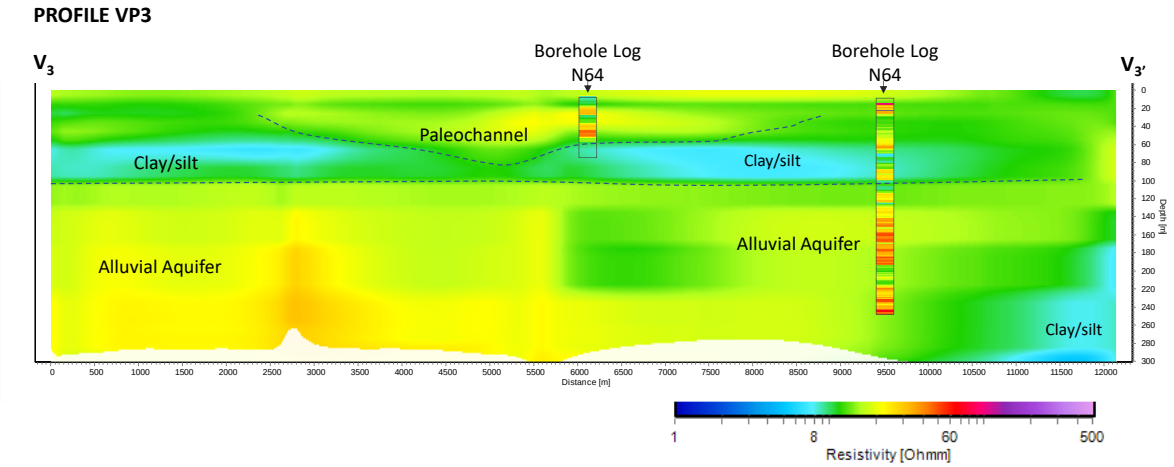


Figure 47. AEM resistivity along profile VP3 running across inferred paleochannel and its comparison with resistivity obtained by borehole geophysical (N64) logs.

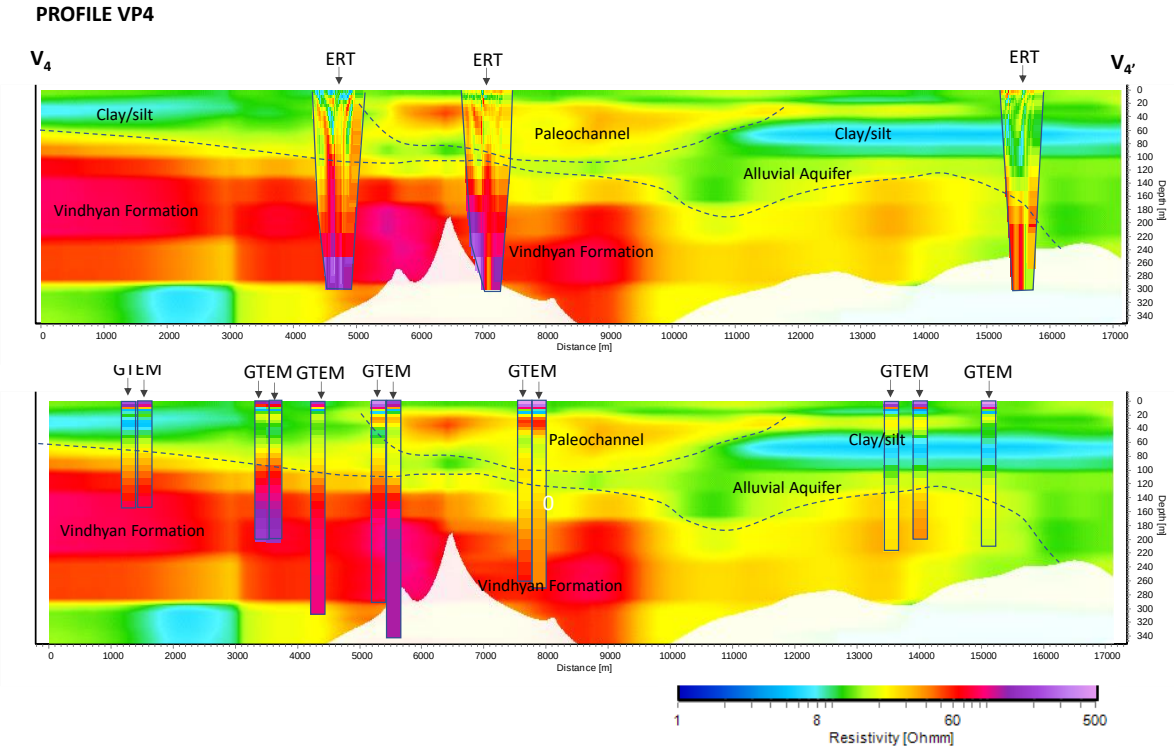


Figure 48. AEM resistivity along profile VP4 running across inferred paleochannel and its comparison with resistivity obtained by: ERT (upper) and GTEM investigations.

The VP5 profile shows excellent matching of resistivity measured by AEM and borehole long normal (N64) resistivity. Both the boreholes are on either sides of the

inferred paleochannel (Fig. 49). Similar results are also seen along profile CP6 (Fig. 50).

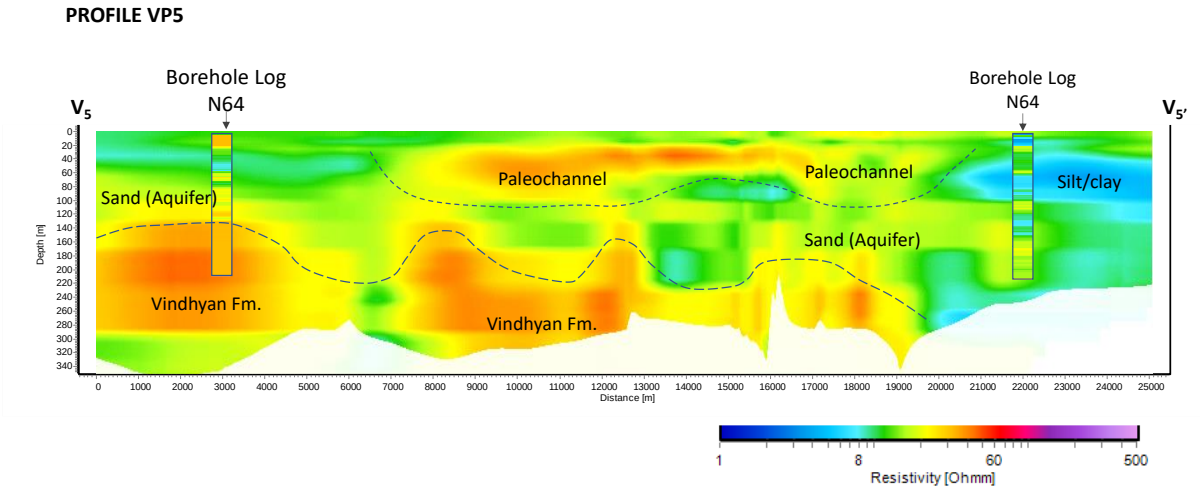


Figure 49. AEM resistivity along profile VP5 running across inferred paleochannel and its comparison with resistivity obtained by: ERT (upper) and GTEM investigations.

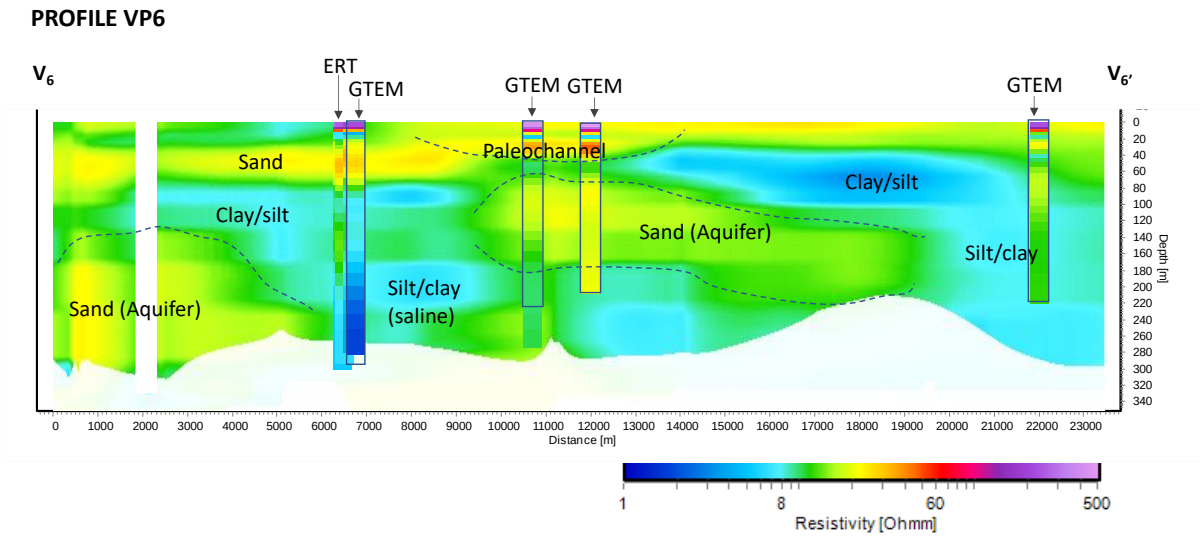


Figure 50. AEM resistivity along profile VP6 running across inferred paleochannel and its comparison with resistivity obtained by: ERT (upper) and GTEM investigations.

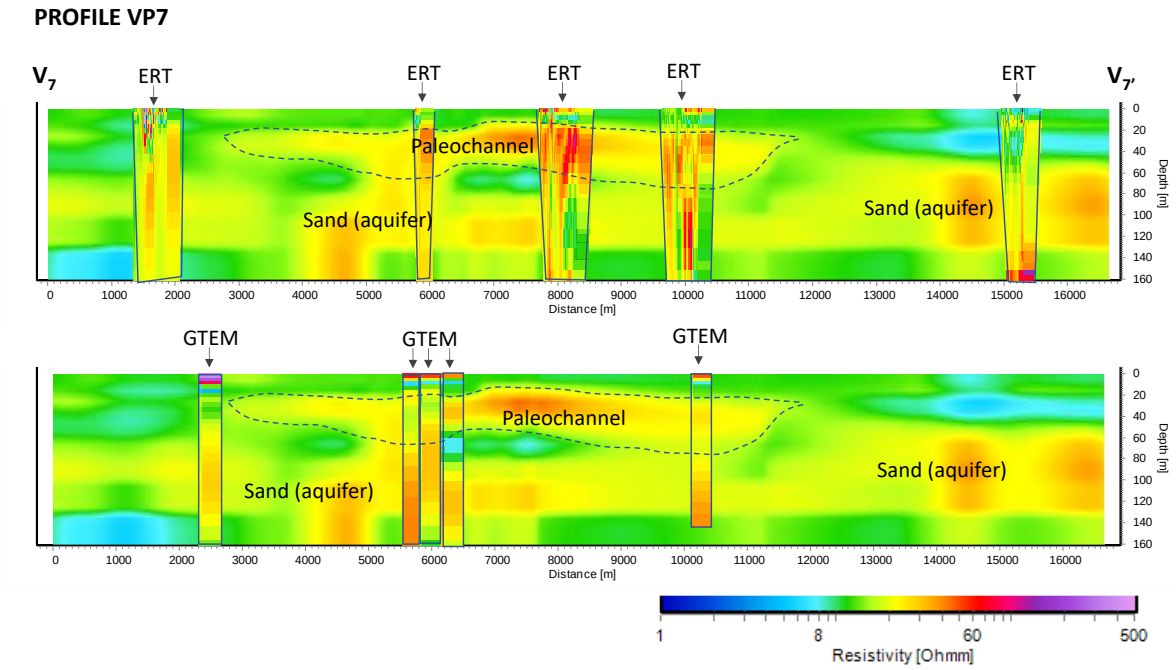


Figure 51. AEM resistivity along profile VP7 running across inferred paleochannel and its comparison with resistivity obtained by: ERT (upper) and GTEM investigations.

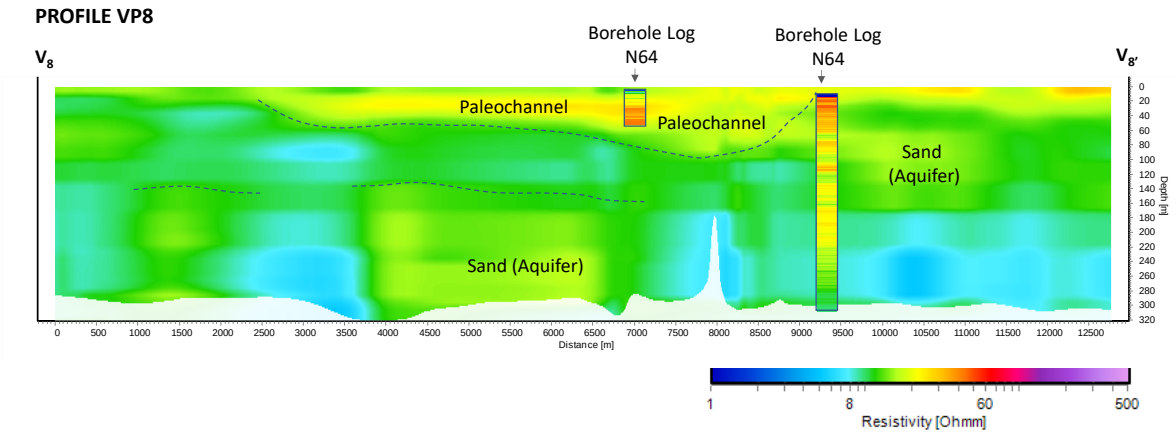


Figure 52. AEM resistivity along profile VP8 running across the inferred paleochannel and its comparison with resistivity obtained by: Borehole resistivity (long normal N64) logs.

Profile VP9 onward borehole resistivity are superimposed over AEM resistivity with resistivity depth curve. Along with resistivity (short normal N16 and long normal N64), natural gamma were also measured. In general, low gamma and high resistivity indicates sandy layer. In contrast high gamma and low resistivity is found over clay layer.

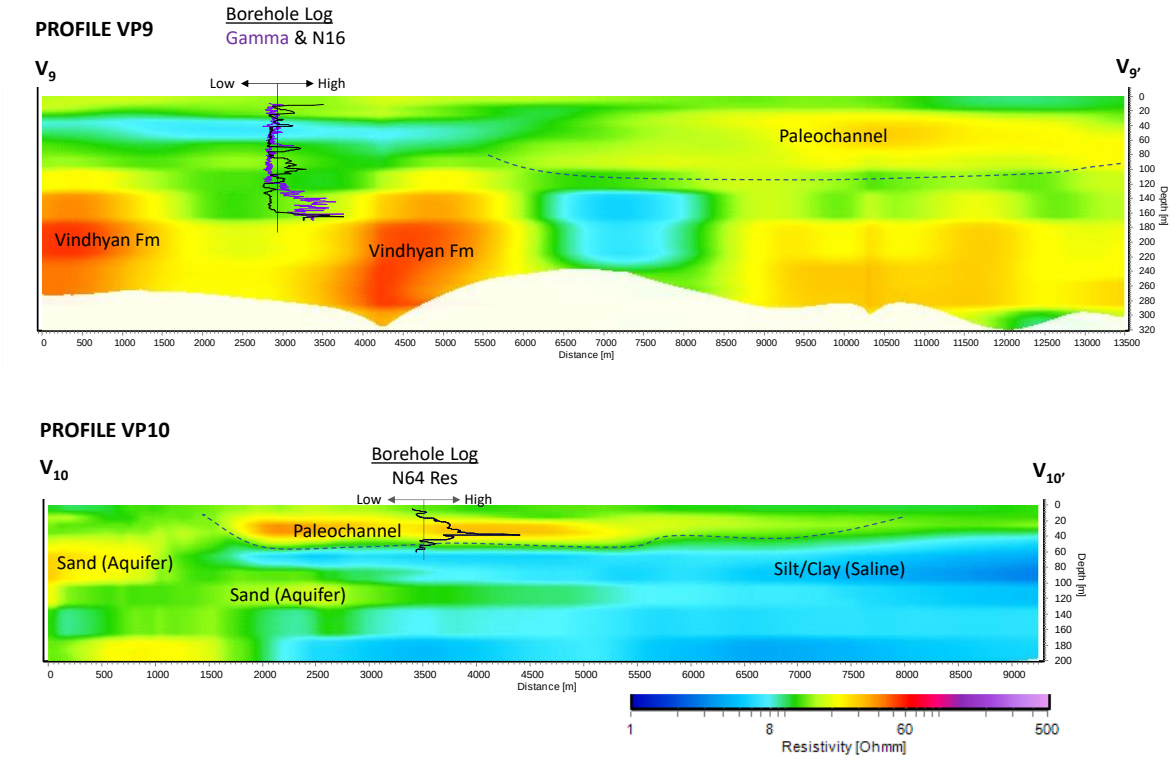


Figure 53. AEM resistivity along profile VP9 and VP10 running across the inferred paleochannel and its comparison with resistivity obtained by: Borehole resistivity (long normal N64 and Gamma) logs.

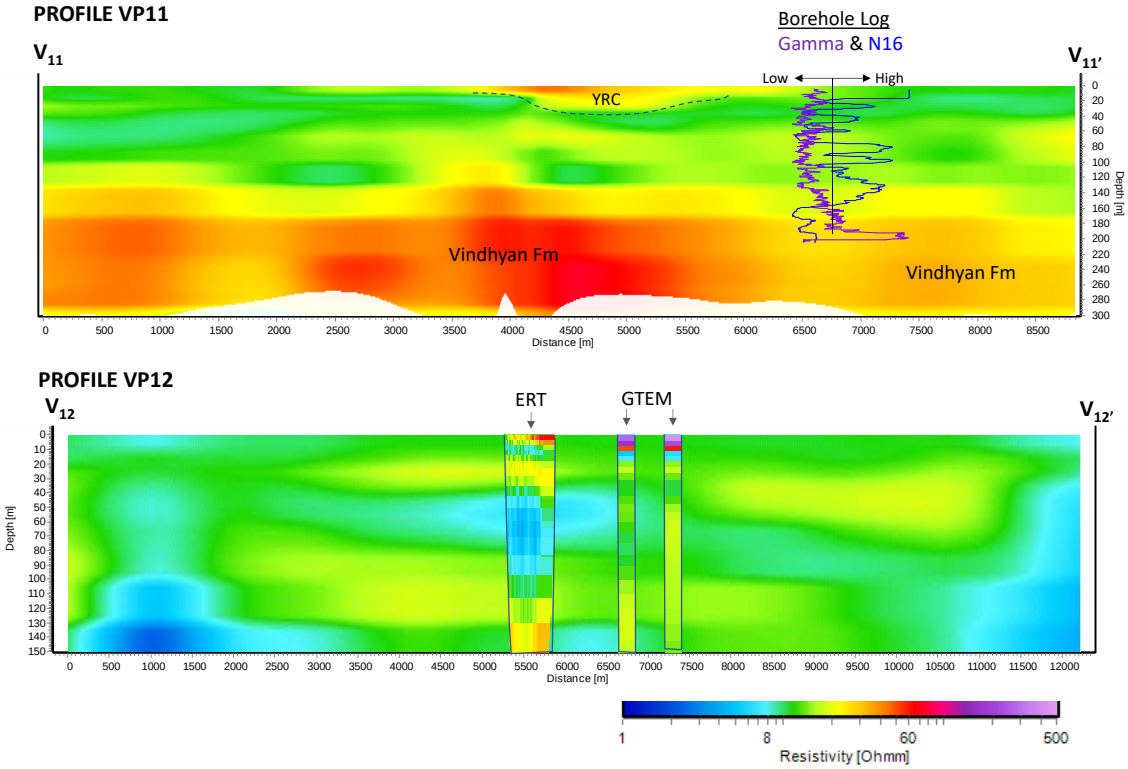


Figure 54. AEM resistivity along profile VP11 (upper) and VP12 (lower) running across the inferred paleochannel and its comparison with: Borehole resistivity (long normal N64 and Gamma) logs (upper) and ERT & GTEM investigations.

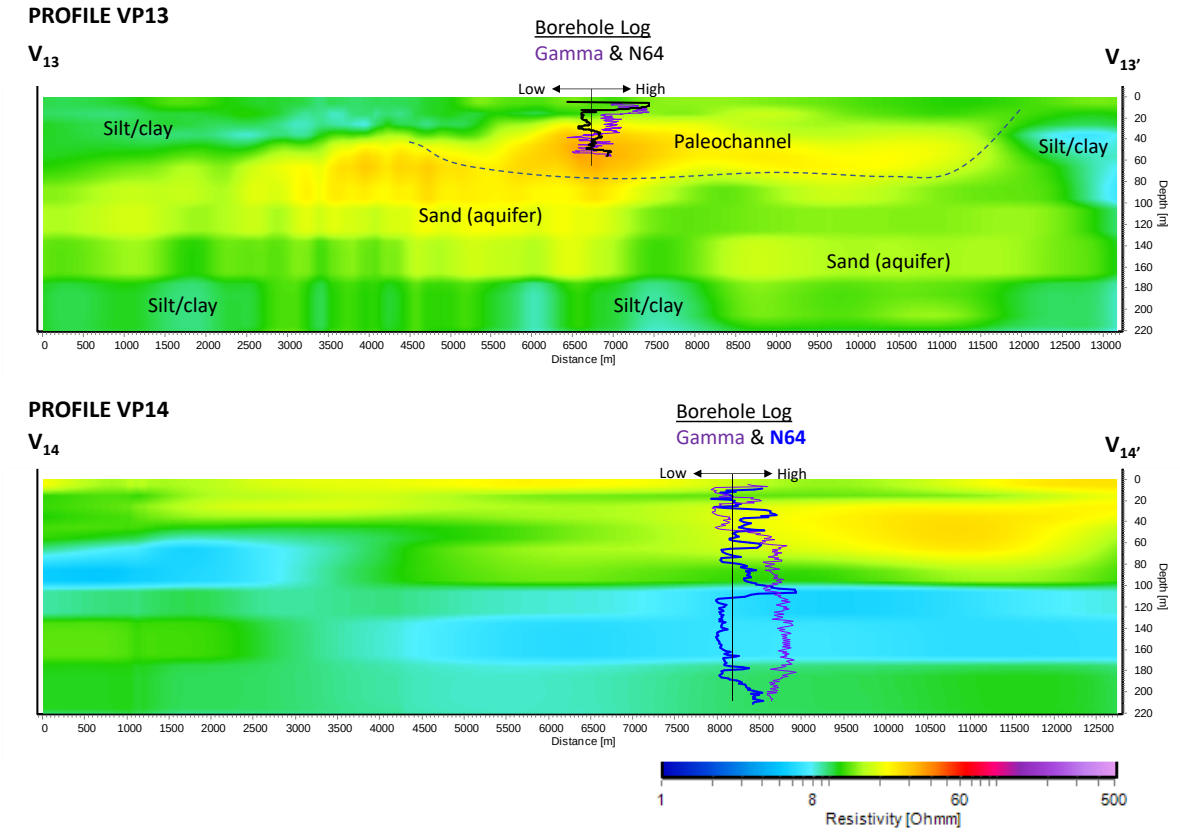


Figure 55. AEM resistivity along profile VP13 (upper) and VP14 running across the inferred paleochannel and its comparison with: Borehole resistivity (long normal N64 resistivity and Gamma) logs.

The profile VP14 shows text book example of opposite character of gamma and resistivity log. This comparison shows that it's not necessary the sand and clay layers are not always in clusters of multiple layers. There is around 80 m thick clayey layer revealed at 100-180 m depth, where high gamma and low resistivity are recorded (Fig. 55).

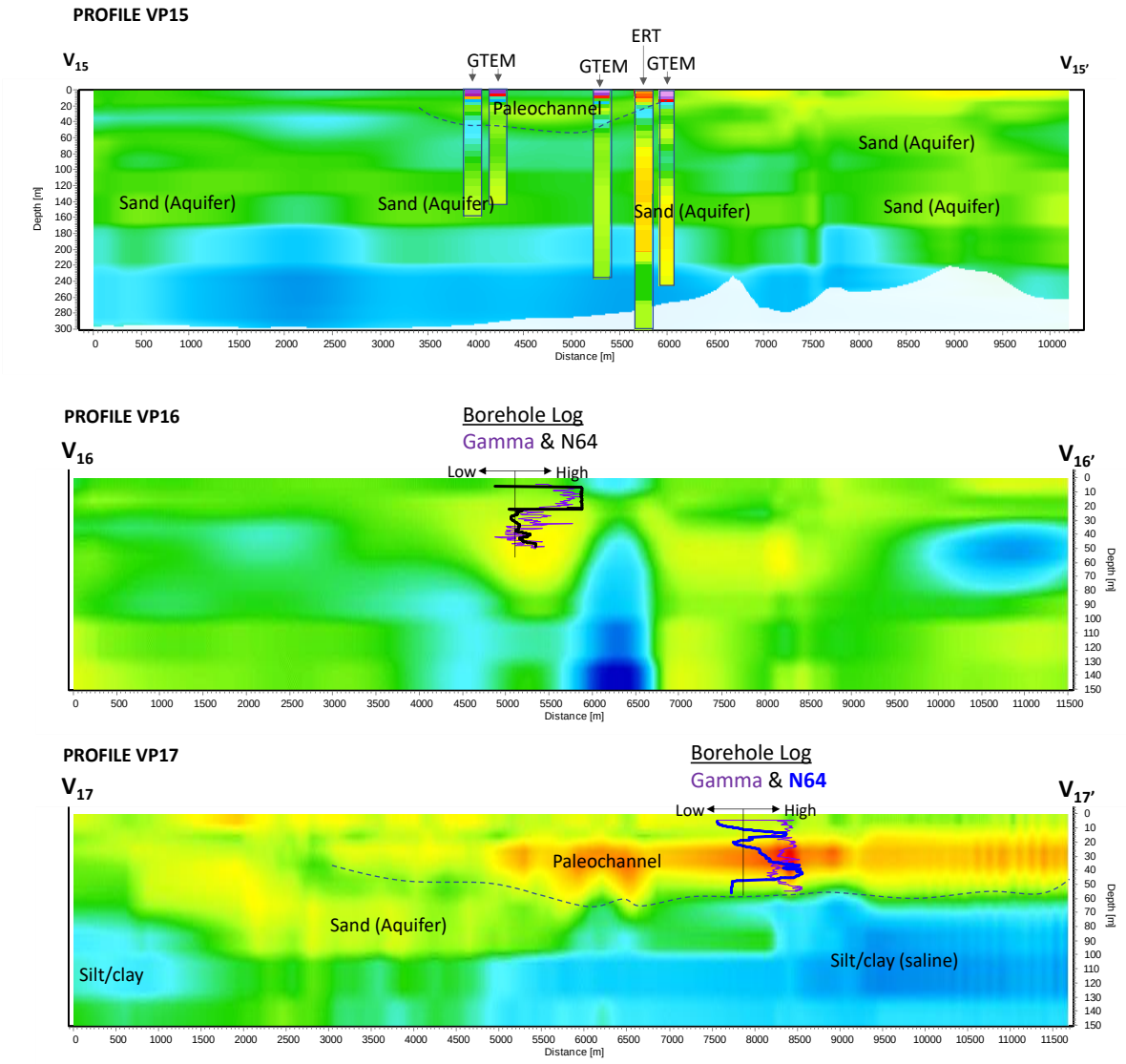


Figure 56. AEM resistivity along profile VP15 (upper), VP16 (middle) and VP17 running across the inferred paleochannel and its comparison with: GEM & ERT Resistivity, Borehole resistivity (long normal N64 resistivity and Gamma) logs.

Overall shallow drilling results have confirmed the presence of paleochannel inferred from AEM investigation. Sand and clay layers are often in clusters of multiple layers as well as considerably thick but fewer number of layers in Ganga Plains.

10. Locating sites suitable for development of a plan for Managed Aquifer Recharge

Various grid sections discussed in previous chapters are used to identify suitable MAR sites. Though, attempts have been made to select site which has sandy layers at the top surface also, it is not the always case. The MAR zone is digitized in a way the bottom of the MAR zone touches the top of the sandy layers in order to have efficient percolation MAR tank or pond as well as have hydrogeological connectivity with underlying aquifer system. Figure 57 depicts a demonstrative MAR zone, where tank bottom touches the resistive layer and has strong hydrogeological linkages with underlying aquifer system.

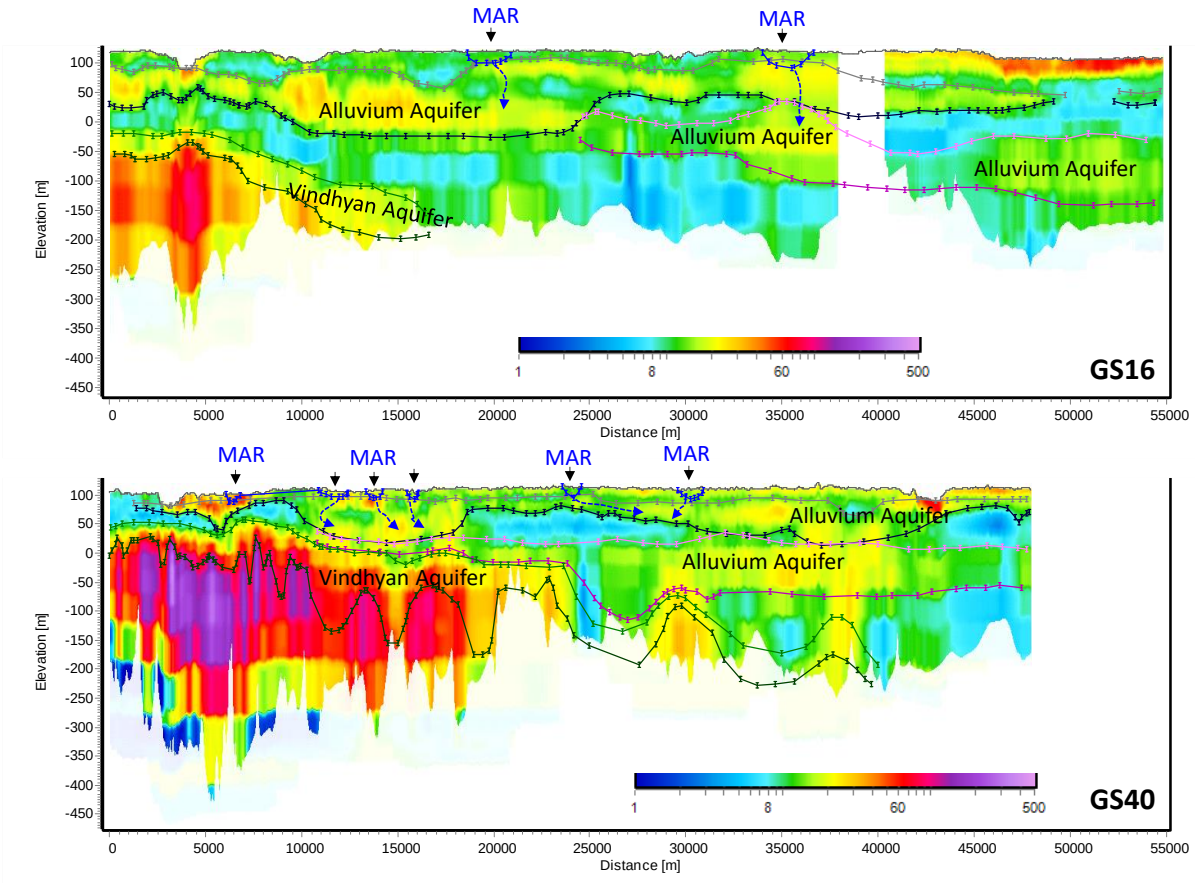


Figure 57. Demonstrative AEM section GS16 & GS40 showing MAR sites and its hydrogeological connectivity with underlying aquifer system.

Zone identified by MAR tank are presented over mean resistivity map of 0-10 m depth (Fug. 58). This information can be further used to develop management plan to enhance aquifer recharge. Enhancing groundwater recharge obviously rejuvenates the aquifer system, which will further help in rejuvenating the river systems, especially river tributaries that are not fed by glacial melt during summer.

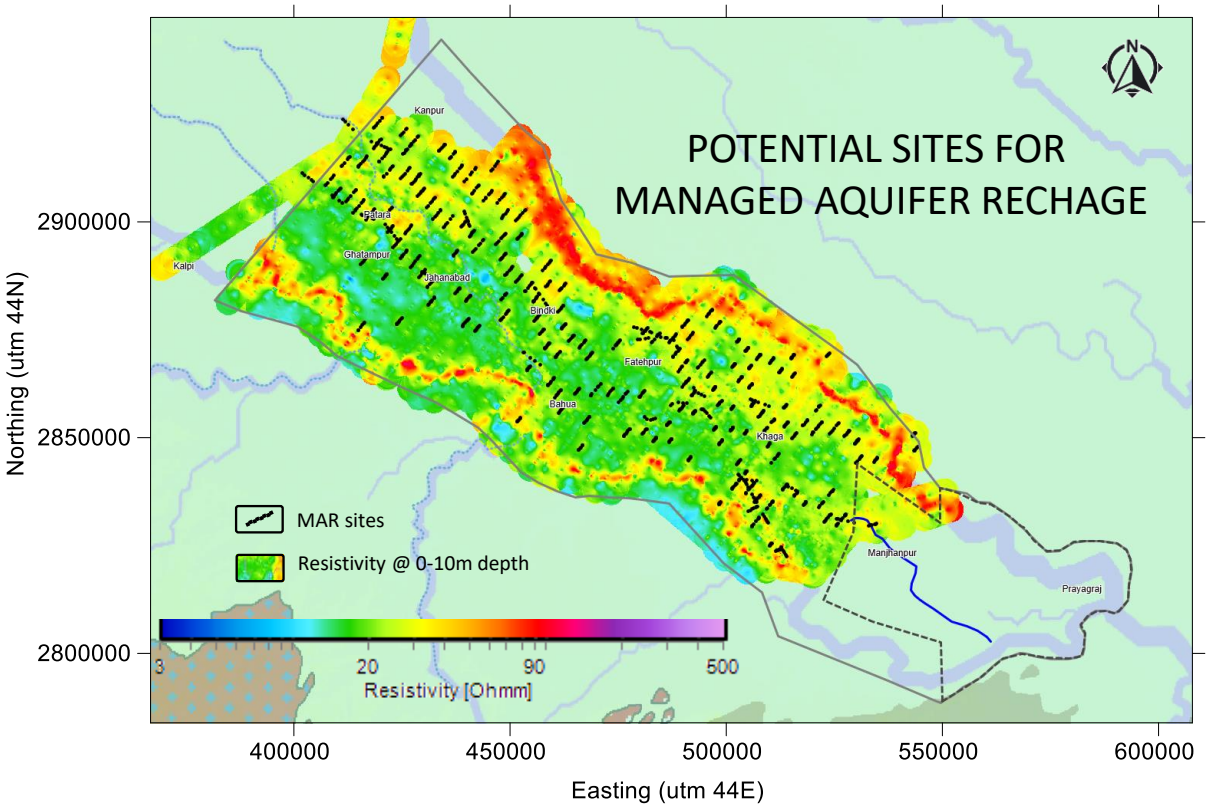


Figure 58. MAR sites digitized in clusters of points superimposed over mean resistivity map of 0-10 m depth. Each clusters with group of points indicates one site.

Table 4.

Longitude	Latitude	UTMX	UTMY	DEM	Elevation of MAR bottom surface (m, amsl)	Depth of MAR bottom surface (m)	MAR Site
81.11354	25.53385	511407.1	2824067	100.48	98.91	1.57	1
81.11565	25.53436	511619.3	2824124	96.75	89.57	7.18	
81.11917	25.53522	511972.9	2824220	94.77	84.90	9.87	
81.12058	25.53556	512114.3	2824258	91.25	84.90	6.35	

81.12445	25.53651	512503.2	2824363	92.97	90.50	2.47	
81.12656	25.53702	512715.4	2824420	92.86	92.86	0.00	
81.32624	25.58548	532763.1	2829820	104.42	103.58	0.84	2
81.33047	25.5865	533187.4	2829934	101.64	90.50	11.14	
81.33329	25.58718	533470.3	2830010	101.08	89.57	11.51	
81.34033	25.58889	534177.4	2830201	103.31	91.43	11.88	
81.34209	25.58931	534354.2	2830249	101.78	95.17	6.61	
81.34385	25.58974	534530.9	2830296	103.44	98.91	4.53	
81.05007	25.6165	505026.9	2833216	104.83	102.40	2.43	3
81.05429	25.61866	505451	2833455	100.83	98.04	2.79	
81.05817	25.62063	505839.7	2833674	100.90	97.50	3.40	
81.06239	25.62279	506263.8	2833912	110.03	96.95	13.08	
81.06697	25.62512	506723.1	2834171	108.78	100.77	8.01	
81.06838	25.62584	506864.5	2834251	112.35	103.49	8.86	
81.07014	25.62673	507041.2	2834350	108.55	105.67	2.88	
80.07134	26.29373	407291.9	2908546	127.83	123.71	4.12	4
80.07311	26.29565	407469.5	2908758	126.34	118.44	7.90	
80.07663	26.29949	407824.7	2909181	126.37	113.17	13.20	
80.08293	26.30636	408459	2909937	126.70	112.42	14.28	
80.08696	26.31075	408864.9	2910420	125.82	117.69	8.13	
80.08999	26.31404	409169.4	2910783	127.93	121.45	6.48	
80.10814	26.33381	410996.1	2912959	126.66	125.97	0.69	5
80.1099	26.33573	411173.7	2913171	128.65	117.69	10.96	
80.11444	26.34067	411630.3	2913715	127.97	110.91	17.06	
80.12226	26.34918	412416.8	2914652	129.61	110.91	18.70	
80.12428	26.35137	412619.8	2914893	126.92	115.43	11.49	
80.1268	26.35411	412873.5	2915196	126.41	125.21	1.20	
80.18206	26.4142	418429.7	2921815	129.66	128.22	1.44	6
80.18433	26.41667	418658	2922087	129.40	119.19	10.21	
80.18761	26.42024	418987.8	2922480	128.92	116.18	12.74	
80.19089	26.42381	419317.7	2922873	129.90	113.17	16.73	
80.1962	26.42956	419850.4	2923507	128.10	116.93	11.17	
80.20099	26.43478	420332.5	2924082	127.65	124.46	3.19	
80.20099	26.43478	420332.5	2924082	127.65	125.97	1.68	
80.08907	26.26917	409042.6	2905814	125.41	124.05	1.36	7
80.09163	26.27199	409300.6	2906124	127.55	104.65	22.90	
80.09466	26.27532	409605.4	2906491	125.69	104.65	21.04	
80.09675	26.27763	409816.5	2906745	125.73	106.89	18.84	
80.10118	26.2825	410262.1	2907282	125.93	110.62	15.31	
80.10514	26.28686	410660.8	2907762	124.72	118.08	6.64	
80.10607	26.28789	410754.6	2907874	124.10	123.30	0.80	
80.14662	26.33249	414835.2	2912787	124.60	124.60	0.00	8
80.14801	26.33402	414975.9	2912956	125.41	117.33	8.08	

80.14965	26.33582	415140.1	2913154	127.26	110.62	16.64	
80.15268	26.33915	415445	2913521	128.35	104.65	23.70	
80.15781	26.34479	415960.9	2914142	127.55	99.43	28.12	
80.1606	26.34786	416242.4	2914481	128.22	109.87	18.35	
80.16503	26.35273	416687.9	2915017	122.04	120.32	1.72	
80.16713	26.35504	416899	2915271	123.48	123.48	0.00	
80.18206	26.37144	418399.9	2917078	129.13	126.29	2.84	9
80.18439	26.374	418634.5	2917360	129.93	120.32	9.61	
80.18813	26.3781	419009.7	2917812	129.29	115.84	13.45	
80.19373	26.38425	419572.6	2918490	127.15	115.09	12.06	
80.19746	26.38835	419947.8	2918941	130.00	123.30	6.70	
80.20026	26.39142	420229.2	2919280	127.41	127.41	0.00	
80.11905	26.26042	412029.4	2904824	123.98	120.10	3.88	10
80.12279	26.26451	412405.9	2905274	124.71	112.66	12.05	
80.12559	26.26758	412688.3	2905612	125.89	110.43	15.46	
80.12957	26.27193	413088.4	2906091	122.23	111.17	11.06	
80.13728	26.28037	413864.9	2907021	125.31	112.66	12.65	
80.13985	26.28318	414123.8	2907330	124.67	118.61	6.06	
80.14149	26.28497	414288.5	2907528	124.22	123.82	0.40	
80.19506	26.34352	419677.4	2913977	126.50	121.59	4.91	11
80.19553	26.34403	419724.5	2914034	126.69	121.59	5.10	
80.20208	26.35118	420383.4	2914822	128.29	113.40	14.89	
80.20676	26.3563	420854	2915386	128.22	113.40	14.82	
80.21027	26.36013	421207	2915808	126.00	117.12	8.88	
80.21332	26.36345	421512.9	2916174	126.67	123.82	2.85	
80.21519	26.3655	421701.2	2916400	125.41	125.41	0.00	
80.24517	26.39821	424713.3	2920005	126.48	126.05	0.43	12
80.24821	26.40153	425019.3	2920371	125.98	119.35	6.63	
80.25243	26.40613	425442.8	2920878	127.78	115.63	12.15	
80.25735	26.4115	425937	2921469	126.62	119.35	7.27	
80.25946	26.4138	426148.8	2921723	126.86	126.79	0.07	
80.13583	26.2372	413687.8	2902241	125.56	122.33	3.23	13
80.14006	26.24176	414114	2902742	127.60	111.92	15.68	
80.14123	26.24302	414232.4	2902882	127.07	110.43	16.64	
80.145	26.24707	414611.3	2903328	129.90	107.45	22.45	
80.14923	26.25163	415037.5	2903829	128.41	108.20	20.21	
80.15417	26.25694	415534.8	2904415	126.39	112.66	13.73	
80.1577	26.26073	415890	2904833	128.96	117.12	11.84	
80.16006	26.26326	416126.8	2905111	129.59	122.33	7.26	
80.20525	26.31184	420673.2	2910463	124.97	118.61	6.36	14
80.20643	26.3131	420791.6	2910602	124.79	114.15	10.64	
80.21232	26.31943	421383.5	2911299	122.76	105.96	16.80	
80.21938	26.32701	422093.9	2912135	125.17	105.22	19.95	

80.22245	26.3303	422401.8	2912497	125.50	113.40	12.10	
80.22527	26.33334	422685.9	2912832	126.30	124.56	1.74	
80.22645	26.3346	422804.3	2912971	126.37	126.37	0.00	
80.25025	26.36015	425195.9	2915786	128.36	125.31	3.05	
80.25284	26.36293	425456.4	2916093	125.40	122.33	3.07	
80.25662	26.36697	425835.2	2916539	125.90	111.17	14.73	
80.25803	26.36849	425977.3	2916706	127.27	106.71	20.56	
80.26039	26.37102	426214.1	2916984	125.26	106.71	18.55	
80.26605	26.37709	426782.4	2917653	124.45	108.20	16.25	
80.26746	26.3786	426924.5	2917821	123.30	111.92	11.38	
80.26888	26.38012	427066.6	2917988	123.25	117.87	5.38	
80.26982	26.38113	427161.3	2918099	124.98	121.59	3.39	
80.27477	26.38644	427658.5	2918685	125.51	123.07	2.44	15
80.27784	26.38973	427966.4	2919047	124.42	113.40	11.02	
80.2842	26.39656	428605.7	2919799	124.99	113.40	11.59	
80.28585	26.39833	428771.4	2919995	122.51	122.51	0.00	
80.16576	26.22315	416667.4	2900664	126.16	123.71	2.45	16
80.16759	26.22513	416852.2	2900883	126.69	116.18	10.51	
80.17333	26.23134	417429.4	2901567	126.50	107.90	18.60	
80.17631	26.23457	417729.6	2901923	126.65	107.90	18.75	
80.17929	26.2378	418029.8	2902278	126.88	108.65	18.23	
80.18434	26.24326	418537.8	2902880	126.98	118.44	8.54	
80.18595	26.245	418699.4	2903072	123.54	121.45	2.09	
80.24518	26.30905	424656.8	2910130	125.97	114.67	11.30	17
80.2484	26.31252	424980.1	2910513	124.25	105.64	18.61	
80.25138	26.31575	425280.3	2910868	127.68	101.12	26.56	
80.25506	26.31972	425649.7	2911306	125.32	101.12	24.20	
80.26057	26.32568	426203.9	2911962	125.16	103.38	21.78	
80.26471	26.33014	426619.6	2912455	126.07	116.18	9.89	
80.26609	26.33163	426758.1	2912619	124.14	120.70	3.44	
80.20742	26.22783	420832.8	2901157	125.84	125.84	0.00	18
80.20834	26.22883	420925.1	2901268	125.84	123.67	2.17	
80.21201	26.23286	421294.3	2901711	126.47	119.14	7.33	
80.21568	26.23688	421663.5	2902155	127.68	113.86	13.82	
80.22141	26.24317	422240.4	2902848	128.41	115.37	13.04	
80.22462	26.2467	422563.5	2903236	125.60	119.90	5.70	
80.22669	26.24896	422771.2	2903486	123.27	123.27	0.00	
80.27098	26.2975	427225.1	2908836	126.37	121.41	4.96	19
80.27121	26.29775	427248.2	2908864	126.96	120.65	6.31	
80.27466	26.30152	427594.3	2909280	129.27	113.10	16.17	
80.2781	26.3053	427940.5	2909696	125.37	110.08	15.29	
80.28108	26.30857	428240.5	2910056	124.18	110.84	13.34	
80.28476	26.31259	428609.7	2910500	125.11	112.35	12.76	

80.28706	26.3151	428840.5	2910777	125.38	119.90	5.48	
80.28866	26.31686	429002.1	2910971	124.33	124.43	-0.10	
80.28981	26.31812	429117.4	2911109	123.72	123.72	0.00	
80.2905	26.31888	429186.7	2911193	123.61	123.61	0.00	
80.33439	26.3669	433594.4	2916488	126.10	118.39	7.71	20
80.33439	26.3669	433594.4	2916488	126.10	117.63	8.47	
80.33738	26.37016	433894.4	2916848	124.46	113.10	11.36	
80.34082	26.37393	434240.6	2917264	124.82	112.35	12.47	
80.34381	26.3772	434540.6	2917624	125.61	116.12	9.49	
80.34634	26.37997	434794.4	2917929	125.36	120.65	4.71	
80.34703	26.38072	434863.6	2918013	126.08	122.16	3.92	
80.15485	26.12988	415510.2	2890342	125.67	119.96	5.71	21
80.15765	26.13295	415793.2	2890680	124.72	112.43	12.29	
80.1607	26.13627	416099.8	2891046	125.63	107.16	18.47	
80.16327	26.13908	416359.2	2891356	127.50	107.91	19.59	
80.16514	26.14113	416547.9	2891581	127.08	113.93	13.15	
80.16795	26.1442	416830.9	2891919	126.93	122.21	4.72	
80.16819	26.14445	416854.4	2891947	127.20	123.72	3.48	
80.21573	26.19631	421641.8	2897661	123.47	122.21	1.26	22
80.21878	26.19963	421948.3	2898027	121.83	114.69	7.14	
80.223	26.20423	422372.8	2898534	122.35	113.18	9.17	
80.22393	26.20525	422467.2	2898647	119.61	114.69	4.92	
80.22675	26.20832	422750.2	2898984	126.67	119.20	7.47	
80.22886	26.21062	422962.4	2899238	125.27	124.47	0.80	
80.28513	26.27191	428622.3	2905994	126.58	119.20	7.38	23
80.28818	26.27523	428928.9	2906360	125.25	112.43	12.82	
80.29194	26.27931	429306.2	2906810	124.63	105.65	18.98	
80.29405	26.28161	429518.5	2907063	126.50	105.65	20.85	
80.29616	26.28391	429730.7	2907317	125.61	109.42	16.19	
80.29945	26.28748	430060.9	2907711	125.29	115.44	9.85	
80.30086	26.28901	430202.4	2907880	123.27	119.20	4.07	
80.35862	26.35181	436003.8	2914805	123.40	119.96	3.44	24
80.3605	26.35385	436192.4	2915030	123.72	114.69	9.03	
80.36191	26.35538	436333.9	2915199	123.62	113.18	10.44	
80.36708	26.361	436852.8	2915818	124.06	113.18	10.88	
80.3706	26.36482	437206.5	2916240	124.71	115.44	9.27	
80.37154	26.36584	437300.8	2916353	123.24	121.46	1.78	
80.22878	26.16497	422924.8	2894183	124.11	115.99	8.12	25
80.23224	26.16873	423273.4	2894596	121.02	106.98	14.04	
80.23478	26.17148	423529	2894900	121.71	106.98	14.73	
80.23917	26.17623	423970.5	2895424	124.06	108.48	15.58	
80.24286	26.18024	424342.3	2895865	127.62	112.99	14.63	
80.24564	26.18324	424621.2	2896196	124.60	118.99	5.61	

80.25626	26.19475	425690.1	2897464	123.85	121.99	1.86	26
80.25857	26.19725	425922.5	2897740	124.13	116.74	7.39	
80.26157	26.2005	426224.6	2898099	125.14	110.73	14.41	
80.26527	26.20451	426596.4	2898540	126.70	110.73	15.97	
80.26873	26.20826	426945	2898953	125.74	114.49	11.25	
80.27128	26.21101	427200.6	2899257	125.49	120.49	5.00	
80.30618	26.24878	430709.5	2903421	122.92	118.24	4.68	27
80.30918	26.25203	431011.6	2903779	123.86	107.73	16.13	
80.31496	26.25829	431592.6	2904469	124.22	101.73	22.49	
80.3182	26.26179	431917.9	2904855	125.59	102.48	23.11	
80.32236	26.26629	432336.2	2905351	126.84	109.98	16.86	
80.32421	26.26829	432522.1	2905572	124.13	116.74	7.39	
80.32537	26.26954	432638.3	2905710	124.14	121.24	2.90	
80.36516	26.31255	436635.2	2910453	122.14	122.14	0.00	28
80.36933	26.31705	437053.5	2910949	122.01	112.99	9.02	
80.37118	26.31905	437239.4	2911170	124.17	110.73	13.44	
80.37674	26.32505	437797.1	2911832	120.10	106.23	13.87	
80.38183	26.33055	438308.3	2912438	119.69	103.98	15.71	
80.3853	26.3343	438656.9	2912852	121.57	108.48	13.09	
80.38739	26.33655	438866.1	2913100	123.23	114.49	8.74	
80.38785	26.33705	438912.5	2913155	123.39	116.74	6.65	
80.20548	26.09863	420551.3	2886849	123.35	122.54	0.81	29
80.20771	26.10107	420776.3	2887118	121.99	111.35	10.64	
80.21079	26.10444	421085.8	2887489	123.93	109.86	14.07	
80.2119	26.10566	421198.3	2887624	124.81	109.86	14.95	
80.21358	26.1075	421367.1	2887827	123.40	113.59	9.81	
80.21442	26.10842	421451.4	2887928	122.89	117.32	5.57	
80.2147	26.10872	421479.6	2887961	122.63	118.81	3.82	
80.2457	26.14269	424602	2891704	122.04	122.04	0.00	30
80.24934	26.14666	424967.7	2892143	123.22	105.38	17.84	
80.24962	26.14697	424995.8	2892177	123.02	105.38	17.64	
80.25353	26.15125	425389.6	2892649	120.88	105.38	15.50	
80.258	26.15615	425839.7	2893188	122.65	105.38	17.27	
80.25996	26.15829	426036.6	2893424	119.36	109.11	10.25	
80.26108	26.15951	426149.1	2893559	121.31	112.84	8.47	
80.32065	26.22466	432140.8	2900742	123.40	121.05	2.35	31
80.3254	26.22986	432619	2901315	121.05	106.87	14.18	
80.32848	26.23322	432928.5	2901686	120.88	106.87	14.01	
80.33324	26.23842	433406.7	2902259	122.74	108.36	14.38	
80.33716	26.2427	433800.5	2902731	123.81	115.82	7.99	
80.33828	26.24393	433913	2902866	124.25	121.05	3.20	
80.39261	26.30323	439370.2	2909408	124.98	121.79	3.19	32
80.3971	26.30813	439820.3	2909948	125.72	114.33	11.39	

80.40606	26.3179	440720.4	2911027	123.54	110.60	12.94	
80.41083	26.3231	441198.7	2911600	123.34	110.60	12.74	
80.41671	26.32952	441789.4	2912308	124.87	115.82	9.05	
80.4198	26.33288	442098.8	2912679	125.59	124.03	1.56	
80.14909	25.99204	414835.6	2875080	120.58	118.61	1.97	33
80.14909	25.99204	414835.6	2875080	120.58	114.95	5.63	
80.15494	25.99848	415425.5	2875789	117.71	93.03	24.68	
80.1594	26.00338	415874.9	2876329	116.50	95.47	21.03	
80.1619	26.00614	416127.8	2876633	120.11	108.86	11.25	
80.16413	26.00859	416352.5	2876903	123.02	117.39	5.63	
80.26952	26.12436	426971	2889662	125.73	121.04	4.69	34
80.27231	26.12743	427251.9	2889999	123.60	108.86	14.74	
80.27594	26.13141	427617.1	2890438	124.45	100.34	24.11	
80.28068	26.13661	428094.7	2891012	121.85	96.69	25.16	
80.28487	26.1412	428516	2891518	123.56	102.78	20.78	
80.28766	26.14427	428796.9	2891856	123.07	113.73	9.34	
80.29129	26.14825	429162.1	2892294	122.12	122.12	0.00	
80.34548	26.20763	434611.8	2898843	122.24	122.24	0.00	35
80.34688	26.20916	434752.3	2899011	124.22	116.26	7.96	
80.35107	26.21375	435173.7	2899518	123.02	100.39	22.63	
80.35359	26.2165	435426.5	2899821	122.65	97.95	24.70	
80.36085	26.22446	436156.9	2900699	122.69	100.39	22.30	
80.36672	26.23088	436746.8	2901408	124.07	116.26	7.81	
80.41036	26.27861	441129	2906673	123.02	119.92	3.10	36
80.41175	26.28014	441269.5	2906842	124.29	107.71	16.58	
80.41539	26.28412	441634.7	2907281	123.75	97.95	25.80	
80.42127	26.29055	442224.6	2907990	122.93	97.95	24.98	
80.42435	26.29391	442533.6	2908361	125.14	105.27	19.87	
80.42659	26.29636	442758.3	2908631	123.08	118.70	4.38	
80.45402	26.32633	445511.3	2911939	122.93	122.36	0.57	37
80.45738	26.33	445848.4	2912344	124.41	104.05	20.36	
80.46327	26.33642	446438.3	2913053	124.58	95.50	29.08	
80.46691	26.3404	446803.5	2913492	124.11	100.39	23.72	
80.47111	26.34499	447224.8	2913998	121.29	113.82	7.47	
80.28864	26.10232	428869.8	2887210	125.94	120.29	5.65	38
80.29281	26.10684	429289	2887708	123.32	110.54	12.78	
80.29642	26.11076	429652.2	2888140	122.83	106.64	16.19	
80.29836	26.11287	429847.8	2888373	121.56	108.59	12.97	
80.30142	26.11619	430155.2	2888739	122.89	115.42	7.47	
80.30364	26.1186	430378.8	2889005	121.34	119.32	2.02	
80.38674	26.20872	438734.1	2898943	120.88	120.88	0.00	39
80.38841	26.21052	438901.8	2899143	122.12	109.56	12.56	
80.38952	26.21173	439013.6	2899276	123.04	105.66	17.38	

80.39174	26.21414	439237.1	2899541	124.21	103.71	20.50	
80.39564	26.21836	439628.4	2900007	122.07	102.73	19.34	
80.39703	26.21986	439768.1	2900173	122.07	106.64	15.43	
80.40065	26.22378	440131.4	2900605	121.35	120.29	1.06	
80.43794	26.26415	443875.9	2905059	120.74	120.74	0.00	40
80.44211	26.26867	444295.1	2905558	123.96	99.81	24.15	
80.44295	26.26957	444378.9	2905657	124.13	99.81	24.32	
80.44963	26.2768	445049.6	2906455	121.10	99.81	21.29	
80.4513	26.27861	445217.2	2906655	123.31	102.73	20.58	
80.45409	26.28162	445496.7	2906987	123.69	114.44	9.25	
80.45659	26.28433	445748.2	2907286	122.08	122.08	0.00	
80.23821	26.0055	423764.2	2876516	111.61	111.61	0.00	41
80.23821	26.0055	423764.2	2876516	111.61	99.95	11.66	
80.23958	26.00701	423902.1	2876682	112.66	93.87	18.79	
80.24122	26.00882	424067.7	2876881	116.26	91.44	24.82	
80.24287	26.01063	424233.3	2877080	113.58	91.44	22.14	
80.24451	26.01243	424398.8	2877280	107.15	93.87	13.28	
80.24807	26.01635	424757.5	2877711	115.01	101.17	13.84	
80.24998	26.01846	424950.6	2877944	116.30	108.47	7.83	
80.30861	26.08294	430855.4	2885052	122.89	119.29	3.60	42
80.30944	26.08384	430938.2	2885152	122.17	114.44	7.73	
80.31382	26.08866	431379.7	2885683	118.52	102.31	16.21	
80.31739	26.09257	431738.3	2886115	118.95	101.10	17.85	
80.3204	26.09589	432041.9	2886480	119.26	107.16	12.10	
80.32287	26.0986	432290.2	2886779	120.13	114.44	5.69	
80.32452	26.10041	432455.8	2886979	120.65	119.29	1.36	
80.36841	26.14859	436870.5	2892293	120.16	113.23	6.93	43
80.36896	26.14919	436925.7	2892359	116.48	99.88	16.60	
80.37225	26.15281	437256.8	2892758	117.85	92.61	25.24	
80.37499	26.15582	437532.8	2893090	120.79	97.46	23.33	
80.37637	26.15732	437670.7	2893256	121.71	113.23	8.48	
80.37774	26.15883	437808.7	2893422	122.07	122.07	0.00	
80.40519	26.18894	440567.9	2896744	121.96	118.20	3.76	44
80.40684	26.19074	440733.4	2896943	119.71	113.33	6.38	
80.40849	26.19255	440899	2897142	119.53	104.82	14.71	
80.41151	26.19586	441202.5	2897508	117.39	103.60	13.79	
80.41343	26.19797	441395.7	2897740	121.52	104.82	16.70	
80.41453	26.19917	441506	2897873	121.52	112.12	9.40	
80.41618	26.20098	441671.6	2898072	117.90	117.90	0.00	
80.46949	26.25937	447024.5	2904516	121.40	120.63	0.77	45
80.47472	26.26509	447548.8	2905147	122.34	102.39	19.95	
80.48021	26.2711	448100.6	2905812	122.56	95.09	27.47	
80.48296	26.27411	448376.5	2906144	122.22	99.95	22.27	

80.48489	26.27622	448569.7	2906376	120.89	110.90	9.99	
80.48626	26.27772	448707.6	2906542	122.72	121.85	0.87	
80.31036	26.04492	431007.3	2880841	118.72	117.15	1.57	46
80.31301	26.0478	431274.7	2881158	116.87	110.52	6.35	
80.3162	26.05125	431595.6	2881539	119.43	109.04	10.39	
80.31726	26.0524	431702.6	2881666	118.49	109.04	9.45	
80.31992	26.05528	431970	2881983	120.98	109.78	11.20	
80.32417	26.05988	432397.9	2882490	123.21	117.15	6.06	
80.3255	26.06132	432531.6	2882649	122.09	121.58	0.51	
80.41352	26.15648	441383.3	2893145	121.70	121.58	0.12	47
80.41644	26.15964	441677.5	2893494	121.99	110.52	11.47	
80.41937	26.1628	441971.6	2893843	123.88	106.83	17.05	
80.42629	26.17027	442666.9	2894668	121.07	101.67	19.40	
80.43002	26.1743	443041.3	2895112	120.95	106.83	14.12	
80.43534	26.18004	443576.2	2895746	120.95	114.94	6.01	
80.43694	26.18177	443736.6	2895936	119.42	119.37	0.05	
80.47929	26.22746	447988.7	2900978	122.23	117.89	4.34	48
80.48169	26.23004	448229.3	2901264	121.54	111.26	10.28	
80.48435	26.23291	448496.8	2901581	122.09	111.26	10.83	
80.48835	26.23722	448897.9	2902056	121.88	111.26	10.62	
80.49208	26.24125	449272.3	2902500	120.61	113.47	7.14	
80.49474	26.24412	449539.7	2902817	123.17	121.58	1.59	
80.37272	26.06959	437259.6	2883542	121.36	116.37	4.99	49
80.37535	26.07246	437523.7	2883858	122.34	98.31	24.03	
80.37771	26.07503	437761.3	2884142	122.41	97.10	25.31	
80.37954	26.07704	437946.1	2884363	122.77	99.51	23.26	
80.38112	26.07875	438104.5	2884552	121.13	103.12	18.01	
80.38243	26.08018	438236.5	2884710	119.28	109.14	10.14	
80.38348	26.08133	438342.1	2884837	119.82	112.76	7.06	
80.46675	26.17204	446711.5	2894846	116.53	116.53	0.00	50
80.47017	26.17576	447054.7	2895257	115.02	106.73	8.29	
80.47359	26.17948	447397.9	2895667	111.51	99.51	12.00	
80.47858	26.18492	447899.5	2896267	117.55	91.08	26.47	
80.48227	26.18892	448269.2	2896709	119.83	91.08	28.75	
80.48463	26.19149	448506.8	2896993	120.45	97.10	23.35	
80.487	26.19407	448744.4	2897277	118.00	105.53	12.47	
80.48858	26.19579	448902.8	2897467	119.02	112.76	6.26	
80.51252	26.22181	451305.4	2900340	120.80	120.80	0.00	51
80.51567	26.22524	451622.2	2900719	117.72	109.28	8.44	
80.51936	26.22925	451991.8	2901161	123.97	99.62	24.35	
80.52304	26.23325	452361.4	2901603	120.91	92.38	28.53	
80.52831	26.23897	452889.5	2902235	119.26	96.00	23.26	
80.53252	26.24355	453311.9	2902740	114.92	104.45	10.47	

80.53436	26.24555	453496.7	2902961	119.48	114.11	5.37	
80.39798	26.05449	439777.9	2881857	119.41	117.56	1.85	52
80.39906	26.05567	439887.4	2881988	120.18	100.67	19.51	
80.39972	26.05639	439953.2	2882067	119.73	100.67	19.06	
80.40124	26.05805	440106.5	2882250	120.85	96.01	24.84	
80.40451	26.06161	440435.1	2882643	121.69	100.67	21.02	
80.40603	26.06328	440588.4	2882827	121.71	103.08	18.63	
80.40756	26.06494	440741.7	2883010	120.57	115.14	5.43	
80.40821	26.06565	440807.4	2883089	119.91	119.91	0.00	
80.47708	26.1407	447729.3	2891371	116.46	116.46	0.00	53
80.47861	26.14236	447882.7	2891554	116.70	103.25	13.45	
80.4797	26.14355	447992.2	2891685	115.27	99.63	15.64	
80.48188	26.14592	448211.2	2891947	115.11	97.21	17.90	
80.4858	26.1502	448605.5	2892419	118.22	97.21	21.01	
80.48798	26.15257	448824.6	2892681	117.14	103.25	13.89	
80.48864	26.15328	448890.3	2892760	119.01	111.69	7.32	
80.48951	26.15423	448977.9	2892864	118.03	118.03	0.00	
80.51635	26.18343	451672.2	2896088	110.98	109.45	1.53	54
80.51787	26.18509	451825.5	2896272	109.13	94.96	14.17	
80.51962	26.18699	452000.8	2896481	110.57	90.13	20.44	
80.52224	26.18984	452263.6	2896796	109.44	90.13	19.31	
80.52464	26.19245	452504.6	2897084	114.71	97.38	17.33	
80.52573	26.19364	452614.1	2897215	116.10	109.45	6.65	
80.5266	26.19459	452701.7	2897320	117.47	117.47	0.00	
80.38981	26.00141	438933.3	2875982	117.74	117.56	0.18	55
80.39053	26.00219	439006.1	2876069	119.45	109.11	10.34	
80.39318	26.00506	439272.9	2876385	119.67	99.46	20.21	
80.39631	26.00845	439588.2	2876760	120.64	99.46	21.18	
80.39945	26.01185	439903.5	2877134	119.67	99.46	20.21	
80.40114	26.01367	440073.3	2877336	121.85	101.87	19.98	
80.40282	26.0155	440243.1	2877537	119.57	106.70	12.87	
80.40475	26.01759	440437.2	2877767	119.57	112.73	6.84	
80.48847	26.10812	448854.1	2887758	121.72	117.56	4.16	56
80.49065	26.11047	449072.4	2888017	120.92	101.87	19.05	
80.4933	26.11334	449339.2	2888334	118.55	95.84	22.71	
80.49837	26.11881	449848.6	2888939	120.07	92.22	27.85	
80.50127	26.12194	450139.7	2889284	119.27	97.05	22.22	
80.50393	26.12481	450406.5	2889601	118.12	110.32	7.80	
80.50562	26.12664	450576.3	2889802	118.20	116.35	1.85	
80.41914	25.99192	441864.4	2874918	119.50	119.31	0.19	57
80.42019	25.99306	441970.2	2875045	119.26	102.82	16.44	
80.42229	25.99536	442181.7	2875298	119.50	96.23	23.27	
80.42419	25.99743	442372.1	2875526	120.33	96.23	24.10	

80.42545	25.99881	442499	2875678	119.56	100.62	18.94	
80.42755	26.0011	442710.5	2875932	120.30	109.42	10.88	
80.42944	26.00317	442900.9	2876160	118.15	120.41	-2.26	
80.47909	26.05735	447893.1	2882139	116.02	119.31	-3.29	58
80.48245	26.06103	448231.5	2882545	118.30	101.72	16.58	
80.4873	26.0663	448718.1	2883128	118.67	95.13	23.54	
80.48793	26.06699	448781.5	2883204	118.19	96.23	21.96	
80.48961	26.06883	448950.8	2883406	116.09	112.71	3.38	
80.49087	26.07021	449077.7	2883558	117.48	117.11	0.37	
80.51256	26.09385	451256.5	2886168	118.71	112.71	6.00	59
80.51551	26.09706	451552.6	2886523	119.40	95.13	24.27	
80.5193	26.10119	451933.4	2886979	120.70	89.63	31.07	
80.52351	26.10578	452356.4	2887486	119.23	96.23	23.00	
80.52583	26.1083	452589.1	2887764	122.79	110.52	12.27	
80.47804	26.01442	447769.8	2877386	111.67	109.19	2.48	60
80.47995	26.01648	447961.6	2877612	110.44	96.85	13.59	
80.48122	26.01785	448089.4	2877764	113.19	90.00	23.19	
80.48398	26.02082	448366.4	2878091	107.91	85.20	22.71	
80.48928	26.02653	448899.1	2878722	112.79	83.83	28.96	
80.49097	26.02835	449069.6	2878923	110.96	92.06	18.90	
80.49415	26.03178	449389.2	2879301	118.21	101.65	16.56	
80.49542	26.03315	449517	2879453	117.48	108.50	8.98	
80.4967	26.03452	449644.9	2879604	118.02	113.30	4.72	
80.53423	26.07494	453416.3	2884066	120.87	117.41	3.46	61
80.53508	26.07585	453501.5	2884167	120.04	107.13	12.91	
80.54017	26.08133	454012.9	2884772	121.77	95.48	26.29	
80.54463	26.08612	454460.3	2885301	119.50	96.85	22.65	
80.5476	26.08932	454758.6	2885654	121.94	105.07	16.87	
80.55014	26.09206	455014.3	2885956	120.86	114.67	6.19	
80.55121	26.0932	455120.9	2886083	121.32	120.83	0.49	
80.57498	26.11876	457507.3	2888906	122.59	118.78	3.81	62
80.57922	26.12333	457933.4	2889410	123.17	111.24	11.93	
80.58241	26.12675	458253	2889788	122.93	103.70	19.23	
80.58687	26.13155	458700.5	2890318	121.85	100.96	20.89	
80.58984	26.13474	458998.8	2890671	122.65	106.44	16.21	
80.59196	26.13702	459211.9	2890923	120.74	113.98	6.76	
80.59345	26.13862	459361	2891099	120.14	118.09	2.05	
80.55307	26.05298	455291.6	2881628	122.33	118.94	3.39	63
80.55434	26.05437	455419.8	2881781	120.36	115.97	4.39	
80.55498	26.05506	455483.8	2881858	121.51	115.97	5.54	
80.55838	26.05876	455825.4	2882267	119.37	113.85	5.52	
80.55987	26.06038	455974.9	2882445	122.31	114.70	7.61	
80.56136	26.062	456124.4	2882624	122.18	117.24	4.94	

80.56263	26.06339	456252.5	2882777	122.70	119.36	3.34	
80.56752	26.06871	456743.6	2883365	122.87	122.87	0.00	
80.58177	26.08421	458174.2	2885076	126.74	119.36	7.38	64
80.58454	26.08721	458451.8	2885408	120.00	111.73	8.27	
80.58666	26.08953	458665.3	2885664	119.53	112.15	7.38	
80.5907	26.09392	459071	2886149	120.35	114.70	5.65	
80.59304	26.09646	459305.9	2886430	121.65	119.36	2.29	
80.55569	26.01294	455539.1	2877193	120.62	118.08	2.54	65
80.5591	26.01663	455881.4	2877601	118.72	113.28	5.44	
80.56101	26.01872	456073.9	2877830	120.39	108.48	11.91	
80.56208	26.01987	456180.8	2877958	118.66	107.79	10.87	
80.56421	26.02218	456394.7	2878213	119.33	107.79	11.54	
80.56612	26.02426	456587.3	2878443	120.29	111.22	9.07	
80.56761	26.02588	456737	2878621	119.42	115.34	4.08	
80.56825	26.02657	456801.2	2878698	119.71	117.40	2.31	
80.61427	26.07646	461421.5	2884208	125.73	120.14	5.59	66
80.61576	26.07807	461571.2	2884387	122.57	115.34	7.23	
80.61768	26.08015	461763.7	2884617	122.45	109.16	13.29	
80.61853	26.08108	461849.3	2884719	120.22	109.16	11.06	
80.62386	26.08685	462384.1	2885356	124.03	113.28	10.75	
80.62599	26.08916	462597.9	2885612	121.02	118.08	2.94	
80.62769	26.09101	462769.1	2885816	122.64	122.64	0.00	
80.56755	25.98489	456715.5	2874082	117.72	117.72	0.00	67
80.56925	25.98674	456886.1	2874287	118.00	112.97	5.03	
80.57264	25.99045	457227.4	2874696	118.50	110.22	8.28	
80.57477	25.99276	457440.7	2874952	118.12	110.91	7.21	
80.57668	25.99484	457632.6	2875182	117.10	112.97	4.13	
80.57774	25.996	457739.3	2875310	117.42	115.02	2.40	
80.61107	26.03234	461087.7	2879323	118.23	118.23	0.00	68
80.61405	26.03558	461386.3	2879681	121.20	115.71	5.49	
80.61723	26.03905	461706.2	2880065	120.06	112.28	7.78	
80.61978	26.04183	461962.1	2880371	118.75	112.28	6.47	
80.62254	26.04483	462239.3	2880704	119.62	115.02	4.60	
80.62318	26.04553	462303.3	2880780	120.01	117.08	2.93	
80.53915	25.91071	453844.3	2865877	117.17	113.98	3.19	69
80.53936	25.91094	453865.6	2865903	117.28	111.40	5.88	
80.54042	25.91209	453972.2	2866030	113.70	103.68	10.02	
80.54148	25.91324	454078.7	2866157	115.65	100.24	15.41	
80.54318	25.91509	454249.2	2866360	118.09	101.10	16.99	
80.54445	25.91647	454377	2866513	117.55	104.54	13.01	
80.54508	25.91716	454440.9	2866589	118.06	106.25	11.81	
80.54657	25.91877	454590.1	2866767	117.73	114.84	2.89	
80.57963	25.95468	457914.1	2870733	116.38	113.98	2.40	70

80.58112	25.95629	458063.3	2870910	118.34	111.40	6.94	
80.58196	25.95721	458148.5	2871012	117.75	103.68	14.07	
80.58345	25.95882	458297.6	2871190	117.07	97.67	19.40	
80.58557	25.96112	458510.7	2871444	116.76	93.38	23.38	
80.58726	25.96296	458681.2	2871648	116.34	93.38	22.96	
80.58854	25.96434	458809	2871800	116.23	98.53	17.70	
80.58981	25.96573	458936.9	2871953	116.20	106.25	9.95	
80.59087	25.96688	459043.4	2872080	116.07	115.70	0.37	
80.61865	25.99702	461834.7	2875410	117.36	112.26	5.10	71
80.6195	25.99794	461919.9	2875512	117.25	103.68	13.57	
80.6212	25.99979	462090.4	2875715	117.59	97.67	19.92	
80.62247	26.00117	462218.3	2875868	118.47	98.53	19.94	
80.62438	26.00324	462410	2876096	119.00	101.96	17.04	
80.62608	26.00508	462580.5	2876300	118.28	107.97	10.31	
80.62735	26.00646	462708.3	2876452	119.35	115.70	3.65	
80.62757	26.00669	462729.6	2876478	119.37	117.41	1.96	
80.60463	25.93704	460410.6	2868771	116.54	116.54	0.00	72
80.60526	25.93773	460474.5	2868848	115.33	107.97	7.36	
80.60738	25.94005	460687.6	2869103	120.08	101.96	18.12	
80.6095	25.94236	460900.6	2869359	118.19	96.81	21.38	
80.61141	25.94445	461092.3	2869590	116.98	101.10	15.88	
80.61353	25.94676	461305.3	2869845	118.61	107.11	11.50	
80.61607	25.94954	461560.9	2870152	118.06	115.70	2.36	
80.63558	25.97085	463520.6	2872506	120.38	117.41	2.97	73
80.63685	25.97224	463648.4	2872660	123.85	102.82	21.03	
80.64109	25.97687	464074.4	2873172	117.41	92.52	24.89	
80.64322	25.97919	464287.4	2873428	119.16	94.23	24.93	
80.64428	25.98034	464393.9	2873556	119.36	101.96	17.40	
80.64576	25.98196	464543	2873735	122.69	114.84	7.85	
80.64703	25.98335	464670.8	2873888	121.43	121.43	0.00	
80.51761	25.8027	451642.6	2853923	105.12	102.78	2.34	74
80.51761	25.8027	451642.6	2853923	105.12	98.51	6.61	
80.51931	25.80454	451813.9	2854127	105.17	94.23	10.94	
80.52122	25.80662	452006.6	2854356	102.80	94.23	8.57	
80.52378	25.80939	452263.6	2854662	103.36	96.80	6.56	
80.52463	25.81032	452349.2	2854764	103.88	99.36	4.52	
80.58784	25.87888	458709.1	2862335	118.91	118.16	0.75	75
80.58847	25.87957	458773.3	2862412	118.30	108.76	9.54	
80.58954	25.88072	458880.4	2862539	118.20	106.20	12.00	
80.59252	25.88395	459180.2	2862896	118.39	101.07	17.32	
80.5955	25.88718	459480	2863253	120.10	100.22	19.88	
80.59934	25.89134	459865.5	2863712	120.46	103.63	16.83	
80.60061	25.89272	459993.9	2863865	119.33	109.62	9.71	

80.60168	25.89388	460101	2863992	120.78	114.74	6.04	
80.66029	25.95733	465989.8	2871003	115.31	115.31	0.00	76
80.66242	25.95964	466203.9	2871258	116.58	101.07	15.51	
80.66626	25.96379	466589.4	2871716	115.61	96.80	18.81	
80.66988	25.96771	466953.4	2872150	118.42	96.80	21.62	
80.67329	25.9714	467296	2872558	117.23	103.63	13.60	
80.675	25.97325	467467.3	2872762	115.60	115.60	0.00	
80.60305	25.85349	460225.3	2859520	117.73	117.01	0.72	77
80.60665	25.85738	460586.7	2859949	117.70	110.17	7.53	
80.60707	25.85784	460629.3	2859999	117.40	107.89	9.51	
80.60834	25.85921	460756.8	2860151	119.08	104.47	14.61	
80.61003	25.86104	460926.9	2860353	118.75	104.47	14.28	
80.61236	25.86355	461160.8	2860631	117.24	104.47	12.77	
80.61278	25.86401	461203.3	2860681	117.62	105.61	12.01	
80.61595	25.86743	461522.2	2861060	119.23	113.59	5.64	
80.61722	25.86881	461649.8	2861211	118.31	118.16	0.15	
80.67668	25.93301	467624.2	2868306	116.82	112.45	4.37	78
80.67774	25.93416	467730.5	2868432	116.41	102.19	14.22	
80.68028	25.9369	467985.6	2868735	115.61	94.20	21.41	
80.68239	25.93918	468198.2	2868987	115.18	94.20	20.98	
80.6843	25.94124	468389.6	2869215	114.55	94.20	20.35	
80.68663	25.94375	468623.4	2869492	114.88	98.76	16.12	
80.68811	25.94535	468772.3	2869669	114.92	105.61	9.31	
80.68959	25.94695	468921.1	2869846	115.32	112.45	2.87	
80.61294	25.82147	461205.8	2855970	117.60	116.83	0.77	79
80.61433	25.82297	461345.6	2856136	119.18	113.20	5.98	
80.61688	25.82571	461601.7	2856439	119.32	110.48	8.84	
80.61873	25.82771	461788	2856660	119.84	110.48	9.36	
80.62035	25.82946	461951.1	2856853	118.28	113.20	5.08	
80.62267	25.83195	462183.9	2857128	119.48	115.92	3.56	
80.65	25.86141	464932	2860383	119.76	115.92	3.84	80
80.65162	25.86316	465095	2860576	119.10	104.12	14.98	
80.65255	25.86416	465188.2	2860686	118.52	100.49	18.03	
80.65464	25.8664	465397.8	2860935	119.02	100.49	18.53	
80.65719	25.86915	465653.9	2861238	119.74	101.40	18.34	
80.65788	25.8699	465723.8	2861321	117.28	105.94	11.34	
80.65858	25.87065	465793.7	2861403	117.76	110.48	7.28	
80.66066	25.87289	466003.3	2861652	120.42	116.83	3.59	
80.73742	25.95549	473711.8	2870781	116.09	112.29	3.80	
80.74415	25.96272	474387.2	2871581	115.52	115.01	0.51	
80.74508	25.96372	474480.3	2871691	115.90	102.31	13.59	
80.74531	25.96397	474503.6	2871719	116.65	99.58	17.07	
80.74671	25.96547	474643.4	2871884	116.32	99.58	16.74	

80.74879	25.96771	474853	2872132	117.00	99.58	17.42	
80.75019	25.96921	474992.7	2872298	116.57	101.40	15.17	
80.75181	25.97095	475155.7	2872491	118.48	105.94	12.54	
80.75344	25.9727	475318.7	2872684	117.58	112.29	5.29	
80.68654	25.858	468591.5	2859996	118.41	114.94	3.47	81
80.68654	25.858	468591.5	2859996	118.41	114.94	3.47	
80.68871	25.86035	468810.2	2860256	117.33	104.98	12.35	
80.6967	25.86897	469612.3	2861208	118.64	98.64	20.00	
80.70226	25.87497	470171.3	2861872	116.57	104.98	11.59	
80.70395	25.8768	470341.4	2862074	117.01	108.60	8.41	
80.70903	25.88228	470851.8	2862680	117.06	116.75	0.31	
80.80615	25.98695	480598.1	2874254	116.62	115.85	0.77	82
80.80712	25.988	480695.3	2874369	115.75	112.23	3.52	
80.81076	25.99191	481059.9	2874802	116.48	104.98	11.50	
80.81391	25.99531	481375.9	2875177	117.49	105.89	11.60	
80.81609	25.99765	481594.6	2875437	116.43	109.51	6.92	
80.81803	25.99974	481789.1	2875668	116.36	114.04	2.32	
80.67149	25.80034	467068.3	2853614	120.24	120.24	0.00	83
80.67305	25.80203	467225	2853801	116.00	106.79	9.21	
80.67565	25.80484	467486.1	2854112	114.55	102.26	12.29	
80.67773	25.8071	467694.9	2854361	114.51	101.36	13.15	
80.68058	25.81019	467982.1	2854703	114.79	105.89	8.90	
80.68318	25.81301	468243.2	2855015	117.15	112.23	4.92	
80.6837	25.81357	468295.4	2855077	117.77	114.94	2.83	
80.72501	25.85835	472446.8	2860026	114.47	111.32	3.15	84
80.72813	25.86172	472760.1	2860399	115.08	95.92	19.16	
80.73177	25.86567	473125.6	2860835	114.95	94.11	20.84	
80.73463	25.86876	473412.8	2861177	115.03	95.02	20.01	
80.73775	25.87214	473726.1	2861551	116.83	108.60	8.23	
80.73853	25.87299	473804.4	2861644	117.17	111.32	5.85	
80.82621	25.96783	482603.1	2872133	114.90	114.04	0.86	85
80.82856	25.97036	482838.1	2872413	114.85	103.17	11.68	
80.83299	25.97515	483282	2872942	115.00	97.74	17.26	
80.83898	25.98162	483882.5	2873658	115.11	97.74	17.37	
80.84132	25.98415	484117.4	2873938	115.83	100.45	15.38	
80.84366	25.98668	484352.4	2874218	116.91	107.70	9.21	
80.84523	25.98837	484509.1	2874405	115.54	114.04	1.50	
80.65866	25.74375	465765.7	2847351	114.80	108.89	5.91	86
80.65944	25.7446	465844.2	2847444	113.14	103.56	9.58	
80.6623	25.74769	466132	2847786	117.75	100.00	17.75	
80.66386	25.74938	466289	2847972	117.40	102.67	14.73	
80.66724	25.75303	466629.1	2848376	117.33	109.78	7.55	
80.66854	25.75444	466759.9	2848532	117.47	114.22	3.25	

80.75106	25.84357	475054	2858384	114.73	111.56	3.17	87
80.75549	25.84834	475498.8	2858912	115.84	100.00	15.84	
80.75888	25.852	475839	2859316	116.04	91.11	24.93	
80.76096	25.85425	476048.3	2859565	115.52	91.11	24.41	
80.7667	25.86043	476623.9	2860248	114.83	93.78	21.05	
80.76826	25.86211	476780.9	2860435	117.64	96.44	21.20	
80.77217	25.86633	477173.3	2860901	115.81	106.22	9.59	
80.86737	25.96888	486723.3	2872244	113.14	112.44	0.70	88
80.86946	25.97113	486932.6	2872493	115.67	107.11	8.56	
80.87103	25.97281	487089.6	2872679	115.41	104.44	10.97	
80.87364	25.97562	487351.3	2872990	117.02	103.56	13.46	
80.87651	25.97871	487639.1	2873332	116.11	103.56	12.55	
80.87912	25.98152	487900.7	2873643	114.50	104.44	10.06	
80.88121	25.98377	488110	2873892	116.25	110.67	5.58	
80.88304	25.98573	488293.2	2874109	115.58	115.58	0.00	
80.89688	26.00061	489679.9	2875756	117.21	117.21	0.00	89
80.89792	26.00174	489784.5	2875881	116.60	113.33	3.27	
80.90184	26.00595	490177	2876347	115.57	105.33	10.24	
80.90419	26.00848	490412.5	2876626	115.10	105.33	9.77	
80.90785	26.01241	490778.8	2877062	117.80	105.33	12.47	
80.90994	26.01466	490988.1	2877310	117.10	111.56	5.54	
80.91099	26.01578	491092.8	2877434	118.91	116.00	2.91	
80.79863	25.85459	479822.2	2859596	115.66	114.20	1.46	90
80.79948	25.85552	479907.5	2859699	115.11	105.39	9.72	
80.80203	25.85829	480163.6	2860006	113.84	99.98	13.86	
80.80607	25.8627	480569.1	2860493	114.56	96.59	17.97	
80.80756	25.86432	480718.5	2860672	114.89	102.01	12.88	
80.80968	25.86663	480931.9	2860928	115.23	108.78	6.45	
80.81032	25.86733	480996	2861005	115.62	110.13	5.49	
80.87564	25.93839	487548	2868867	113.81	113.52	0.29	91
80.87649	25.93932	487633.3	2868970	114.55	106.75	7.80	
80.88118	25.94441	488102.9	2869533	113.63	94.56	19.07	
80.88394	25.94742	488380.3	2869866	113.43	94.56	18.87	
80.88778	25.95158	488764.5	2870327	114.02	96.59	17.43	
80.88969	25.95367	488956.6	2870558	115.14	104.04	11.10	
80.89182	25.95598	489170	2870814	116.12	112.17	3.95	
80.90939	25.97507	490930.4	2872926	115.97	114.93	1.04	92
80.91281	25.97879	491273	2873338	115.50	104.72	10.78	
80.91702	25.98336	491694.8	2873844	113.61	101.31	12.30	
80.92018	25.98679	492011.1	2874223	115.31	104.72	10.59	
80.92229	25.98907	492222	2874476	113.78	112.66	1.12	
80.95388	26.02336	495385.1	2878272	119.76	116.06	3.70	93
80.95783	26.02765	495780.5	2878746	116.50	99.04	17.46	

80.9602	26.03022	496017.7	2879031	114.44	99.04	15.40	
80.96336	26.03365	496334	2879411	119.17	101.31	17.86	
80.96573	26.03622	496571.2	2879695	117.78	108.12	9.66	
80.96652	26.03707	496650.3	2879790	116.54	116.06	0.48	
80.76285	25.77296	476221.2	2850562	114.65	111.35	3.30	94
80.76373	25.77391	476309.8	2850667	119.08	108.87	10.21	
80.76572	25.77605	476509.2	2850904	115.58	103.11	12.47	
80.7677	25.7782	476708.5	2851142	117.41	103.11	14.30	
80.77079	25.78153	477018.6	2851510	116.86	103.93	12.93	
80.77277	25.78368	477217.9	2851747	120.50	107.23	13.27	
80.77564	25.78677	477505.9	2852090	113.44	112.17	1.27	
80.77652	25.78772	477594.5	2852195	115.12	114.64	0.48	
80.88819	25.90821	488802	2865524	115.49	112.17	3.32	95
80.89195	25.91226	489178.5	2865972	113.85	112.17	1.68	
80.89615	25.91678	489599.3	2866472	112.26	98.99	13.27	
80.89747	25.91821	489732.2	2866630	111.41	98.99	12.42	
80.90521	25.92654	490507.4	2867552	118.20	98.16	20.04	
80.90631	25.92773	490618.2	2867684	115.36	99.81	15.55	
80.90808	25.92963	490795.4	2867895	114.73	104.75	9.98	
80.90896	25.93059	490884	2868000	115.23	109.70	5.53	
80.91007	25.93178	490994.7	2868132	114.08	113.82	0.26	
80.97301	25.9995	497299.2	2875629	116.00	109.36	6.64	96
80.97512	26.00176	497509.9	2875880	113.53	103.68	9.85	
80.97775	26.00459	497773.2	2876193	112.92	99.13	13.79	
80.98222	26.0094	498220.9	2876725	115.57	101.41	14.16	
80.9838	26.0111	498378.9	2876913	117.10	105.95	11.15	
80.98512	26.01251	498510.6	2877070	115.98	111.64	4.34	
80.80609	25.77754	480557.5	2851063	115.09	112.94	2.15	97
80.80738	25.77894	480687.3	2851217	114.37	108.82	5.55	
80.80971	25.78146	480920.8	2851496	116.24	103.88	12.36	
80.81332	25.78538	481284.1	2851930	118.11	105.52	12.59	
80.81513	25.78734	481465.7	2852146	114.98	111.29	3.69	
80.81591	25.78818	481543.6	2852239	114.31	113.76	0.55	
80.89736	25.87634	489717.6	2861993	115.05	112.94	2.11	
80.90099	25.88025	490080.8	2862427	115.16	105.52	9.64	
80.90409	25.88361	490392.3	2862798	113.00	98.93	14.07	
80.9059	25.88557	490573.9	2863015	113.99	96.46	17.53	
80.9072	25.88697	490703.6	2863170	113.73	96.46	17.27	
80.90927	25.88921	490911.2	2863418	119.32	102.23	17.09	
80.91082	25.89089	491066.9	2863603	115.33	107.17	8.16	
80.91341	25.89368	491326.4	2863913	114.90	114.59	0.31	
80.93334	25.91523	493324.5	2866297	114.94	114.59	0.35	98
80.93516	25.91718	493506.1	2866514	115.04	103.05	11.99	

80.93956	25.92194	493947.3	2867041	114.01	97.29	16.72	
80.9437	25.92641	494362.5	2867536	116.40	98.93	17.47	
80.94578	25.92865	494570.1	2867784	116.42	106.35	10.07	
80.94811	25.93117	494803.6	2868062	114.58	113.76	0.82	
80.83034	25.76152	482986.6	2849285	113.68	110.93	2.75	99
80.83155	25.76283	483108.1	2849430	114.70	107.25	7.45	
80.83215	25.76348	483168.9	2849502	114.45	105.40	9.05	
80.83397	25.76544	483351.3	2849719	116.71	104.17	12.54	
80.83619	25.76784	483574.2	2849984	116.43	104.17	12.26	
80.8374	25.76915	483695.8	2850129	118.56	109.70	8.86	
80.83801	25.7698	483756.6	2850201	115.73	113.39	2.34	
80.83831	25.77013	483787	2850238	115.25	115.24	0.01	
80.86192	25.79564	486157.7	2853059	114.76	110.32	4.44	100
80.86293	25.79672	486259.1	2853180	113.81	107.25	6.56	
80.86374	25.7976	486340.1	2853276	114.21	104.17	10.04	
80.86525	25.79923	486492.1	2853457	113.19	103.56	9.63	
80.86636	25.80043	486603.5	2853590	114.15	103.56	10.59	
80.86747	25.80163	486715	2853723	116.35	105.40	10.95	
80.86838	25.80261	486806.2	2853831	113.07	110.32	2.75	
80.86858	25.80283	486826.4	2853855	113.37	112.78	0.59	
80.89019	25.82615	488994.6	2856436	110.63	110.63	0.00	
80.89241	25.82855	489217.4	2856701	112.29	110.32	1.97	
80.89383	25.83007	489359.3	2856870	111.10	102.94	8.16	
80.89494	25.83127	489470.8	2857003	111.65	96.18	15.47	
80.89676	25.83323	489653.1	2857220	111.07	95.57	15.50	
80.89948	25.83617	489926.7	2857545	110.55	99.87	10.68	
80.9008	25.83759	490058.4	2857702	113.88	110.93	2.95	
80.91928	25.85753	491912.4	2859909	115.16	110.93	4.23	101
80.91979	25.85807	491963.1	2859969	114.06	106.02	8.04	
80.9209	25.85927	492074.5	2860102	114.70	101.71	12.99	
80.92454	25.86319	492439.3	2860536	114.05	96.79	17.26	
80.92656	25.86537	492641.9	2860777	113.89	105.40	8.49	
80.92818	25.86712	492804	2860970	113.34	113.34	0.00	
80.95628	25.8974	495620.6	2864322	116.05	106.02	10.03	102
80.95739	25.8986	495732	2864455	115.33	102.33	13.00	
80.95992	25.90132	495985.3	2864756	112.27	95.57	16.70	
80.96234	25.90393	496228.5	2865046	111.66	96.18	15.48	
80.96507	25.90687	496502	2865371	112.51	109.09	3.42	
81.02356	25.96981	502358	2872341	112.29	108.48	3.81	103
81.02426	25.97058	502428.9	2872426	111.82	103.56	8.26	
81.02619	25.97264	502621.4	2872655	112.93	101.10	11.83	
81.0274	25.97395	502743	2872799	113.02	101.10	11.92	
81.02821	25.97482	502824.1	2872896	113.04	104.17	8.87	

81.02852	25.97515	502854.5	2872932	113.05	106.63	6.42	
81.02902	25.97569	502905.1	2872992	113.77	110.93	2.84	
80.8672	25.76049	486683.2	2849167	115.45	111.43	4.02	104
80.86811	25.76147	486774.3	2849275	115.06	103.46	11.60	
80.86962	25.7631	486926.2	2849456	114.38	101.63	12.75	
80.87154	25.76517	487118.7	2849685	114.97	102.24	12.73	
80.87245	25.76616	487209.8	2849794	113.09	105.91	7.18	
80.87305	25.76681	487270.6	2849866	113.62	110.20	3.42	
80.87305	25.76681	487270.6	2849866	113.62	110.20	3.42	
80.9218	25.81945	492162.1	2855692	110.87	109.59	1.28	105
80.92291	25.82065	492273.5	2855825	111.59	101.01	10.58	
80.92372	25.82152	492354.5	2855921	110.93	98.56	12.37	
80.92433	25.82218	492415.3	2855994	110.29	98.56	11.73	
80.92584	25.82381	492567.2	2856175	113.77	101.01	12.76	
80.92645	25.82447	492627.9	2856247	114.57	104.69	9.88	
80.92695	25.82501	492678.6	2856307	115.99	109.59	6.40	
80.92735	25.82545	492719.1	2856356	116.70	112.04	4.66	
80.96837	25.86969	496830.8	2861253	114.43	111.43	3.00	106
80.96928	25.87067	496922	2861361	113.40	104.69	8.71	
80.96998	25.87143	496992.8	2861446	111.47	99.18	12.29	
80.97069	25.87219	497063.8	2861530	112.74	94.89	17.85	
80.9715	25.87306	497144.8	2861627	112.18	93.05	19.13	
80.97261	25.87426	497256.2	2861759	110.05	94.89	15.16	
80.97332	25.87502	497327.1	2861844	112.67	99.79	12.88	
80.97382	25.87557	497377.7	2861904	109.73	104.08	5.65	
80.97443	25.87622	497438.5	2861977	110.77	107.75	3.02	
81.01305	25.91783	501307.1	2866584	112.59	107.75	4.84	107
81.01396	25.91881	501398.3	2866693	112.28	103.46	8.82	
81.01457	25.91946	501459	2866765	112.13	101.01	11.12	
81.01548	25.92045	501550.2	2866874	112.52	99.18	13.34	
81.01609	25.9211	501610.9	2866946	112.54	99.18	13.36	
81.017	25.92208	501702.1	2867055	112.85	100.40	12.45	
81.01831	25.92349	501833.8	2867212	112.76	104.69	8.07	
81.01892	25.92415	501894.5	2867284	112.09	108.98	3.11	
81.0434	25.9505	504345.3	2870203	113.69	108.98	4.71	108
81.04411	25.95126	504416.2	2870287	112.90	106.53	6.37	
81.04553	25.95279	504558	2870456	113.03	101.63	11.40	
81.04654	25.95388	504659.3	2870577	113.81	100.40	13.41	
81.04846	25.95595	504851.7	2870806	112.38	98.56	13.82	
81.04917	25.95671	504922.6	2870891	112.19	100.40	11.79	
81.04988	25.95747	504993.5	2870975	111.28	104.69	6.59	
81.05038	25.95801	505044.1	2871035	111.65	109.59	2.06	
80.9795	25.83737	497945.9	2857674	112.18	111.43	0.75	109

80.98082	25.83879	498077.6	2857831	113.33	105.91	7.42	
80.98203	25.8401	498199.1	2857976	112.27	98.56	13.71	
80.98284	25.84096	498280.2	2858072	111.14	96.73	14.41	
80.98496	25.84325	498492.9	2858326	117.40	95.50	21.90	
80.98759	25.84609	498756.3	2858639	116.66	101.63	15.03	
80.9888	25.84739	498877.8	2858784	113.19	111.43	1.76	
81.02601	25.88747	502605.8	2863222	113.53	108.36	5.17	110
81.02814	25.88975	502818.5	2863475	111.66	101.01	10.65	
81.02905	25.89073	502909.7	2863584	112.53	94.89	17.64	
81.03127	25.89313	503132.5	2863849	113.10	91.83	21.27	
81.03319	25.8952	503325	2864078	116.26	97.95	18.31	
81.03411	25.89618	503416.2	2864187	116.20	107.14	9.06	
81.03471	25.89683	503477	2864259	114.34	113.88	0.46	
81.051	25.91436	505107.9	2866201	112.84	111.43	1.41	111
81.05171	25.91512	505178.8	2866285	112.67	104.69	7.98	
81.05252	25.91599	505259.9	2866381	111.85	102.24	9.61	
81.05373	25.9173	505381.4	2866526	111.40	101.63	9.77	
81.05566	25.91937	505573.9	2866755	110.93	102.24	8.69	
81.05627	25.92002	505634.7	2866828	111.67	105.30	6.37	
81.05697	25.92078	505705.6	2866912	112.12	110.20	1.92	
81.06912	25.93384	506921.3	2868359	109.75	106.53	3.22	112
81.07114	25.93602	507123.8	2868600	111.79	98.56	13.23	
81.07317	25.9382	507326.4	2868842	110.93	93.66	17.27	
81.07469	25.93983	507478.4	2869023	110.62	92.44	18.18	
81.0755	25.9407	507559.4	2869119	111.99	94.28	17.71	
81.07702	25.94233	507711.4	2869300	111.81	101.01	10.80	
81.07762	25.94299	507772.2	2869372	111.45	105.91	5.54	
81.07793	25.94331	507802.6	2869408	110.40	108.36	2.04	
80.91143	25.72258	491115.7	2844965	111.96	111.76	0.20	113
80.91201	25.7232	491173.8	2845034	111.64	105.46	6.18	
80.91346	25.72477	491319.1	2845208	115.47	103.52	11.95	
80.91558	25.72708	491532.2	2845463	112.39	103.52	8.87	
80.91693	25.72854	491667.8	2845625	112.16	106.91	5.25	
80.9177	25.72938	491745.3	2845717	111.79	111.79	0.00	
80.96994	25.78597	496986.1	2851983	111.44	110.79	0.65	114
80.97148	25.78765	497141.1	2852168	113.32	100.12	13.20	
80.97264	25.7889	497257.3	2852307	111.25	97.70	13.55	
80.97342	25.78974	497334.8	2852400	110.59	98.18	12.41	
80.97438	25.79079	497431.7	2852515	112.38	100.12	12.26	
80.97496	25.79141	497489.8	2852585	113.25	104.49	8.76	
80.97602	25.79257	497596.4	2852712	112.52	111.27	1.25	
81.00994	25.82927	500996.6	2856777	113.15	112.24	0.91	115
81.0112	25.83063	501122.5	2856928	111.89	105.94	5.95	

81.01217	25.83168	501219.4	2857044	113.85	104.49	9.36	
81.01381	25.83346	501384.1	2857241	113.44	104.49	8.95	
81.01516	25.83492	501519.7	2857403	113.56	108.36	5.20	
81.01594	25.83576	501597.2	2857495	112.05	112.05	0.00	
81.05133	25.87402	505142.7	2861734	113.36	108.85	4.51	116
81.05201	25.87476	505210.5	2861815	112.80	102.06	10.74	
81.05385	25.87674	505394.5	2862035	110.79	98.18	12.61	
81.05569	25.87873	505578.6	2862255	111.62	98.67	12.95	
81.05772	25.88092	505782	2862498	112.31	105.94	6.37	
81.05888	25.88218	505898.3	2862637	112.85	110.79	2.06	
81.09895	25.92545	509908.8	2867432	111.65	111.27	0.38	117
81.10088	25.92754	510102.5	2867664	110.18	105.94	4.24	
81.10263	25.92942	510276.8	2867872	110.41	102.06	8.35	
81.10534	25.93235	510548.1	2868196	110.63	101.58	9.05	
81.1065	25.9336	510664.3	2868335	109.94	101.09	8.85	
81.10805	25.93528	510819.3	2868521	112.03	104.49	7.54	
81.10902	25.93632	510916.2	2868636	111.87	110.30	1.57	
80.98169	25.75576	498164.1	2848636	110.40	110.40	0.00	118
80.9826	25.75674	498255.2	2848745	113.29	103.21	10.08	
80.98412	25.75837	498407.1	2848926	111.71	98.91	12.80	
80.98492	25.75925	498488.1	2849022	113.35	97.68	15.67	
80.98704	25.76153	498700.6	2849276	114.94	98.91	16.03	
80.98775	25.7623	498771.5	2849360	113.35	102.59	10.76	
80.98906	25.76371	498903.1	2849517	113.28	106.89	6.39	
80.99037	25.76513	499034.7	2849674	110.92	110.92	0.00	
81.00834	25.78452	500836.6	2851822	110.12	110.12	0.00	119
81.00935	25.78561	500937.8	2851942	109.28	100.75	8.53	
81.01036	25.7867	501039	2852063	109.36	99.52	9.84	
81.01198	25.78845	501201	2852256	110.71	100.14	10.57	
81.01359	25.79019	501362.9	2852449	110.46	103.82	6.64	
81.0142	25.79084	501423.7	2852522	110.42	108.11	2.31	
81.0146	25.79128	501464.2	2852570	109.57	109.34	0.23	
81.05633	25.83627	505644.9	2857553	112.00	112.00	0.00	120
81.05653	25.83648	505665.2	2857577	112.31	105.05	7.26	
81.05784	25.8379	505796.8	2857734	111.82	98.91	12.91	
81.05835	25.83845	505847.4	2857794	111.71	97.68	14.03	
81.05926	25.83943	505938.5	2857903	111.69	97.68	14.01	
81.05986	25.84008	505999.2	2857975	111.69	98.30	13.39	
81.06219	25.84259	506232.1	2858253	109.97	105.05	4.92	
81.0628	25.84324	506292.8	2858325	109.77	108.11	1.66	
81.0633	25.84378	506343.4	2858386	110.50	110.50	0.00	
81.12135	25.90629	512153.9	2865312	111.40	108.73	2.67	121
81.12185	25.90683	512204.5	2865372	111.73	101.98	9.75	

81.12428	25.90944	512447.5	2865661	111.81	98.30	13.51	
81.12479	25.90999	512498.1	2865722	113.76	98.30	15.46	
81.1256	25.91086	512579.1	2865818	112.47	99.52	12.95	
81.12742	25.91282	512761.3	2866035	110.55	104.43	6.12	
81.12833	25.9138	512852.4	2866144	109.01	109.01	0.00	
81.14807	25.93503	514826.4	2868497	114.85	111.18	3.67	122
81.14908	25.93611	514927.6	2868618	113.27	105.05	8.22	
81.15019	25.93731	515038.9	2868750	114.19	101.98	12.21	
81.1509	25.93807	515109.8	2868835	114.69	101.98	12.71	
81.15374	25.94112	515393.3	2869173	114.38	98.91	15.47	
81.15495	25.94243	515514.7	2869317	111.70	107.50	4.20	
81.15566	25.94319	515585.6	2869402	111.56	111.56	0.00	
81.04129	25.77814	504139.8	2851115	113.03	110.66	2.37	123
81.04187	25.77876	504197.9	2851184	117.42	107.01	10.41	
81.04341	25.78044	504352.9	2851370	113.26	100.92	12.34	
81.04477	25.7819	504488.6	2851532	114.90	100.92	13.98	
81.04535	25.78252	504546.7	2851601	112.17	102.14	10.03	
81.0468	25.78409	504692.1	2851775	109.19	109.19	0.00	
81.0468	25.78409	504692.1	2851775	109.19	109.19	0.00	
81.07349	25.81294	507366.4	2854971	110.75	109.44	1.31	124
81.07572	25.81534	507589.3	2855237	113.29	103.96	9.33	
81.07813	25.81796	507831.5	2855526	112.55	98.49	14.06	
81.08036	25.82036	508054.4	2855793	112.54	97.88	14.66	
81.08229	25.82245	508248.2	2856024	113.67	100.92	12.75	
81.08346	25.8237	508364.5	2856163	111.87	105.18	6.69	
81.0852	25.82559	508538.9	2856372	114.26	109.44	4.82	
81.08568	25.82611	508587.3	2856430	114.73	112.48	2.25	
81.15025	25.8958	515050.4	2864153	113.90	113.09	0.81	125
81.15287	25.89862	515312	2864465	112.32	103.96	8.36	
81.155	25.90091	515525.2	2864720	112.67	98.49	14.18	
81.15665	25.90269	515689.9	2864917	114.23	103.96	10.27	
81.15849	25.90467	515874	2865137	113.68	113.09	0.59	
81.02333	25.71425	502340.4	2844039	112.74	111.73	1.01	126
81.02477	25.71582	502485.3	2844213	116.29	100.82	15.47	
81.02631	25.71749	502639.8	2844399	118.19	96.57	21.62	
81.02737	25.71865	502746	2844527	113.60	97.18	16.42	
81.02882	25.72022	502890.8	2844701	111.30	100.21	11.09	
81.03036	25.7219	503045.4	2844887	113.20	105.67	7.53	
81.03171	25.72336	503180.6	2845049	113.17	110.51	2.66	
81.08614	25.78256	508636.8	2851607	111.74	109.30	2.44	127
81.0873	25.78381	508752.7	2851746	112.61	102.03	10.58	
81.08903	25.7857	508926.5	2851955	116.45	98.39	18.06	
81.09193	25.78884	509216.2	2852303	112.66	97.79	14.87	

81.09289	25.78989	509312.8	2852419	109.75	102.63	7.12	
81.09357	25.79062	509380.4	2852500	111.16	108.09	3.07	
81.10359	25.80152	510384.7	2853707	114.97	111.73	3.24	128
81.10533	25.8034	510558.6	2853916	112.57	105.67	6.90	
81.10764	25.80591	510790.3	2854195	113.96	102.63	11.33	
81.10899	25.80738	510925.5	2854357	111.28	106.27	5.01	
81.11015	25.80864	511041.4	2854497	113.12	111.12	2.00	
81.13156	25.83189	513185.3	2857073	110.54	107.60	2.94	129
81.13253	25.83293	513281.8	2857189	111.33	98.49	12.84	
81.13369	25.83419	513397.7	2857328	114.96	89.98	24.98	
81.13562	25.83628	513590.9	2857561	114.10	89.37	24.73	
81.13677	25.83754	513706.8	2857700	111.00	99.09	11.91	
81.13784	25.83869	513813	2857828	110.32	108.21	2.11	
81.23122	25.93992	523151.4	2869051	113.96	110.64	3.32	130
81.23276	25.94159	523305.9	2869236	113.03	103.96	9.07	
81.23412	25.94306	523441.1	2869399	114.97	103.35	11.62	
81.23615	25.94525	523643.9	2869643	114.27	107.60	6.67	
81.23692	25.94609	523721.1	2869735	111.58	111.58	0.00	
80.9817	25.63035	498163.2	2834749	100.45	100.45	0.00	131
80.98223	25.63093	498216.6	2834813	100.88	88.35	12.53	
80.98289	25.63163	498282	2834891	102.32	91.41	10.91	
80.98412	25.63296	498405.7	2835038	101.23	88.96	12.27	
80.98499	25.6339	498493	2835142	101.31	92.63	8.68	
80.98634	25.63537	498628.9	2835304	103.08	99.36	3.72	
81.01215	25.66326	501219.1	2838393	110.29	109.15	1.14	
81.01321	25.66441	501325.8	2838520	110.02	104.26	5.76	
81.01476	25.66608	501481	2838706	111.59	101.81	9.78	
81.01659	25.66807	501665.4	2838925	105.67	98.14	7.53	
81.0193	25.67099	501937	2839249	106.13	96.30	9.83	
81.02065	25.67245	502072.8	2839411	105.31	98.14	7.17	
81.02162	25.6735	502169.8	2839527	103.85	102.42	1.43	
81.0223	25.67423	502237.8	2839608	105.09	104.87	0.22	
81.02829	25.6807	502839.2	2840325	106.64	106.09	0.55	132
81.02926	25.68175	502936.2	2840441	107.43	97.53	9.90	
81.03081	25.68342	503091.4	2840626	108.12	95.69	12.43	
81.03303	25.68582	503314.6	2840892	107.65	98.14	9.51	
81.03371	25.68656	503382.5	2840973	106.33	106.33	0.00	
81.04174	25.69522	504187.7	2841933	105.63	104.26	1.37	133
81.0428	25.69637	504294.4	2842061	105.35	96.30	9.05	
81.04425	25.69794	504439.9	2842234	102.83	93.25	9.58	
81.04512	25.69888	504527.3	2842338	103.81	96.30	7.51	
81.04541	25.69919	504556.3	2842373	105.11	101.81	3.30	
81.04561	25.6994	504575.8	2842396	105.52	103.03	2.49	

81.0938	25.75141	509407	2848158	116.51	114.05	2.46	134
81.09496	25.75266	509523.4	2848296	114.93	103.03	11.90	
81.09748	25.75537	509775.7	2848597	111.67	95.69	15.98	
81.09903	25.75705	509930.9	2848782	113.77	106.09	7.68	
81.1	25.75809	510027.9	2848898	115.09	114.05	1.04	
81.13215	25.79275	513248.7	2852739	106.43	106.43	0.00	135
81.13332	25.794	513365.1	2852878	109.36	101.91	7.45	
81.13467	25.79546	513500.9	2853040	107.94	97.63	10.31	
81.13642	25.79734	513675.6	2853248	109.09	93.35	15.74	
81.13758	25.79859	513792	2853387	110.65	93.96	16.69	
81.13903	25.80016	513937.5	2853560	111.96	98.24	13.72	
81.14029	25.80152	514063.6	2853711	114.47	104.36	10.11	
81.14078	25.80204	514112.1	2853769	111.74	108.64	3.10	
81.0435	25.65389	504366	2837356	110.31	108.03	2.28	136
81.04477	25.65525	504493.8	2837507	108.27	104.16	4.11	
81.0505	25.66138	505068.7	2838186	108.46	102.22	6.24	
81.05178	25.66275	505196.4	2838337	111.74	102.22	9.52	
81.05284	25.66388	505302.9	2838463	109.54	105.45	4.09	
81.05708	25.66842	505728.7	2838966	107.81	104.80	3.01	
81.05836	25.66979	505856.5	2839117	104.41	99.64	4.77	
81.05963	25.67115	505984.3	2839268	101.03	98.99	2.04	
81.06175	25.67342	506197.2	2839520	106.91	101.58	5.33	
81.06282	25.67456	506303.6	2839646	108.87	104.80	4.07	
81.06388	25.67569	506410.1	2839771	110.78	108.03	2.75	
81.10295	25.71748	510327.9	2844402	111.87	111.26	0.61	137
81.10954	25.72452	510988	2845182	109.43	109.43	0.00	
81.11145	25.72657	511179.7	2845408	108.82	100.28	8.54	
81.11655	25.73202	511690.7	2846012	107.34	97.70	9.64	
81.11847	25.73406	511882.3	2846239	108.57	103.51	5.06	
81.1208	25.73656	512116.5	2846515	106.87	106.87	0.00	
81.15035	25.76811	515076.2	2850013	109.72	109.72	0.00	138
81.15226	25.77016	515267.8	2850240	111.16	101.58	9.58	
81.15567	25.77379	515608.5	2850642	108.41	97.70	10.71	
81.15822	25.77652	515864	2850944	108.22	97.70	10.52	
81.16013	25.77856	516055.7	2851171	108.23	102.87	5.36	
81.16141	25.77992	516183.4	2851322	108.13	108.13	0.00	
81.17545	25.7949	517588.8	2852983	108.91	108.67	0.24	139
81.17609	25.79558	517652.6	2853058	108.62	100.28	8.34	
81.178	25.79763	517844.3	2853285	106.83	97.70	9.13	
81.18247	25.80239	518291.4	2853813	107.81	96.41	11.40	
81.18502	25.80511	518546.9	2854115	109.36	99.64	9.72	
81.18608	25.80625	518653.4	2854241	108.94	106.74	2.20	
81.20481	25.82622	520527.1	2856455	110.99	110.61	0.38	140

81.20651	25.82804	520697.5	2856657	115.20	105.45	9.75	
81.21184	25.83371	521229.8	2857286	110.67	102.87	7.80	
81.21311	25.83507	521357.6	2857437	111.35	104.16	7.19	
81.21524	25.83734	521570.5	2857688	112.70	108.67	4.03	
81.06395	25.63498	506419.5	2835262	111.06	111.06	0.00	141
81.06481	25.63591	506506	2835365	113.52	108.19	5.33	
81.06546	25.6366	506570.8	2835443	109.52	107.52	2.00	
81.06891	25.64032	506916.8	2835855	110.68	103.50	7.18	
81.07128	25.64288	507154.6	2836138	109.73	103.50	6.23	
81.07365	25.64543	507392.5	2836421	109.20	104.17	5.03	
81.07602	25.64799	507630.3	2836705	110.29	106.85	3.44	
81.07796	25.65009	507824.9	2836936	108.85	108.85	0.00	
81.19557	25.77672	519609.4	2850972	112.23	107.52	4.71	142
81.19903	25.78044	519955.4	2851384	106.50	101.48	5.02	
81.20011	25.7816	520063.5	2851513	107.71	99.47	8.24	
81.2053	25.78717	520582.4	2852131	108.61	97.46	11.15	
81.20767	25.78973	520820.3	2852414	108.20	94.78	13.42	
81.21048	25.79275	521101.4	2852749	108.77	94.78	13.99	
81.21308	25.79553	521360.9	2853058	109.39	96.12	13.27	
81.2161	25.79878	521663.6	2853419	115.30	101.48	13.82	
81.21891	25.8018	521944.7	2853754	111.85	105.51	6.34	
81.21977	25.80273	522031.2	2853857	110.80	107.52	3.28	
81.05824	25.58509	505849.1	2829737	110.09	105.41	4.68	143
81.0591	25.58601	505935.1	2829840	109.97	100.19	9.78	
81.06146	25.58855	506171.6	2830121	108.67	98.44	10.23	
81.06788	25.59548	506816.7	2830889	106.76	94.96	11.80	
81.07195	25.59987	507225.2	2831376	107.40	100.19	7.21	
81.07388	25.60195	507418.7	2831606	107.00	105.41	1.59	
81.07474	25.60288	507504.8	2831708	107.88	107.88	0.00	
81.09192	25.62139	509228.2	2833760	103.76	101.74	2.02	144
81.09321	25.62278	509357.5	2833914	103.19	95.09	8.10	
81.09858	25.62857	509896.5	2834556	107.14	88.44	18.70	
81.10094	25.63112	510133.6	2834838	104.75	87.33	17.42	
81.1046	25.63506	510500.1	2835274	109.86	95.09	14.77	
81.10567	25.63622	510607.9	2835403	110.17	102.85	7.32	
81.10675	25.63738	510715.7	2835531	107.77	107.77	0.00	
81.12834	25.66063	512880.2	2838108	112.22	111.21	1.01	145
81.12984	25.66224	513030.7	2838287	106.99	104.25	2.74	
81.13327	25.66594	513374.7	2838696	108.12	100.19	7.93	
81.13692	25.66987	513740.3	2839132	107.61	99.60	8.01	
81.13885	25.67194	513933.8	2839362	103.96	103.67	0.29	
81.13928	25.67241	513976.8	2839413	102.55	102.55	0.00	
81.23719	25.77768	523781.5	2851086	110.37	105.99	4.38	146

81.24041	25.78114	524104.1	2851469	106.73	103.67	3.06	
81.24385	25.78484	524448.1	2851879	106.11	94.96	11.15	
81.24836	25.78968	524899.6	2852417	106.12	93.22	12.90	
81.25331	25.79499	525394.2	2853005	108.32	94.38	13.94	
81.2561	25.79799	525673.7	2853338	113.62	101.93	11.69	
81.25782	25.79984	525845.7	2853543	112.44	110.05	2.39	
81.15485	25.64755	515542.6	2836663	107.29	107.29	0.00	147
81.15636	25.64918	515694.6	2836843	109.33	104.52	4.81	
81.16048	25.65361	516107.1	2837334	107.37	102.13	5.24	
81.16199	25.65523	516259.1	2837514	107.63	105.12	2.51	
81.16329	25.65663	516389.4	2837669	110.63	110.50	0.13	
81.27129	25.77249	527201.9	2850517	108.10	105.72	2.38	148
81.27324	25.77458	527397.3	2850749	107.82	101.54	6.28	
81.27519	25.77667	527592.7	2850981	107.40	100.34	7.06	
81.27736	25.779	527809.8	2851239	106.46	100.34	6.12	
81.27997	25.78179	528070.3	2851549	107.10	100.34	6.76	
81.28062	25.78249	528135.5	2851626	105.66	101.54	4.12	
81.28171	25.78365	528244	2851755	106.77	103.93	2.84	
81.28236	25.78435	528309.2	2851832	106.90	106.90	0.00	
81.09849	25.54437	509894.1	2825231	96.21	93.47	2.74	149
81.09897	25.54489	509942.4	2825289	94.51	86.80	7.71	
81.10003	25.54604	510048.6	2825416	91.23	83.09	8.14	
81.10147	25.5476	510193.5	2825589	90.99	80.86	10.13	
81.10263	25.54885	510309.4	2825728	88.94	81.61	7.33	
81.10311	25.54937	510357.7	2825785	88.70	83.09	5.61	
81.10349	25.54979	510396.3	2825831	90.39	87.54	2.85	
81.17714	25.62948	517783.3	2834664	107.94	105.34	2.60	150
81.17791	25.63031	517860.6	2834756	106.58	101.63	4.95	
81.17897	25.63146	517966.8	2834883	108.05	98.66	9.39	
81.18003	25.6326	518073	2835010	109.22	97.18	12.04	
81.18148	25.63416	518217.8	2835183	109.83	98.66	11.17	
81.18235	25.6351	518304.8	2835287	107.39	102.37	5.02	
81.18283	25.63562	518353	2835345	107.73	106.82	0.91	
81.18292	25.63572	518362.7	2835356	108.16	107.56	0.60	
81.29529	25.757	529612.3	2848807	105.39	103.11	2.28	151
81.29596	25.75773	529679.8	2848888	105.67	97.18	8.49	
81.29703	25.75888	529786.1	2849015	108.49	93.47	15.02	
81.29867	25.76064	529950.3	2849211	105.74	91.25	14.49	
81.29982	25.76189	530066.1	2849350	106.28	91.25	15.03	
81.3005	25.76262	530133.7	2849431	107.85	93.47	14.38	
81.30127	25.76345	530210.9	2849523	106.82	95.70	11.12	
81.30195	25.76418	530278.5	2849604	108.68	98.66	10.02	
81.30243	25.7647	530326.8	2849661	107.56	101.63	5.93	

81.30359	25.76595	530442.7	2849800	106.21	106.21	0.00	
81.21141	25.624	521224	2834063	106.78	106.65	0.13	152
81.2142	25.62703	521503.9	2834398	107.92	103.55	4.37	
81.21935	25.6326	522019.5	2835016	107.52	101.40	6.12	
81.22023	25.63356	522107.8	2835122	108.43	102.60	5.83	
81.22258	25.6361	522343.5	2835405	105.38	104.50	0.88	
81.23567	25.65028	523654.6	2836976	105.19	105.19	0.00	153
81.23934	25.65426	524022.8	2837418	103.99	100.93	3.06	
81.24243	25.6576	524332.2	2837788	105.29	100.21	5.08	
81.24332	25.65855	524420.6	2837894	106.40	102.12	4.28	
81.24611	25.66158	524700.4	2838230	104.57	104.57	0.00	
81.29777	25.71745	529870.9	2844427	106.12	106.12	0.00	154
81.30012	25.71999	530106.6	2844710	108.26	105.70	2.56	
81.30513	25.7254	530607.4	2845310	107.10	102.83	4.27	
81.30808	25.72859	530902.1	2845663	109.61	103.79	5.82	
81.30925	25.72986	531019.9	2845805	108.99	105.22	3.77	
81.31058	25.73129	531152.4	2845964	114.03	108.56	5.47	
81.22489	25.59416	522583.5	2830761	106.99	106.99	0.00	155
81.22581	25.59517	522675.1	2830872	107.85	104.68	3.17	
81.22736	25.59687	522830.7	2831061	106.18	100.43	5.75	
81.22992	25.59969	523087.1	2831373	106.54	95.58	10.96	
81.23403	25.6042	523499	2831874	107.62	94.37	13.25	
81.23732	25.60782	523828.6	2832275	106.56	96.79	9.77	
81.23805	25.60862	523901.9	2832364	108.97	101.65	7.32	
81.2396	25.61033	524057.5	2832553	106.92	106.92	0.00	
81.33875	25.71911	533981.6	2844621	111.84	106.50	5.34	156
81.34067	25.72121	534173.9	2844855	108.13	99.22	8.91	
81.34241	25.72312	534347.8	2845066	108.67	91.94	16.73	
81.34461	25.72553	534567.6	2845334	105.73	94.37	11.36	
81.34607	25.72713	534714.1	2845512	106.78	99.83	6.95	
81.34708	25.72824	534814.8	2845634	106.52	105.89	0.63	
81.2522	25.58588	525327.6	2829848	108.59	106.70	1.89	157
81.25293	25.58665	525400.3	2829933	108.19	105.07	3.12	
81.25483	25.58867	525590.8	2830158	107.17	102.75	4.42	
81.25619	25.59012	525726.9	2830319	109.53	102.28	7.25	
81.26289	25.59726	526398.4	2831110	110.31	99.72	10.59	
81.26398	25.59842	526507.3	2831239	110.05	100.88	9.17	
81.26696	25.6016	526806.7	2831592	107.35	101.81	5.54	
81.27222	25.6072	527333	2832213	108.40	104.38	4.02	
81.27267	25.60768	527378.4	2832266	110.22	105.54	4.68	
81.27376	25.60883	527487.3	2832394	109.43	107.63	1.80	
81.27403	25.60912	527514.4	2832427	110.53	108.33	2.20	
81.42752	25.77224	542867.5	2850531	107.63	105.54	2.09	158

81.42879	25.77359	542994.6	2850681	104.71	100.18	4.53	
81.42943	25.77426	543058.1	2850756	103.23	98.79	4.44	
81.43124	25.77619	543239.6	2850970	110.84	99.02	11.82	
81.43252	25.77754	543366.6	2851120	107.27	100.42	6.85	
81.43342	25.7785	543457.3	2851227	108.61	103.68	4.93	
81.43442	25.77956	543557.1	2851344	112.76	108.57	4.19	
81.43165	25.74158	543292.8	2847137	107.10	103.70	3.40	159
81.43284	25.74289	543411.6	2847282	111.62	96.82	14.80	
81.43411	25.7443	543538.9	2847439	108.17	92.44	15.73	
81.43692	25.74739	543819	2847782	104.45	91.19	13.26	
81.43802	25.7486	543929.3	2847917	104.66	94.94	9.72	
81.43955	25.75029	544082.1	2848104	108.60	101.83	6.77	

11. SUMMARY

The heliborne geophysical data was acquired along the coarse grid flight line running along NE-SW direction at every 3 km spacing during March 2021. The flight lines run across the Ganga and Yamuna rivers roughly at 5-10 km distance on either sides of the rivers. Flight lines were also planned running all along the Ganga and Yamuna rivers for riverbed characterization. Upon completion of the coarse gird flight lines, infill lines were added in the interesting zones identified based on QC results. Major focus has been to trace extension of the recently discovered 45 km long buried paleochannel between Prayagraj and Kaushambi towards Kanpur. The second objective has been to establish hydrogeological linkages between Ganga and Yamuna rivers with underlying aquifer system including paleochannels, if any.

The acquired Heliborne geophysical data are of excellent quality providing high-resolution conductivity (or resistivity) distribution from very shallow (top soil) to 500 m depth at favourable locations. Besides low and high moments, super low moment data has also been processed that enabled to have useful data from around 4 μs that corresponds to the soil zone. Number of high tension power lines network in the area with dense clusters near Fatehpur poses challenge for acquiring good quality AEM data. This has forced us to fly at low speed in order to acquire good data with dense sampling for high-resolution resistivity imaging.

The AEM result provided high quality resistivity distribution of similar order and pattern as was observed in the adjacent eastern part of Ganga-Yamuna Doab between Kaushambi and Prayagraj districts during the earlier survey. High resistivity (≥100 Ωm) over Ganga and Yamuna rivers clearly mapped river channel deposits of coarse sand mixed with pebbles, etc. The Vindhyan formation is reflected with significantly high resistivity (~ 500 Ωm or more) and found dipping towards north forming bedrock to the Ganga alluvium sediments. Based on AEM results, ten shallow wells have also been drilled and logged with geophysical measurements that have validated the findings.

11.1 Paleochannel

The 45 km long buried paleochannel that was discovered between Sarai Akil (Prayagraj) and Shamshabad (Kaushambi) villages, is found continuing with connectivity to further westward up to Kanpur that adds ~160 km additional buried course in meandering pattern passing through villages viz., Fura, Sultanpur Sato, Sangaon, Bindki, upto Devkali in the western margin of the study area. Total length of discovered paleochannel including its extension up to Kanpur exceeds 200 km.

Besides continued extension of discovered paleochannel, additional branch of paleochannel with strong signature has also emerged almost at the same depth level that finally joins Yamuna River near Parvejpur in Kaushambi district. This branch of paleochannel passes through villages Parvejpur, Laghura to Gajner meandering south of Fatehpur city. The length of this branch of paleochannel is also around 160 km long.

There is another ~50 km long buried paleochannel that emerged from Kesurwa village (north of Fatehpur) that partly coincides and crosses the Ganga River. It could be traced passing through Davatpur, Katari Bhalepur, Dulikhera, Ashikpur up to Satan village in north near north bank of Ganga River. These paleochannel are found prominently within 15-25 m depth.

Moving further down below 25 m depth, the paleochannel between Sarai Akil and Laghura via Shamshabad village disappear. Additional ~5 km long new branch of paleochannel appears that joins Ganga River near Kunda village. The branch of paleochannel that runs across the Ganga River in NW of Fatehpur city, passes below the root of Ganga bottom separated by ~15 m thick clay layer. So broadly two sets of paleochannels are identified i.e. 15-25 m depth and 25-50 m depth. Dimension of additionally traced paleochannel are tabulated below:

#	Items	Dimension	Remark
	Previous Discovery		
1	Discovered paleo river course between Prayagraj and Kaushambi	45 km long, 4-6 km wide and ~15 m thick	Discovery of heliborne geophysical study during 2017-19.

		buried under 10-15 m thick alluvial cover	
2	**Westward extension Paleochannel** Westward extension of paleochannel	~160 km long, 4-6 km ide, ~15 m thick buried under 10-15 m thick alluvial cover	Traced extension in continuity of previous discovery that combines to around 200 m long channel from Sarai Akil (near Prayagraj) to Devkali (near Kanpur)
	New Additional Paleochannel inferred @15-25 m depth		
3	Additional inferred paleochannel running almost parallel to the above that joins Yamuna River at Parvejpur village	~160 km long, 4-6 km wide, ~15 m thick and buried under 10-15 m thick alluvial cover	This is located between Pavejpur (Kaushambi district) and Gajner village (Kanpur district).
4	Inferred paleochannel between Kesurwa village (north of Fatehpur) and Satan village at north bank of Ganga River	~50 km long, ~ 4 km wide and ~15 m thick buried under 10-15 m thick alluvial cover.	This partly coincides and also run across the Ganga River
	New Additional Paleochannel inferred @25-50 m depth		
6	**Westward extension Paleochannel** Part of paleochannel between Laghura to Sarai Akil, shift its joining from Yamuna river to Ganga River	~170 m long, 4-6 km wide, ~25 m thick buried under ~25 thick alluvial cover	Strong shift from Yamuna tributary to Ganga tributary. Could have been caused by strong tectonic event.

7	Continued presence of inferred paleochannel that joins Yamuna River at Parvejpur village	~160 km long, 4-6 km wide, ~25 m thick and buried under ~25 m thick alluvial cover	Except marginal changes in meandering pattern, the major channel remain presence throughout it length.
8	Continued presence of inferred paleochannel running across the present ganga river	~36 km long, ~ 4 km wide and ~25 m thick buried under ~25 m thick alluvial cover.	

11.2 River-Aquifer Linkages

There are broadly three principal aquifers mapped within upper 500 m depth column. The upper two are principal aquifers in alluvium and the third underlying aquifer is in Vindhyan formation. Top and bottom surface elevation map is extracted from the AEM results. Dominant sand contents form aquifer in alluvium column. In contrary weathered-fractured part in Vindhyan formation form the aquifer.

The area suffers by strong tectonic disturbances causing shifting of present day Ganga and Yamuna rivers. Study revealed that the buried paleochannels are also guided by fault. Tectonic disturbances have also dislocated aquifer layers as well created hydrogeological linkages that qualify to facilitate groundwater exchange. The Yamuna River has stronger hydrogeological linkages than the Ganga River in this part of the study. Hydrogeological connectivity of Ganga, Yamuna and inferred paleochannels through underlying aquifer system has made them as unified unit. Thus pollutant entering into Ganga and Yamuna rivers, have all likely chances to spread into aquifer system, especially when water level in aquifer falls down below the river water level. Increasing the water level in aquifer to the level of river water or above, will create hydraulic pressure from aquifer to river and hence most likely will reduce or stop the contaminant migration/spread from river to aquifer.

To enhance aquifer rejuvenation and develop groundwater level, number of suitable managed aquifer recharge (MAR) sites are identified having ensured hydrogeological linkages with underlying aquifer system. These knowledgebases can be used to device effective plan for managed aquifer recharge.

12. Way forward

Continued presence of paleochannel till western and north western margin of the study area indicates strong possibility of its further extension towards Himalaya. The inferred hydrogeological linkages of Ganga and Yamuna rivers with underlying aquifer and paleochannel at places provide high-resolution knowledge of vulnerable zone for contaminant leakage / migration. At the same time hydrogeological linkages of inferred paleochannel with underlying aquifer system provide knowledge of suitable zone for managed aquifer recharge. As this area has also emerging problem of salinity, fluoride, Arsenic contamination, reduction in base flow and resultant drying of river tributaries during non-monsoon season, etc., there is a strong need of extending the survey further westward till Himalayan foothill and with wider coverage for logical conclusion and important input to have effective plan for managed aquifer recharge.

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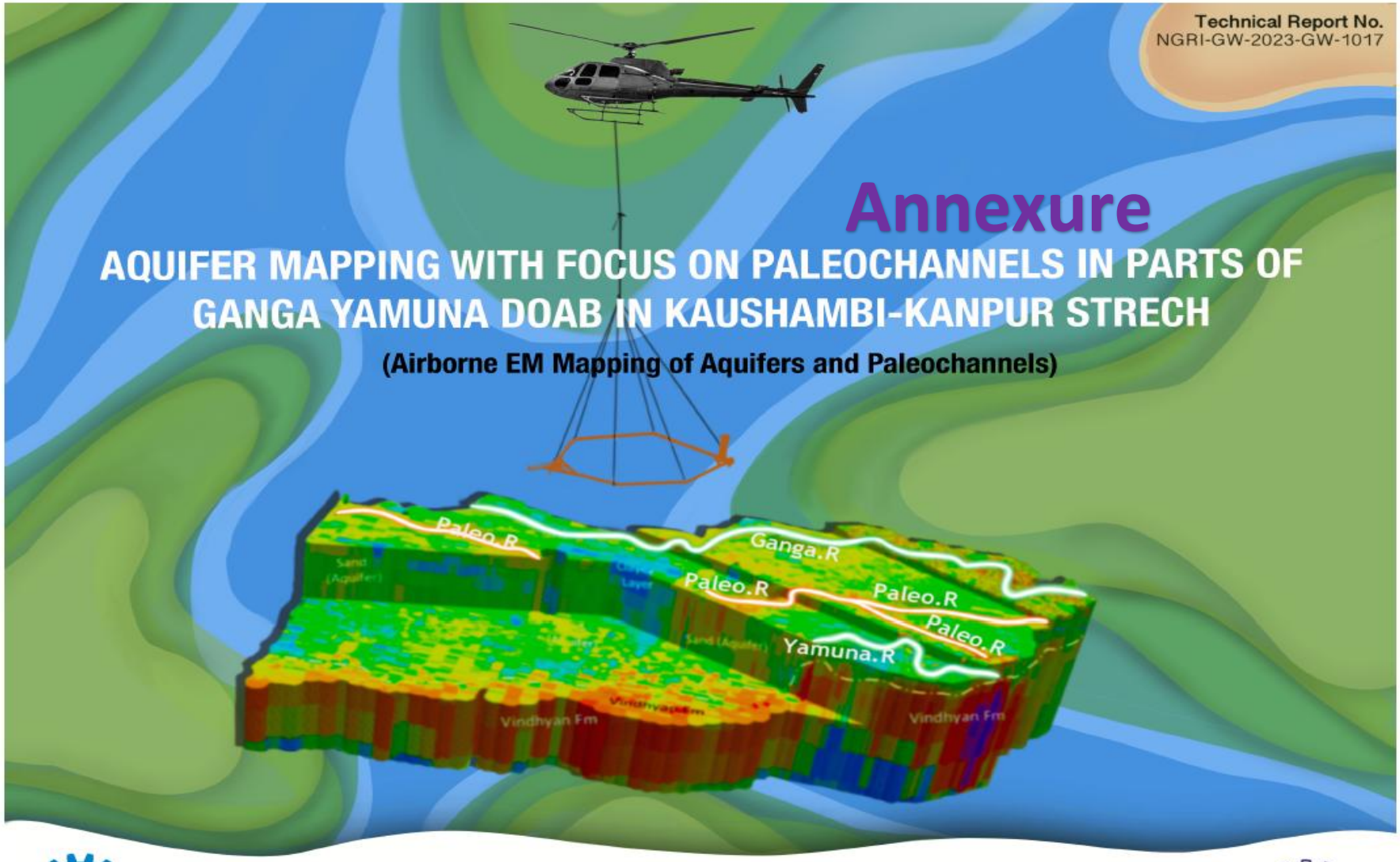
Principal

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Annexure

AQUIFER MAPPING WITH FOCUS ON PALEOCHANNELS IN PARTS OF GANGA YAMUNA DOAB IN KAUSHAMBI-KANPUR STRECH

(Airborne EM Mapping of Aquifers and Paleochannels)



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AQUIFER MAPPING WITH FOCUS ON PALAEO-CHANNELS IN PARTS OF GANGA YAMUNA DOAB IN KAUSHAMBI-KANPUR STRETCH (MAR Sites)

Funded by

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(Registered Society, Under Act 1860)
Ministry of Jal Shakti
Department of Water Resources, River Development & Ganga Rejuvenation
Government of India

Project carried out under tripartite Memorandum of Agreement between

CENTRAL GROUND WATER BOARD (CGWB) FARIDABAD

NATIONAL MISSION FOR CLEAN GANGA (NMCG) NEW DELHI

CSIR-NATIONAL GEOPHYSICAL RESEARCH INSTITUTE (CSIR-NGRI) HYDERABAD

15. Annexure-B: Details of inferred Managed aquifer Recharge site

S. No.	Longitude	Latitude	DEM	Elevation of MAR bottom surface (m, amsl)	Depth of MAR bottom surface (m)	MAR Site	City/ municipality	Sub-city area	Postcode
1	81.11354	25.53385	100.48	98.91	1.57	1	Khaga	Kot	212656
2	81.11565	25.53436	96.75	89.57	7.18				
3	81.11917	25.53522	94.77	84.9	9.87				
4	81.12058	25.53556	91.25	84.9	6.35				
5	81.12445	25.53651	92.97	90.5	2.47				
6	81.12656	25.53702	92.86	92.86	0		Khaga	Kot	212656
7	81.32624	25.58548	104.42	103.58	0.84	2	Sirathu	Malak Pinzri	212217
8	81.33047	25.5865	101.64	90.5	11.14				
9	81.33329	25.58718	101.08	89.57	11.51				
10	81.34033	25.58889	103.31	91.43	11.88				
11	81.34209	25.58931	101.78	95.17	6.61				
12	81.34385	25.58974	103.44	98.91	4.53		Sirathu	Chak Khodaygang	212217
13	81.05007	25.6165	104.83	102.4	2.43	3	Khaga	Tihar	212658
14	81.05429	25.61866	100.83	98.04	2.79				
15	81.05817	25.62063	100.9	97.5	3.4				
16	81.06239	25.62279	110.03	96.95	13.08				
17	81.06697	25.62512	108.78	100.77	8.01				
18	81.06838	25.62584	112.35	103.49	8.86				
19	81.07014	25.62673	108.55	105.67	2.88		Khaga	Rari	212658

20	80.07134	26.29373	127.83	123.71	4.12	4	Akbarpur	Gajner	209121
21	80.07311	26.29565	126.34	118.44	7.9				
22	80.07663	26.29949	126.37	113.17	13.2				
23	80.08293	26.30636	126.7	112.42	14.28				
24	80.08696	26.31075	125.82	117.69	8.13				
25	80.08999	26.31404	127.93	121.45	6.48		Akbarpur	Jitharauli	209121
26	80.10814	26.33381	126.66	125.97	0.69	5	Akbarpur	Bhathana	209121
27	80.1099	26.33573	128.65	117.69	10.96				
28	80.11444	26.34067	127.97	110.91	17.06				
29	80.12226	26.34918	129.61	110.91	18.7				
30	80.12428	26.35137	126.92	115.43	11.49				
31	80.1268	26.35411	126.41	125.21	1.2		Akbarpur	Rasulpur Gogumau	209121
32	80.18206	26.4142	129.66	128.22	1.44	6	Kanpur	Sachendi Urf Chacheri	209304
33	80.18433	26.41667	129.4	119.19	10.21				
34	80.18761	26.42024	128.92	116.18	12.74				
35	80.19089	26.42381	129.9	113.17	16.73				
36	80.1962	26.42956	128.1	116.93	11.17				
37	80.20099	26.43478	127.65	124.46	3.19				
38	80.20099	26.43478	127.65	125.97	1.68		Kanpur	Bhailamau	209305
39	80.08907	26.26917	125.41	124.05	1.36	7	Ghatampur	Hathehi	209206
40	80.09163	26.27199	127.55	104.65	22.9				
41	80.09466	26.27532	125.69	104.65	21.04				
42	80.09675	26.27763	125.73	106.89	18.84				
43	80.10118	26.2825	125.93	110.62	15.31				
44	80.10514	26.28686	124.72	118.08	6.64				
45	80.10607	26.28789	124.1	123.3	0.8		Akbarpur	Hilauthi	209121
46	80.14662	26.33249	124.6	124.6	0	8	Akbarpur	Manethu	209121

47	80.14801	26.33402	125.41	117.33	8.08				
48	80.14965	26.33582	127.26	110.62	16.64				
49	80.15268	26.33915	128.35	104.65	23.7				
50	80.15781	26.34479	127.55	99.43	28.12				
51	80.1606	26.34786	128.22	109.87	18.35				
52	80.16503	26.35273	122.04	120.32	1.72				
53	80.16713	26.35504	123.48	123.48	0		Kanpur	Aiti	209214
54	80.18206	26.37144	129.13	126.29	2.84	9	Kanpur	Binaur	209214
55	80.18439	26.374	129.93	120.32	9.61				
56	80.18813	26.3781	129.29	115.84	13.45				
57	80.19373	26.38425	127.15	115.09	12.06				
58	80.19746	26.38835	130	123.3	6.7				
59	80.20026	26.39142	127.41	127.41	0		Kanpur	Bhairam Pur	209214
60	80.11905	26.26042	123.98	120.1	3.88	10	Akbarpur	Targaon Ghatampur	209308
61	80.12279	26.26451	124.71	112.66	12.05				
62	80.12559	26.26758	125.89	110.43	15.46				
63	80.12957	26.27193	122.23	111.17	11.06				
64	80.13728	26.28037	125.31	112.66	12.65				
65	80.13985	26.28318	124.67	118.61	6.06				
66	80.14149	26.28497	124.22	123.82	0.4		Ghatampur	Alapur	209308
67	80.19506	26.34352	126.5	121.59	4.91	11	Kanpur	Sapai	209214
68	80.19553	26.34403	126.69	121.59	5.1				
69	80.20208	26.35118	128.29	113.4	14.89				
70	80.20676	26.3563	128.22	113.4	14.82				
71	80.21027	26.36013	126	117.12	8.88				
72	80.21332	26.36345	126.67	123.82	2.85				
73	80.21519	26.3655	125.41	125.41	0		Kanpur	Itara	209214

74	80.24517	26.39821	126.48	126.05	0.43	12	Kanpur	Patehuri	209214
75	80.24821	26.40153	125.98	119.35	6.63				
76	80.25243	26.40613	127.78	115.63	12.15				
77	80.25735	26.4115	126.62	119.35	7.27				
78	80.25946	26.4138	126.86	126.79	0.07		Kanpur	Pipauri	209214
79	80.13583	26.2372	125.56	122.33	3.23	13	Ghatampur	Tejpur	209308
80	80.14006	26.24176	127.6	111.92	15.68				
81	80.14123	26.24302	127.07	110.43	16.64				
82	80.145	26.24707	129.9	107.45	22.45				
83	80.14923	26.25163	128.41	108.2	20.21				
84	80.15417	26.25694	126.39	112.66	13.73				
85	80.1577	26.26073	128.96	117.12	11.84				
86	80.16006	26.26326	129.59	122.33	7.26		Ghatampur	Barnao	209308
87	80.20525	26.31184	124.97	118.61	6.36	14	Kanpur	Kathara	209214
88	80.20643	26.3131	124.79	114.15	10.64				
89	80.21232	26.31943	122.76	105.96	16.8				
90	80.21938	26.32701	125.17	105.22	19.95				
91	80.22245	26.3303	125.5	113.4	12.1				
92	80.22527	26.33334	126.3	124.56	1.74				
93	80.22645	26.3346	126.37	126.37	0				
94	80.25025	26.36015	128.36	125.31	3.05				
95	80.25284	26.36293	125.4	122.33	3.07				
96	80.25662	26.36697	125.9	111.17	14.73				
97	80.25803	26.36849	127.27	106.71	20.56				
98	80.26039	26.37102	125.26	106.71	18.55				
99	80.26605	26.37709	124.45	108.2	16.25				
100	80.26746	26.3786	123.3	111.92	11.38				

101	80.26888	26.38012	123.25	117.87	5.38				
102	80.26982	26.38113	124.98	121.59	3.39		Kanpur	Dhori	209214
103	80.27477	26.38644	125.51	123.07	2.44	15	Kanpur	Senpurab Para	209214
104	80.27784	26.38973	124.42	113.4	11.02				
105	80.2842	26.39656	124.99	113.4	11.59				
106	80.28585	26.39833	122.51	122.51	0		Kanpur	Khandepur	208027
107	80.16576	26.22315	126.16	123.71	2.45	16	Ghatampur	Kewadiya	209308
108	80.16759	26.22513	126.69	116.18	10.51				
109	80.17333	26.23134	126.5	107.9	18.6				
110	80.17631	26.23457	126.65	107.9	18.75				
111	80.17929	26.2378	126.88	108.65	18.23				
112	80.18434	26.24326	126.98	118.44	8.54				
113	80.18595	26.245	123.54	121.45	2.09		Ghatampur	Patara	209308
114	80.24518	26.30905	125.97	114.67	11.3	17	Kanpur	Kathara	209214
115	80.2484	26.31252	124.25	105.64	18.61				
116	80.25138	26.31575	127.68	101.12	26.56				
117	80.25506	26.31972	125.32	101.12	24.2				
118	80.26057	26.32568	125.16	103.38	21.78				
119	80.26471	26.33014	126.07	116.18	9.89				
120	80.26609	26.33163	124.14	120.7	3.44		Kanpur	Bhawanipur	209214
121	80.20742	26.22783	125.84	125.84	0	18	Ghatampur	Hirni	209308
122	80.20834	26.22883	125.84	123.67	2.17				
123	80.21201	26.23286	126.47	119.14	7.33				
124	80.21568	26.23688	127.68	113.86	13.82				
125	80.22141	26.24317	128.41	115.37	13.04				
126	80.22462	26.2467	125.6	119.9	5.7				
127	80.22669	26.24896	123.27	123.27	0		Ghatampur	Dharampur Ghatampur	209308

128	80.27098	26.2975	126.37	121.41	4.96	19	Kanpur	Kishunpurmajhawan	209214
129	80.27121	26.29775	126.96	120.65	6.31				
130	80.27466	26.30152	129.27	113.1	16.17				
131	80.2781	26.3053	125.37	110.08	15.29				
132	80.28108	26.30857	124.18	110.84	13.34				
133	80.28476	26.31259	125.11	112.35	12.76				
134	80.28706	26.3151	125.38	119.9	5.48				
135	80.28866	26.31686	124.33	124.43	-0.1				
136	80.28981	26.31812	123.72	123.72	0				
137	80.2905	26.31888	123.61	123.61	0		Kanpur	Hajipur	209214
138	80.33439	26.3669	126.1	118.39	7.71	20	Kanpur	Kathogar	208021
139	80.33439	26.3669	126.1	117.63	8.47				
140	80.33738	26.37016	124.46	113.1	11.36				
141	80.34082	26.37393	124.82	112.35	12.47				
142	80.34381	26.3772	125.61	116.12	9.49				
143	80.34634	26.37997	125.36	120.65	4.71				
144	80.34703	26.38072	126.08	122.16	3.92		Kanpur	Nagawa	208021
145	80.15485	26.12988	125.67	119.96	5.71	21	Ghatampur	Narainpur Ghatampur	209206
146	80.15765	26.13295	124.72	112.43	12.29				
147	80.1607	26.13627	125.63	107.16	18.47				
148	80.16327	26.13908	127.5	107.91	19.59				
149	80.16514	26.14113	127.08	113.93	13.15				
150	80.16795	26.1442	126.93	122.21	4.72				
151	80.16819	26.14445	127.2	123.72	3.48		Ghatampur		209206
152	80.21573	26.19631	123.47	122.21	1.26	22	Ghatampur	Chhanja	209209
153	80.21878	26.19963	121.83	114.69	7.14				
154	80.223	26.20423	122.35	113.18	9.17				

155	80.22393	26.20525	119.61	114.69	4.92				
156	80.22675	26.20832	126.67	119.2	7.47				
157	80.22886	26.21062	125.27	124.47	0.8		Ghatampur	Saray	209209
158	80.28513	26.27191	126.58	119.2	7.38	23	Kanpur	Surauli	209214
159	80.28818	26.27523	125.25	112.43	12.82				
160	80.29194	26.27931	124.63	105.65	18.98				
161	80.29405	26.28161	126.5	105.65	20.85				
162	80.29616	26.28391	125.61	109.42	16.19				
163	80.29945	26.28748	125.29	115.44	9.85				
164	80.30086	26.28901	123.27	119.2	4.07		Kanpur	Segarapur	209214
165	80.35862	26.35181	123.4	119.96	3.44	24	Kanpur	Koriya	208021
166	80.3605	26.35385	123.72	114.69	9.03				
167	80.36191	26.35538	123.62	113.18	10.44				
168	80.36708	26.361	124.06	113.18	10.88				
169	80.3706	26.36482	124.71	115.44	9.27				
170	80.37154	26.36584	123.24	121.46	1.78		Kanpur	Ghurwakhera	208021
171	80.22878	26.16497	124.11	115.99	8.12	25	Ghatampur	Oriya	209204
172	80.23224	26.16873	121.02	106.98	14.04				
173	80.23478	26.17148	121.71	106.98	14.73				
174	80.23917	26.17623	124.06	108.48	15.58				
175	80.24286	26.18024	127.62	112.99	14.63				
176	80.24564	26.18324	124.6	118.99	5.61		Ghatampur	Behta Bujurg	209209
177	80.25626	26.19475	123.85	121.99	1.86	26	Ghatampur	Behta Bujurg	209209
178	80.25857	26.19725	124.13	116.74	7.39				
179	80.26157	26.2005	125.14	110.73	14.41				
180	80.26527	26.20451	126.7	110.73	15.97				
181	80.26873	26.20826	125.74	114.49	11.25				

182	80.27128	26.21101	125.49	120.49	5		Ghatampur	Bhitargaon	209209
183	80.30618	26.24878	122.92	118.24	4.68	27	Ghatampur	Devsarh	209401
184	80.30918	26.25203	123.86	107.73	16.13				
185	80.31496	26.25829	124.22	101.73	22.49				
186	80.3182	26.26179	125.59	102.48	23.11				
187	80.32236	26.26629	126.84	109.98	16.86				
188	80.32421	26.26829	124.13	116.74	7.39				
189	80.32537	26.26954	124.14	121.24	2.9		Ghatampur	Simra	209401
190	80.36516	26.31255	122.14	122.14	0	28	Kanpur	Kakrali	209401
191	80.36933	26.31705	122.01	112.99	9.02				
192	80.37118	26.31905	124.17	110.73	13.44				
193	80.37674	26.32505	120.1	106.23	13.87				
194	80.38183	26.33055	119.69	103.98	15.71				
195	80.3853	26.3343	121.57	108.48	13.09				
196	80.38739	26.33655	123.23	114.49	8.74				
197	80.38785	26.33705	123.39	116.74	6.65		Kanpur	Kudhawa	209402
198	80.20548	26.09863	123.35	122.54	0.81	29	Ghatampur	Koriyan	209206
199	80.20771	26.10107	121.99	111.35	10.64				
200	80.21079	26.10444	123.93	109.86	14.07				
201	80.2119	26.10566	124.81	109.86	14.95				
202	80.21358	26.1075	123.4	113.59	9.81				
203	80.21442	26.10842	122.89	117.32	5.57				
204	80.2147	26.10872	122.63	118.81	3.82		Ghatampur	Paras	209206
205	80.2457	26.14269	122.04	122.04	0	30	Ghatampur	Bihupur	209206
206	80.24934	26.14666	123.22	105.38	17.84				
207	80.24962	26.14697	123.02	105.38	17.64				
208	80.25353	26.15125	120.88	105.38	15.5				

209	80.258	26.15615	122.65	105.38	17.27				
210	80.25996	26.15829	119.36	109.11	10.25				
211	80.26108	26.15951	121.31	112.84	8.47		Ghatampur	Pahewa	209209
212	80.32065	26.22466	123.4	121.05	2.35	31	Ghatampur	Sukhiapur	209401
213	80.3254	26.22986	121.05	106.87	14.18				
214	80.32848	26.23322	120.88	106.87	14.01				
215	80.33324	26.23842	122.74	108.36	14.38				
216	80.33716	26.2427	123.81	115.82	7.99				
217	80.33828	26.24393	124.25	121.05	3.2		Ghatampur	Lachhman Khera	209401
218	80.39261	26.30323	124.98	121.79	3.19	32	Kanpur	Tusaura	209401
219	80.3971	26.30813	125.72	114.33	11.39				
220	80.40606	26.3179	123.54	110.6	12.94				
221	80.41083	26.3231	123.34	110.6	12.74				
222	80.41671	26.32952	124.87	115.82	9.05				
223	80.4198	26.33288	125.59	124.03	1.56		Kanpur	Tilsaharibujurg	209402
224	80.14909	25.99204	120.58	118.61	1.97	33	Ghatampur	Rampur	208001
225	80.14909	25.99204	120.58	114.95	5.63				
226	80.15494	25.99848	117.71	93.03	24.68				
227	80.1594	26.00338	116.5	95.47	21.03				
228	80.1619	26.00614	120.11	108.86	11.25				
229	80.16413	26.00859	123.02	117.39	5.63		Ghatampur	Anupur	208001
230	80.26952	26.12436	125.73	121.04	4.69	34	Ghatampur	Bhadwara	209206
231	80.27231	26.12743	123.6	108.86	14.74				
232	80.27594	26.13141	124.45	100.34	24.11				
233	80.28068	26.13661	121.85	96.69	25.16				
234	80.28487	26.1412	123.56	102.78	20.78				
235	80.28766	26.14427	123.07	113.73	9.34				

236	80.29129	26.14825	122.12	122.12	0		Ghatampur	Patari	209206
237	80.34548	26.20763	122.24	122.24	0	35	Ghatampur	Gopalpur Narwal	209401
238	80.34688	26.20916	124.22	116.26	7.96				
239	80.35107	26.21375	123.02	100.39	22.63				
240	80.35359	26.2165	122.65	97.95	24.7				
241	80.36085	26.22446	122.69	100.39	22.3				
242	80.36672	26.23088	124.07	116.26	7.81		Ghatampur	Mirzapur	209401
243	80.41036	26.27861	123.02	119.92	3.1	36	Kanpur	Babibhitari	209401
244	80.41175	26.28014	124.29	107.71	16.58				
245	80.41539	26.28412	123.75	97.95	25.8				
246	80.42127	26.29055	122.93	97.95	24.98				
247	80.42435	26.29391	125.14	105.27	19.87				
248	80.42659	26.29636	123.08	118.7	4.38		Kanpur	Baradhari	209401
249	80.45402	26.32633	122.93	122.36	0.57	37	Kanpur	Hathi Pur	209402
250	80.45738	26.33	124.41	104.05	20.36				
251	80.46327	26.33642	124.58	95.5	29.08				
252	80.46691	26.3404	124.11	100.39	23.72				
253	80.47111	26.34499	121.29	113.82	7.47		Kanpur	Salempur	209402
254	80.28864	26.10232	125.94	120.29	5.65	38	Ghatampur	Kamalpur	209206
255	80.29281	26.10684	123.32	110.54	12.78				
256	80.29642	26.11076	122.83	106.64	16.19				
257	80.29836	26.11287	121.56	108.59	12.97				
258	80.30142	26.11619	122.89	115.42	7.47				
259	80.30364	26.1186	121.34	119.32	2.02		Ghatampur	Almanpur	209206
260	80.38674	26.20872	120.88	120.88	0	39	Ghatampur	Barai Garh	209401
261	80.38841	26.21052	122.12	109.56	12.56				
262	80.38952	26.21173	123.04	105.66	17.38				

263	80.39174	26.21414	124.21	103.71	20.5				
264	80.39564	26.21836	122.07	102.73	19.34				
265	80.39703	26.21986	122.07	106.64	15.43				
266	80.40065	26.22378	121.35	120.29	1.06		Ghatampur	Barai Garh	209401
267	80.43794	26.26415	120.74	120.74	0	40	Kanpur	Semarjhal	209401
268	80.44211	26.26867	123.96	99.81	24.15				
269	80.44295	26.26957	124.13	99.81	24.32				
270	80.44963	26.2768	121.1	99.81	21.29				
271	80.4513	26.27861	123.31	102.73	20.58				
272	80.45409	26.28162	123.69	114.44	9.25				
273	80.45659	26.28433	122.08	122.08	0		Kanpur	Phuphuwarsuithok	209401
274	80.23821	26.0055	111.61	111.61	0	41	Ghatampur	Kandhauli	208001
275	80.23821	26.0055	111.61	99.95	11.66				
276	80.23958	26.00701	112.66	93.87	18.79				
277	80.24122	26.00882	116.26	91.44	24.82				
278	80.24287	26.01063	113.58	91.44	22.14				
279	80.24451	26.01243	107.15	93.87	13.28				
280	80.24807	26.01635	115.01	101.17	13.84				
281	80.24998	26.01846	116.3	108.47	7.83		Bindki	Badanpur	212631
282	80.30861	26.08294	122.89	119.29	3.6	42	Ghatampur	Asadhana	209206
283	80.30944	26.08384	122.17	114.44	7.73				
284	80.31382	26.08866	118.52	102.31	16.21				
285	80.31739	26.09257	118.95	101.1	17.85				
286	80.3204	26.09589	119.26	107.16	12.1				
287	80.32287	26.0986	120.13	114.44	5.69				
288	80.32452	26.10041	120.65	119.29	1.36		Bindki	Shahjahanpur Aaham	212631
289	80.36841	26.14859	120.16	113.23	6.93	43	Ghatampur	Maholia	209209

290	80.36896	26.14919	116.48	99.88	16.6				
291	80.37225	26.15281	117.85	92.61	25.24				
292	80.37499	26.15582	120.79	97.46	23.33				
293	80.37637	26.15732	121.71	113.23	8.48				
294	80.37774	26.15883	122.07	122.07	0		Ghatampur	Gauri Narwal	209401
295	80.40519	26.18894	121.96	118.2	3.76	44	Ghatampur	Kudni	209401
296	80.40684	26.19074	119.71	113.33	6.38				
297	80.40849	26.19255	119.53	104.82	14.71				
298	80.41151	26.19586	117.39	103.6	13.79				
299	80.41343	26.19797	121.52	104.82	16.7				
300	80.41453	26.19917	121.52	112.12	9.4				
301	80.41618	26.20098	117.9	117.9	0		Ghatampur	Chirla	209401
302	80.46949	26.25937	121.4	120.63	0.77	45	Kanpur	Hathigaon	209401
303	80.47472	26.26509	122.34	102.39	19.95				
304	80.48021	26.2711	122.56	95.09	27.47				
305	80.48296	26.27411	122.22	99.95	22.27				
306	80.48489	26.27622	120.89	110.9	9.99				
307	80.48626	26.27772	122.72	121.85	0.87		Kanpur	Sarsaul	209402
308	80.31036	26.04492	118.72	117.15	1.57	46	Bindki	Kotha Bakhariya	212631
309	80.31301	26.0478	116.87	110.52	6.35				
310	80.3162	26.05125	119.43	109.04	10.39				
311	80.31726	26.0524	118.49	109.04	9.45				
312	80.31992	26.05528	120.98	109.78	11.2				
313	80.32417	26.05988	123.21	117.15	6.06				
314	80.3255	26.06132	122.09	121.58	0.51		Bindki	Banthara	212631
315	80.41352	26.15648	121.7	121.58	0.12	47	Bindki	Musarfa	212657
316	80.41644	26.15964	121.99	110.52	11.47				

317	80.41937	26.1628	123.88	106.83	17.05				
318	80.42629	26.17027	121.07	101.67	19.4				
319	80.43002	26.1743	120.95	106.83	14.12				
320	80.43534	26.18004	120.95	114.94	6.01				
321	80.43694	26.18177	119.42	119.37	0.05		Ghatampur	Viran Khera	209401
322	80.47929	26.22746	122.23	117.89	4.34	48	Kanpur	Puranpur	208001
323	80.48169	26.23004	121.54	111.26	10.28				
324	80.48435	26.23291	122.09	111.26	10.83				
325	80.48835	26.23722	121.88	111.26	10.62				
326	80.49208	26.24125	120.61	113.47	7.14				
327	80.49474	26.24412	123.17	121.58	1.59		Kanpur	Tiwaripur Salempur	208001
328	80.37272	26.06959	121.36	116.37	4.99	49	Bindki	Kapilmaiyke Kishunpur Kapile	212659
329	80.37535	26.07246	122.34	98.31	24.03				
330	80.37771	26.07503	122.41	97.1	25.31				
331	80.37954	26.07704	122.77	99.51	23.26				
332	80.38112	26.07875	121.13	103.12	18.01				
333	80.38243	26.08018	119.28	109.14	10.14				
334	80.38348	26.08133	119.82	112.76	7.06		Bindki	Kapilmaiyke Kishunpur Kapile	212659
335	80.46675	26.17204	116.53	116.53	0	50	Bindki	Bhaisauli	212657
336	80.47017	26.17576	115.02	106.73	8.29				
337	80.47359	26.17948	111.51	99.51	12				
338	80.47858	26.18492	117.55	91.08	26.47				
339	80.48227	26.18892	119.83	91.08	28.75				
340	80.48463	26.19149	120.45	97.1	23.35				
341	80.487	26.19407	118	105.53	12.47				
342	80.48858	26.19579	119.02	112.76	6.26		Kanpur	Mahuli	208001
343	80.51252	26.22181	120.8	120.8	0	51	Kanpur	Mahuli	209402

344	80.51567	26.22524	117.72	109.28	8.44				
345	80.51936	26.22925	123.97	99.62	24.35				
346	80.52304	26.23325	120.91	92.38	28.53				
347	80.52831	26.23897	119.26	96	23.26				
348	80.53252	26.24355	114.92	104.45	10.47				
349	80.53436	26.24555	119.48	114.11	5.37		Kanpur	Domanpur	209402
350	80.39798	26.05449	119.41	117.56	1.85	52	Bindki	Paparenda	212659
351	80.39906	26.05567	120.18	100.67	19.51				
352	80.39972	26.05639	119.73	100.67	19.06				
353	80.40124	26.05805	120.85	96.01	24.84				
354	80.40451	26.06161	121.69	100.67	21.02				
355	80.40603	26.06328	121.71	103.08	18.63				
356	80.40756	26.06494	120.57	115.14	5.43				
357	80.40821	26.06565	119.91	119.91	0		Bindki	Naraini	212659
358	80.47708	26.1407	116.46	116.46	0	53	Bindki	Dewmai	212657
359	80.47861	26.14236	116.7	103.25	13.45				
360	80.4797	26.14355	115.27	99.63	15.64				
361	80.48188	26.14592	115.11	97.21	17.9				
362	80.4858	26.1502	118.22	97.21	21.01				
363	80.48798	26.15257	117.14	103.25	13.89				
364	80.48864	26.15328	119.01	111.69	7.32				
365	80.48951	26.15423	118.03	118.03	0		Bindki	Tikara	212657
366	80.51635	26.18343	110.98	109.45	1.53	54	Bindki	Mirai	212665
367	80.51787	26.18509	109.13	94.96	14.17				
368	80.51962	26.18699	110.57	90.13	20.44				
369	80.52224	26.18984	109.44	90.13	19.31				
370	80.52464	26.19245	114.71	97.38	17.33				

371	80.52573	26.19364	116.1	109.45	6.65				
372	80.5266	26.19459	117.47	117.47	0		Kanpur	Mahuli	208001
373	80.38981	26.00141	117.74	117.56	0.18	55	Bindki	Babai	212631
374	80.39053	26.00219	119.45	109.11	10.34				
375	80.39318	26.00506	119.67	99.46	20.21				
376	80.39631	26.00845	120.64	99.46	21.18				
377	80.39945	26.01185	119.67	99.46	20.21				
378	80.40114	26.01367	121.85	101.87	19.98				
379	80.40282	26.0155	119.57	106.7	12.87				
380	80.40475	26.01759	119.57	112.73	6.84		Bindki	Naseniya	212657
381	80.48847	26.10812	121.72	117.56	4.16	56	Bindki	Rasulpur Bakevar	212657
382	80.49065	26.11047	120.92	101.87	19.05				
383	80.4933	26.11334	118.55	95.84	22.71				
384	80.49837	26.11881	120.07	92.22	27.85				
385	80.50127	26.12194	119.27	97.05	22.22				
386	80.50393	26.12481	118.12	110.32	7.8				
387	80.50562	26.12664	118.2	116.35	1.85		Bindki	Padhara	212657
388	80.41914	25.99192	119.5	119.31	0.19	57	Bindki	Dariyapur Chediya	212657
389	80.42019	25.99306	119.26	102.82	16.44				
390	80.42229	25.99536	119.5	96.23	23.27				
391	80.42419	25.99743	120.33	96.23	24.1				
392	80.42545	25.99881	119.56	100.62	18.94				
393	80.42755	26.0011	120.3	109.42	10.88				
394	80.42944	26.00317	118.15	120.41	-2.26		Bindki	Khanpur Kadim	212657
395	80.47909	26.05735	116.02	119.31	-3.29	58	Bindki	Udupur	212657
396	80.48245	26.06103	118.3	101.72	16.58				
397	80.4873	26.0663	118.67	95.13	23.54				

398	80.48793	26.06699	118.19	96.23	21.96				
399	80.48961	26.06883	116.09	112.71	3.38				
400	80.49087	26.07021	117.48	117.11	0.37		Bindki	Gandharvi	212657
401	80.51256	26.09385	118.71	112.71	6	59	Bindki	Jogapur	212657
402	80.51551	26.09706	119.4	95.13	24.27				
403	80.5193	26.10119	120.7	89.63	31.07				
404	80.52351	26.10578	119.23	96.23	23				
405	80.52583	26.1083	122.79	110.52	12.27		Bindki	Nama Mau	212665
406	80.47804	26.01442	111.67	109.19	2.48	60	Bindki	Mau	212657
407	80.47995	26.01648	110.44	96.85	13.59				
408	80.48122	26.01785	113.19	90	23.19				
409	80.48398	26.02082	107.91	85.2	22.71				
410	80.48928	26.02653	112.79	83.83	28.96				
411	80.49097	26.02835	110.96	92.06	18.9				
412	80.49415	26.03178	118.21	101.65	16.56				
413	80.49542	26.03315	117.48	108.5	8.98				
414	80.4967	26.03452	118.02	113.3	4.72		Bindki	Naraicha	212657
415	80.53423	26.07494	120.87	117.41	3.46	61	Bindki	Chak Maulvi	212657
416	80.53508	26.07585	120.04	107.13	12.91				
417	80.54017	26.08133	121.77	95.48	26.29				
418	80.54463	26.08612	119.5	96.85	22.65				
419	80.5476	26.08932	121.94	105.07	16.87				
420	80.55014	26.09206	120.86	114.67	6.19				
421	80.55121	26.0932	121.32	120.83	0.49		Bindki	Corsam	212665
422	80.57498	26.11876	122.59	118.78	3.81	62	Bindki	Pahur	212665
423	80.57922	26.12333	123.17	111.24	11.93				
424	80.58241	26.12675	122.93	103.7	19.23				

425	80.58687	26.13155	121.85	100.96	20.89				
426	80.58984	26.13474	122.65	106.44	16.21				
427	80.59196	26.13702	120.74	113.98	6.76				
428	80.59345	26.13862	120.14	118.09	2.05		Bindki	Sai	212665
429	80.55307	26.05298	122.33	118.94	3.39	63	Bindki	Rajipur	212657
430	80.55434	26.05437	120.36	115.97	4.39				
431	80.55498	26.05506	121.51	115.97	5.54				
432	80.55838	26.05876	119.37	113.85	5.52				
433	80.55987	26.06038	122.31	114.7	7.61				
434	80.56136	26.062	122.18	117.24	4.94				
435	80.56263	26.06339	122.7	119.36	3.34				
436	80.56752	26.06871	122.87	122.87	0		Bindki	Tenduli	212665
437	80.58177	26.08421	126.74	119.36	7.38	64	Bindki	Corsam	212665
438	80.58454	26.08721	120	111.73	8.27				
439	80.58666	26.08953	119.53	112.15	7.38				
440	80.5907	26.09392	120.35	114.7	5.65				
441	80.59304	26.09646	121.65	119.36	2.29		Bindki	Mauhar	212665
442	80.55569	26.01294	120.62	118.08	2.54	65	Bindki	Sarkandi	212635
443	80.5591	26.01663	118.72	113.28	5.44				
444	80.56101	26.01872	120.39	108.48	11.91				
445	80.56208	26.01987	118.66	107.79	10.87				
446	80.56421	26.02218	119.33	107.79	11.54				
447	80.56612	26.02426	120.29	111.22	9.07				
448	80.56761	26.02588	119.42	115.34	4.08				
449	80.56825	26.02657	119.71	117.4	2.31		Bindki	Chakmohiuddinpur	212635
450	80.61427	26.07646	125.73	120.14	5.59	66	Bindki	Rushtampur	212635
451	80.61576	26.07807	122.57	115.34	7.23				

452	80.61768	26.08015	122.45	109.16	13.29				
453	80.61853	26.08108	120.22	109.16	11.06				
454	80.62386	26.08685	124.03	113.28	10.75				
455	80.62599	26.08916	121.02	118.08	2.94				
456	80.62769	26.09101	122.64	122.64	0		Bindki	Guneer	212664
457	80.56755	25.98489	117.72	117.72	0	67	Bindki	Madna	212635
458	80.56925	25.98674	118	112.97	5.03				
459	80.57264	25.99045	118.5	110.22	8.28				
460	80.57477	25.99276	118.12	110.91	7.21				
461	80.57668	25.99484	117.1	112.97	4.13				
462	80.57774	25.996	117.42	115.02	2.4		Bindki	Chack Aulia Khara	212635
463	80.61107	26.03234	118.23	118.23	0	68	Bindki	Nandouli	212635
464	80.61405	26.03558	121.2	115.71	5.49				
465	80.61723	26.03905	120.06	112.28	7.78				
466	80.61978	26.04183	118.75	112.28	6.47				
467	80.62254	26.04483	119.62	115.02	4.6				
468	80.62318	26.04553	120.01	117.08	2.93		Bindki	Mahrha	212664
469	80.53915	25.91071	117.17	113.98	3.19	69	Bindki	Dada Sahimal Pur	212657
470	80.53936	25.91094	117.28	111.4	5.88				
471	80.54042	25.91209	113.7	103.68	10.02				
472	80.54148	25.91324	115.65	100.24	15.41				
473	80.54318	25.91509	118.09	101.1	16.99				
474	80.54445	25.91647	117.55	104.54	13.01				
475	80.54508	25.91716	118.06	106.25	11.81				
476	80.54657	25.91877	117.73	114.84	2.89		Bindki	Dada Sahimal Pur	212657
477	80.57963	25.95468	116.38	113.98	2.4	70	Bindki	Madna	212635
478	80.58112	25.95629	118.34	111.4	6.94				

479	80.58196	25.95721	117.75	103.68	14.07				
480	80.58345	25.95882	117.07	97.67	19.4				
481	80.58557	25.96112	116.76	93.38	23.38				
482	80.58726	25.96296	116.34	93.38	22.96				
483	80.58854	25.96434	116.23	98.53	17.7				
484	80.58981	25.96573	116.2	106.25	9.95				
485	80.59087	25.96688	116.07	115.7	0.37		Bindki	Korwa	212635
486	80.61865	25.99702	117.36	112.26	5.1	71	Bindki	Koriaya	212635
487	80.6195	25.99794	117.25	103.68	13.57				
488	80.6212	25.99979	117.59	97.67	19.92				
489	80.62247	26.00117	118.47	98.53	19.94				
490	80.62438	26.00324	119	101.96	17.04				
491	80.62608	26.00508	118.28	107.97	10.31				
492	80.62735	26.00646	119.35	115.7	3.65				
493	80.62757	26.00669	119.37	117.41	1.96		Bindki	Koriaya	212664
494	80.60463	25.93704	116.54	116.54	0	72	Bindki	Joniha	212635
495	80.60526	25.93773	115.33	107.97	7.36				
496	80.60738	25.94005	120.08	101.96	18.12				
497	80.6095	25.94236	118.19	96.81	21.38				
498	80.61141	25.94445	116.98	101.1	15.88				
499	80.61353	25.94676	118.61	107.11	11.5				
500	80.61607	25.94954	118.06	115.7	2.36		Bindki	Tikari Manouti	212635
501	80.63558	25.97085	120.38	117.41	2.97	73	Bindki	Deegh	212635
502	80.63685	25.97224	123.85	102.82	21.03				
503	80.64109	25.97687	117.41	92.52	24.89				
504	80.64322	25.97919	119.16	94.23	24.93				
505	80.64428	25.98034	119.36	101.96	17.4				

506	80.64576	25.98196	122.69	114.84	7.85				
507	80.64703	25.98335	121.43	121.43	0		Fatehpur	Ojhi Kharagsenpur Maibhadwa	212635
508	80.51761	25.8027	105.12	102.78	2.34	74	Fatehpur	Lalauli	212661
509	80.51761	25.8027	105.12	98.51	6.61				
510	80.51931	25.80454	105.17	94.23	10.94				
511	80.52122	25.80662	102.8	94.23	8.57				
512	80.52378	25.80939	103.36	96.8	6.56				
513	80.52463	25.81032	103.88	99.36	4.52		Fatehpur	Lalauli	212661
514	80.58784	25.87888	118.91	118.16	0.75	75	Bindki	Himmat Pur	212661
515	80.58847	25.87957	118.3	108.76	9.54				
516	80.58954	25.88072	118.2	106.2	12				
517	80.59252	25.88395	118.39	101.07	17.32				
518	80.5955	25.88718	120.1	100.22	19.88				
519	80.59934	25.89134	120.46	103.63	16.83				
520	80.60061	25.89272	119.33	109.62	9.71				
521	80.60168	25.89388	120.78	114.74	6.04		Bindki	Yaqubpur	212663
522	80.66029	25.95733	115.31	115.31	0	76	Fatehpur	Rampur	212663
523	80.66242	25.95964	116.58	101.07	15.51				
524	80.66626	25.96379	115.61	96.8	18.81				
525	80.66988	25.96771	118.42	96.8	21.62				
526	80.67329	25.9714	117.23	103.63	13.6				
527	80.675	25.97325	115.6	115.6	0		Bindki	Tapani	212663
528	80.60305	25.85349	117.73	117.01	0.72	77	Fatehpur	Rampur	212663
529	80.60665	25.85738	117.7	110.17	7.53				
530	80.60707	25.85784	117.4	107.89	9.51				
531	80.60834	25.85921	119.08	104.47	14.61				
532	80.61003	25.86104	118.75	104.47	14.28				

533	80.61236	25.86355	117.24	104.47	12.77				
534	80.61278	25.86401	117.62	105.61	12.01				
535	80.61595	25.86743	119.23	113.59	5.64				
536	80.61722	25.86881	118.31	118.16	0.15		Bindki	Tapani	212663
537	80.67668	25.93301	116.82	112.45	4.37	78	Fatehpur	Sahli	212661
538	80.67774	25.93416	116.41	102.19	14.22				
539	80.68028	25.9369	115.61	94.2	21.41				
540	80.68239	25.93918	115.18	94.2	20.98				
541	80.6843	25.94124	114.55	94.2	20.35				
542	80.68663	25.94375	114.88	98.76	16.12				
543	80.68811	25.94535	114.92	105.61	9.31				
544	80.68959	25.94695	115.32	112.45	2.87		Fatehpur	Asta	212661
545	80.61294	25.82147	117.6	116.83	0.77	79	Fatehpur	Singhaw	212661
546	80.61433	25.82297	119.18	113.2	5.98				
547	80.61688	25.82571	119.32	110.48	8.84				
548	80.61873	25.82771	119.84	110.48	9.36				
549	80.62035	25.82946	118.28	113.2	5.08				
550	80.62267	25.83195	119.48	115.92	3.56		Fatehpur	Bahuwa	212663
551	80.65	25.86141	119.76	115.92	3.84	80	Fatehpur	Bahidpur	212663
552	80.65162	25.86316	119.1	104.12	14.98				
553	80.65255	25.86416	118.52	100.49	18.03				
554	80.65464	25.8664	119.02	100.49	18.53				
555	80.65719	25.86915	119.74	101.4	18.34				
556	80.65788	25.8699	117.28	105.94	11.34				
557	80.65858	25.87065	117.76	110.48	7.28				
558	80.66066	25.87289	120.42	116.83	3.59				
559	80.73742	25.95549	116.09	112.29	3.8				

560	80.74415	25.96272	115.52	115.01	0.51				
561	80.74508	25.96372	115.9	102.31	13.59				
562	80.74531	25.96397	116.65	99.58	17.07				
563	80.74671	25.96547	116.32	99.58	16.74				
564	80.74879	25.96771	117	99.58	17.42				
565	80.75019	25.96921	116.57	101.4	15.17				
566	80.75181	25.97095	118.48	105.94	12.54				
567	80.75344	25.9727	117.58	112.29	5.29		Fatehpur	Korai	212601
568	80.68654	25.858	118.41	114.94	3.47	81	Fatehpur	Jindpur	212663
569	80.68654	25.858	118.41	114.94	3.47				
570	80.68871	25.86035	117.33	104.98	12.35				
571	80.6967	25.86897	118.64	98.64	20				
572	80.70226	25.87497	116.57	104.98	11.59				
573	80.70395	25.8768	117.01	108.6	8.41				
574	80.70903	25.88228	117.06	116.75	0.31		Fatehpur	Shah	212601
575	80.80615	25.98695	116.62	115.85	0.77	82	Fatehpur	Semarhta	212601
576	80.80712	25.988	115.75	112.23	3.52				
577	80.81076	25.99191	116.48	104.98	11.5				
578	80.81391	25.99531	117.49	105.89	11.6				
579	80.81609	25.99765	116.43	109.51	6.92				
580	80.81803	25.99974	116.36	114.04	2.32		Fatehpur	Semarhta	212601
581	80.67149	25.80034	120.24	120.24	0	83	Fatehpur	Bara Gaon	212663
582	80.67305	25.80203	116	106.79	9.21				
583	80.67565	25.80484	114.55	102.26	12.29				
584	80.67773	25.8071	114.51	101.36	13.15				
585	80.68058	25.81019	114.79	105.89	8.9				
586	80.68318	25.81301	117.15	112.23	4.92				

587	80.6837	25.81357	117.77	114.94	2.83		Fatehpur	Mardanpur	212663
588	80.72501	25.85835	114.47	111.32	3.15	84	Fatehpur	Mohanpur	212601
589	80.72813	25.86172	115.08	95.92	19.16				
590	80.73177	25.86567	114.95	94.11	20.84				
591	80.73463	25.86876	115.03	95.02	20.01				
592	80.73775	25.87214	116.83	108.6	8.23				
593	80.73853	25.87299	117.17	111.32	5.85		Fatehpur	Mohammadpur	212601
594	80.82621	25.96783	114.9	114.04	0.86	85	Fatehpur	Jamalpur	212601
595	80.82856	25.97036	114.85	103.17	11.68				
596	80.83299	25.97515	115	97.74	17.26				
597	80.83898	25.98162	115.11	97.74	17.37				
598	80.84132	25.98415	115.83	100.45	15.38				
599	80.84366	25.98668	116.91	107.7	9.21				
600	80.84523	25.98837	115.54	114.04	1.5		Fatehpur	Saleiyabad	212601
601	80.65866	25.74375	114.8	108.89	5.91	86	Fatehpur	Jukra	212621
602	80.65944	25.7446	113.14	103.56	9.58				
603	80.6623	25.74769	117.75	100	17.75				
604	80.66386	25.74938	117.4	102.67	14.73				
605	80.66724	25.75303	117.33	109.78	7.55				
606	80.66854	25.75444	117.47	114.22	3.25		Fatehpur	Jukra	212621
607	80.75106	25.84357	114.73	111.56	3.17	87	Fatehpur	Samiyana	212621
608	80.75549	25.84834	115.84	100	15.84				
609	80.75888	25.852	116.04	91.11	24.93				
610	80.76096	25.85425	115.52	91.11	24.41				
611	80.7667	25.86043	114.83	93.78	21.05				
612	80.76826	25.86211	117.64	96.44	21.2				
613	80.77217	25.86633	115.81	106.22	9.59		Fatehpur	Fatehnagar Karsabha	212601

614	80.86737	25.96888	113.14	112.44	0.7	88	Fatehpur	Sangrampur	229404
615	80.86946	25.97113	115.67	107.11	8.56				
616	80.87103	25.97281	115.41	104.44	10.97				
617	80.87364	25.97562	117.02	103.56	13.46				
618	80.87651	25.97871	116.11	103.56	12.55				
619	80.87912	25.98152	114.5	104.44	10.06				
620	80.88121	25.98377	116.25	110.67	5.58				
621	80.88304	25.98573	115.58	115.58	0		Fatehpur	Mansoorpur Modhanpur	229404
622	80.89688	26.00061	117.21	117.21	0	89	Fatehpur	Malipur	229404
623	80.89792	26.00174	116.6	113.33	3.27				
624	80.90184	26.00595	115.57	105.33	10.24				
625	80.90419	26.00848	115.1	105.33	9.77				
626	80.90785	26.01241	117.8	105.33	12.47				
627	80.90994	26.01466	117.1	111.56	5.54				
628	80.91099	26.01578	118.91	116	2.91		Fatehpur	Chandipur	229404
629	80.79863	25.85459	115.66	114.2	1.46	90	Fatehpur	Fulwamau	212601
630	80.79948	25.85552	115.11	105.39	9.72				
631	80.80203	25.85829	113.84	99.98	13.86				
632	80.80607	25.8627	114.56	96.59	17.97				
633	80.80756	25.86432	114.89	102.01	12.88				
634	80.80968	25.86663	115.23	108.78	6.45				
635	80.81032	25.86733	115.62	110.13	5.49		Fatehpur	Lotha	212601
636	80.87564	25.93839	113.81	113.52	0.29	91	Fatehpur	Mishramau	212645
637	80.87649	25.93932	114.55	106.75	7.8				
638	80.88118	25.94441	113.63	94.56	19.07				
639	80.88394	25.94742	113.43	94.56	18.87				
640	80.88778	25.95158	114.02	96.59	17.43				

641	80.88969	25.95367	115.14	104.04	11.1				
642	80.89182	25.95598	116.12	112.17	3.95		Fatehpur	Padri	212651
643	80.90939	25.97507	115.97	114.93	1.04	92	Fatehpur	Farsi	212651
644	80.91281	25.97879	115.5	104.72	10.78				
645	80.91702	25.98336	113.61	101.31	12.3				
646	80.92018	25.98679	115.31	104.72	10.59				
647	80.92229	25.98907	113.78	112.66	1.12		Fatehpur	Bahvlolpur	212651
648	80.95388	26.02336	119.76	116.06	3.7	93	Fatehpur	Lalipur	212654
649	80.95783	26.02765	116.5	99.04	17.46				
650	80.9602	26.03022	114.44	99.04	15.4				
651	80.96336	26.03365	119.17	101.31	17.86				
652	80.96573	26.03622	117.78	108.12	9.66				
653	80.96652	26.03707	116.54	116.06	0.48		Fatehpur	Naugaon	212654
654	80.76285	25.77296	114.65	111.35	3.3	94	Fatehpur	Mauli	212621
655	80.76373	25.77391	119.08	108.87	10.21				
656	80.76572	25.77605	115.58	103.11	12.47				
657	80.7677	25.7782	117.41	103.11	14.3				
658	80.77079	25.78153	116.86	103.93	12.93				
659	80.77277	25.78368	120.5	107.23	13.27				
660	80.77564	25.78677	113.44	112.17	1.27				
661	80.77652	25.78772	115.12	114.64	0.48		Fatehpur	Bavanra	212621
662	80.88819	25.90821	115.49	112.17	3.32	95	Fatehpur	Sarai Shahid Khan	212645
663	80.89195	25.91226	113.85	112.17	1.68				
664	80.89615	25.91678	112.26	98.99	13.27				
665	80.89747	25.91821	111.41	98.99	12.42				
666	80.90521	25.92654	118.2	98.16	20.04				
667	80.90631	25.92773	115.36	99.81	15.55				

668	80.90808	25.92963	114.73	104.75	9.98				
669	80.90896	25.93059	115.23	109.7	5.53				
670	80.91007	25.93178	114.08	113.82	0.26		Fatehpur	Hasanpur	212645
671	80.97301	25.9995	116	109.36	6.64	96	Fatehpur	Govardhanpur	212654
672	80.97512	26.00176	113.53	103.68	9.85				
673	80.97775	26.00459	112.92	99.13	13.79				
674	80.98222	26.0094	115.57	101.41	14.16				
675	80.9838	26.0111	117.1	105.95	11.15				
676	80.98512	26.01251	115.98	111.64	4.34		Fatehpur	Jamrawan	212654
677	80.80609	25.77754	115.09	112.94	2.15	97	Fatehpur	Sarki	212621
678	80.80738	25.77894	114.37	108.82	5.55				
679	80.80971	25.78146	116.24	103.88	12.36				
680	80.81332	25.78538	118.11	105.52	12.59				
681	80.81513	25.78734	114.98	111.29	3.69				
682	80.81591	25.78818	114.31	113.76	0.55				
683	80.89736	25.87634	115.05	112.94	2.11				
684	80.90099	25.88025	115.16	105.52	9.64				
685	80.90409	25.88361	113	98.93	14.07				
686	80.9059	25.88557	113.99	96.46	17.53				
687	80.9072	25.88697	113.73	96.46	17.27				
688	80.90927	25.88921	119.32	102.23	17.09				
689	80.91082	25.89089	115.33	107.17	8.16				
690	80.91341	25.89368	114.9	114.59	0.31		Fatehpur	Mohammadpur Nabada	212645
691	80.93334	25.91523	114.94	114.59	0.35	98	Fatehpur	Bhadoae	212645
692	80.93516	25.91718	115.04	103.05	11.99				
693	80.93956	25.92194	114.01	97.29	16.72				
694	80.9437	25.92641	116.4	98.93	17.47				

695	80.94578	25.92865	116.42	106.35	10.07				
696	80.94811	25.93117	114.58	113.76	0.82		Fatehpur	Makanpur	212651
697	80.83034	25.76152	113.68	110.93	2.75	99	Fatehpur	Besandi	212620
698	80.83155	25.76283	114.7	107.25	7.45				
699	80.83215	25.76348	114.45	105.4	9.05				
700	80.83397	25.76544	116.71	104.17	12.54				
701	80.83619	25.76784	116.43	104.17	12.26				
702	80.8374	25.76915	118.56	109.7	8.86				
703	80.83801	25.7698	115.73	113.39	2.34				
704	80.83831	25.77013	115.25	115.24	0.01		Fatehpur	Besandi	212620
705	80.86192	25.79564	114.76	110.32	4.44	100	Fatehpur	Bilari Maw	212620
706	80.86293	25.79672	113.81	107.25	6.56				
707	80.86374	25.7976	114.21	104.17	10.04				
708	80.86525	25.79923	113.19	103.56	9.63				
709	80.86636	25.80043	114.15	103.56	10.59				
710	80.86747	25.80163	116.35	105.4	10.95				
711	80.86838	25.80261	113.07	110.32	2.75				
712	80.86858	25.80283	113.37	112.78	0.59				
713	80.89019	25.82615	110.63	110.63	0				
714	80.89241	25.82855	112.29	110.32	1.97				
715	80.89383	25.83007	111.1	102.94	8.16				
716	80.89494	25.83127	111.65	96.18	15.47				
717	80.89676	25.83323	111.07	95.57	15.5				
718	80.89948	25.83617	110.55	99.87	10.68				
719	80.9008	25.83759	113.88	110.93	2.95		Fatehpur	Chhitampur	212645
720	80.91928	25.85753	115.16	110.93	4.23	101	Fatehpur	Haswa	212645
721	80.91979	25.85807	114.06	106.02	8.04				

722	80.9209	25.85927	114.7	101.71	12.99				
723	80.92454	25.86319	114.05	96.79	17.26				
724	80.92656	25.86537	113.89	105.4	8.49				
725	80.92818	25.86712	113.34	113.34	0		Fatehpur	Haswa	212645
726	80.95628	25.8974	116.05	106.02	10.03	102	Fatehpur	Mohammadpur Kla	212645
727	80.95739	25.8986	115.33	102.33	13				
728	80.95992	25.90132	112.27	95.57	16.7				
729	80.96234	25.90393	111.66	96.18	15.48				
730	80.96507	25.90687	112.51	109.09	3.42		Fatehpur	Semra	212651
731	81.02356	25.96981	112.29	108.48	3.81	103	Fatehpur	Mawae	212651
732	81.02426	25.97058	111.82	103.56	8.26				
733	81.02619	25.97264	112.93	101.1	11.83				
734	81.0274	25.97395	113.02	101.1	11.92				
735	81.02821	25.97482	113.04	104.17	8.87				
736	81.02852	25.97515	113.05	106.63	6.42				
737	81.02902	25.97569	113.77	110.93	2.84		Fatehpur	Hasanpur	212650
738	80.8672	25.76049	115.45	111.43	4.02	104	Fatehpur	Harnawa	212620
739	80.86811	25.76147	115.06	103.46	11.6				
740	80.86962	25.7631	114.38	101.63	12.75				
741	80.87154	25.76517	114.97	102.24	12.73				
742	80.87245	25.76616	113.09	105.91	7.18				
743	80.87305	25.76681	113.62	110.2	3.42				
744	80.87305	25.76681	113.62	110.2	3.42		Fatehpur	Asothar	212620
745	80.9218	25.81945	110.87	109.59	1.28	105	Fatehpur	Misa	212622
746	80.92291	25.82065	111.59	101.01	10.58				
747	80.92372	25.82152	110.93	98.56	12.37				
748	80.92433	25.82218	110.29	98.56	11.73				

749	80.92584	25.82381	113.77	101.01	12.76				
750	80.92645	25.82447	114.57	104.69	9.88				
751	80.92695	25.82501	115.99	109.59	6.4				
752	80.92735	25.82545	116.7	112.04	4.66		Fatehpur	Misa	212622
753	80.96837	25.86969	114.43	111.43	3	106	Fatehpur	Rampur Thariyanw	212622
754	80.96928	25.87067	113.4	104.69	8.71				
755	80.96998	25.87143	111.47	99.18	12.29				
756	80.97069	25.87219	112.74	94.89	17.85				
757	80.9715	25.87306	112.18	93.05	19.13				
758	80.97261	25.87426	110.05	94.89	15.16				
759	80.97332	25.87502	112.67	99.79	12.88				
760	80.97382	25.87557	109.73	104.08	5.65				
761	80.97443	25.87622	110.77	107.75	3.02		Fatehpur	Balhemau	212622
762	81.01305	25.91783	112.59	107.75	4.84	107	Fatehpur	Ashikpur Aoreya	212622
763	81.01396	25.91881	112.28	103.46	8.82				
764	81.01457	25.91946	112.13	101.01	11.12				
765	81.01548	25.92045	112.52	99.18	13.34				
766	81.01609	25.9211	112.54	99.18	13.36				
767	81.017	25.92208	112.85	100.4	12.45				
768	81.01831	25.92349	112.76	104.69	8.07				
769	81.01892	25.92415	112.09	108.98	3.11		Fatehpur	Sakhiyanwa	212650
770	81.0434	25.9505	113.69	108.98	4.71	108	Khaga	Makhdumpur Khurd	212650
771	81.04411	25.95126	112.9	106.53	6.37				
772	81.04553	25.95279	113.03	101.63	11.4				
773	81.04654	25.95388	113.81	100.4	13.41				
774	81.04846	25.95595	112.38	98.56	13.82				
775	81.04917	25.95671	112.19	100.4	11.79				

776	81.04988	25.95747	111.28	104.69	6.59				
777	81.05038	25.95801	111.65	109.59	2.06		Khaga	Gauspur	212650
778	80.9795	25.83737	112.18	111.43	0.75	109	Fatehpur	Bahrampur	212622
779	80.98082	25.83879	113.33	105.91	7.42				
780	80.98203	25.8401	112.27	98.56	13.71				
781	80.98284	25.84096	111.14	96.73	14.41				
782	80.98496	25.84325	117.4	95.5	21.9				
783	80.98759	25.84609	116.66	101.63	15.03				
784	80.9888	25.84739	113.19	111.43	1.76		Fatehpur	Rampur Thariyanw	212622
785	81.02601	25.88747	113.53	108.36	5.17	110	Khaga	Nahyaia	212622
786	81.02814	25.88975	111.66	101.01	10.65				
787	81.02905	25.89073	112.53	94.89	17.64				
788	81.03127	25.89313	113.1	91.83	21.27				
789	81.03319	25.8952	116.26	97.95	18.31				
790	81.03411	25.89618	116.2	107.14	9.06				
791	81.03471	25.89683	114.34	113.88	0.46		Khaga	Bhairampur	212650
792	81.051	25.91436	112.84	111.43	1.41	111	Khaga	Mawaiya	212650
793	81.05171	25.91512	112.67	104.69	7.98				
794	81.05252	25.91599	111.85	102.24	9.61				
795	81.05373	25.9173	111.4	101.63	9.77				
796	81.05566	25.91937	110.93	102.24	8.69				
797	81.05627	25.92002	111.67	105.3	6.37				
798	81.05697	25.92078	112.12	110.2	1.92		Khaga	Champatpur	212650
799	81.06912	25.93384	109.75	106.53	3.22	112	Khaga	Razipur Chhulaha	212650
800	81.07114	25.93602	111.79	98.56	13.23				
801	81.07317	25.9382	110.93	93.66	17.27				
802	81.07469	25.93983	110.62	92.44	18.18				

803	81.0755	25.9407	111.99	94.28	17.71				
804	81.07702	25.94233	111.81	101.01	10.8				
805	81.07762	25.94299	111.45	105.91	5.54				
806	81.07793	25.94331	110.4	108.36	2.04		Khaga	Nizamuddin	212650
807	80.91143	25.72258	111.96	111.76	0.2	113	Fatehpur	Sarkandi	212620
808	80.91201	25.7232	111.64	105.46	6.18				
809	80.91346	25.72477	115.47	103.52	11.95				
810	80.91558	25.72708	112.39	103.52	8.87				
811	80.91693	25.72854	112.16	106.91	5.25				
812	80.9177	25.72938	111.79	111.79	0		Fatehpur	Sarkandi	212658
813	80.96994	25.78597	111.44	110.79	0.65	114	Fatehpur	Dharmpur Sato	212622
814	80.97148	25.78765	113.32	100.12	13.2				
815	80.97264	25.7889	111.25	97.7	13.55				
816	80.97342	25.78974	110.59	98.18	12.41				
817	80.97438	25.79079	112.38	100.12	12.26				
818	80.97496	25.79141	113.25	104.49	8.76				
819	80.97602	25.79257	112.52	111.27	1.25		Fatehpur	Aoreai	212622
820	81.00994	25.82927	113.15	112.24	0.91	115	Fatehpur	Teksari Bujurg	212622
821	81.0112	25.83063	111.89	105.94	5.95				
822	81.01217	25.83168	113.85	104.49	9.36				
823	81.01381	25.83346	113.44	104.49	8.95				
824	81.01516	25.83492	113.56	108.36	5.2				
825	81.01594	25.83576	112.05	112.05	0		Fatehpur	Rattpur	212622
826	81.05133	25.87402	113.36	108.85	4.51	116	Khaga	Salampur	212650
827	81.05201	25.87476	112.8	102.06	10.74				
828	81.05385	25.87674	110.79	98.18	12.61				
829	81.05569	25.87873	111.62	98.67	12.95				

830	81.05772	25.88092	112.31	105.94	6.37				
831	81.05888	25.88218	112.85	110.79	2.06		Khaga	Dihwa	212652
832	81.09895	25.92545	111.65	111.27	0.38	117	Khaga	Kasraon	212652
833	81.10088	25.92754	110.18	105.94	4.24				
834	81.10263	25.92942	110.41	102.06	8.35				
835	81.10534	25.93235	110.63	101.58	9.05				
836	81.1065	25.9336	109.94	101.09	8.85				
837	81.10805	25.93528	112.03	104.49	7.54				
838	81.10902	25.93632	111.87	110.3	1.57		Khaga	Kura Karnai	212650
839	80.98169	25.75576	110.4	110.4	0	118	Fatehpur	Sato Joga	212620
840	80.9826	25.75674	113.29	103.21	10.08				
841	80.98412	25.75837	111.71	98.91	12.8				
842	80.98492	25.75925	113.35	97.68	15.67				
843	80.98704	25.76153	114.94	98.91	16.03				
844	80.98775	25.7623	113.35	102.59	10.76				
845	80.98906	25.76371	113.28	106.89	6.39				
846	80.99037	25.76513	110.92	110.92	0		Fatehpur	Sato Peet	212622
847	81.00834	25.78452	110.12	110.12	0	119	Khaga	Khemkaranpur Basai	212622
848	81.00935	25.78561	109.28	100.75	8.53				
849	81.01036	25.7867	109.36	99.52	9.84				
850	81.01198	25.78845	110.71	100.14	10.57				
851	81.01359	25.79019	110.46	103.82	6.64				
852	81.0142	25.79084	110.42	108.11	2.31				
853	81.0146	25.79128	109.57	109.34	0.23		Khaga	Manjhteni	212622
854	81.05633	25.83627	112	112	0	120	Khaga	Khasmau	212622
855	81.05653	25.83648	112.31	105.05	7.26		Khaga	Sevant	212622
856	81.05784	25.8379	111.82	98.91	12.91				

857	81.05835	25.83845	111.71	97.68	14.03				
858	81.05926	25.83943	111.69	97.68	14.01				
859	81.05986	25.84008	111.69	98.3	13.39				
860	81.06219	25.84259	109.97	105.05	4.92				
861	81.0628	25.84324	109.77	108.11	1.66				
862	81.0633	25.84378	110.5	110.5	0		Khaga	Sevant	212622
863	81.12135	25.90629	111.4	108.73	2.67	121	Khaga	Raichandrapur	212652
864	81.12185	25.90683	111.73	101.98	9.75				
865	81.12428	25.90944	111.81	98.3	13.51				
866	81.12479	25.90999	113.76	98.3	15.46				
867	81.1256	25.91086	112.47	99.52	12.95				
868	81.12742	25.91282	110.55	104.43	6.12				
869	81.12833	25.9138	109.01	109.01	0		Khaga	Sithaura	212652
870	81.14807	25.93503	114.85	111.18	3.67	122	Khaga	Akbarpur Churai	212652
871	81.14908	25.93611	113.27	105.05	8.22				
872	81.15019	25.93731	114.19	101.98	12.21				
873	81.1509	25.93807	114.69	101.98	12.71				
874	81.15374	25.94112	114.38	98.91	15.47				
875	81.15495	25.94243	111.7	107.5	4.2				
876	81.15566	25.94319	111.56	111.56	0		Khaga	Akbarpur Churai	212652
877	81.04129	25.77814	113.03	110.66	2.37	123	Khaga	Tani	212622
878	81.04187	25.77876	117.42	107.01	10.41				
879	81.04341	25.78044	113.26	100.92	12.34				
880	81.04477	25.7819	114.9	100.92	13.98				
881	81.04535	25.78252	112.17	102.14	10.03				
882	81.0468	25.78409	109.19	109.19	0				
883	81.0468	25.78409	109.19	109.19	0		Khaga	Tani	212622

884	81.07349	25.81294	110.75	109.44	1.31	124	Khaga	Bhogalpur	212622
885	81.07572	25.81534	113.29	103.96	9.33				
886	81.07813	25.81796	112.55	98.49	14.06				
887	81.08036	25.82036	112.54	97.88	14.66				
888	81.08229	25.82245	113.67	100.92	12.75				
889	81.08346	25.8237	111.87	105.18	6.69				
890	81.0852	25.82559	114.26	109.44	4.82				
891	81.08568	25.82611	114.73	112.48	2.25		Khaga	Teuja	212622
892	81.15025	25.8958	113.9	113.09	0.81	125	Khaga	Hari Rampur Kaithola	212652
893	81.15287	25.89862	112.32	103.96	8.36				
894	81.155	25.90091	112.67	98.49	14.18				
895	81.15665	25.90269	114.23	103.96	10.27				
896	81.15849	25.90467	113.68	113.09	0.59		Khaga	Aurangabad	212652
897	81.02333	25.71425	112.74	111.73	1.01	126	Khaga	Jagatpur	212622
898	81.02477	25.71582	116.29	100.82	15.47				
899	81.02631	25.71749	118.19	96.57	21.62				
900	81.02737	25.71865	113.6	97.18	16.42				
901	81.02882	25.72022	111.3	100.21	11.09				
902	81.03036	25.7219	113.2	105.67	7.53				
903	81.03171	25.72336	113.17	110.51	2.66		Khaga	Silmi Garhwa	212622
904	81.08614	25.78256	111.74	109.3	2.44	127	Khaga	Tilkapur	212655
905	81.0873	25.78381	112.61	102.03	10.58				
906	81.08903	25.7857	116.45	98.39	18.06				
907	81.09193	25.78884	112.66	97.79	14.87				
908	81.09289	25.78989	109.75	102.63	7.12				
909	81.09357	25.79062	111.16	108.09	3.07		Khaga	Sangrampur Sani	212622
910	81.10359	25.80152	114.97	111.73	3.24	128	Khaga	Sarsai Buzurg	212652

911	81.10533	25.8034	112.57	105.67	6.9		Khaga	Sarsai Buzurg	212652
912	81.10764	25.80591	113.96	102.63	11.33				
913	81.10899	25.80738	111.28	106.27	5.01				
914	81.11015	25.80864	113.12	111.12	2		Khaga	Sarsai Buzurg	212652
915	81.13156	25.83189	110.54	107.6	2.94	129	Khaga	Ajnai	212652
916	81.13253	25.83293	111.33	98.49	12.84				
917	81.13369	25.83419	114.96	89.98	24.98				
918	81.13562	25.83628	114.1	89.37	24.73				
919	81.13677	25.83754	111	99.09	11.91				
920	81.13784	25.83869	110.32	108.21	2.11		Khaga	Prayasdaspur	212652
921	81.23122	25.93992	113.96	110.64	3.32	130	Unchahar	Kotiya Chitra	229401
922	81.23276	25.94159	113.03	103.96	9.07				
923	81.23412	25.94306	114.97	103.35	11.62				
924	81.23615	25.94525	114.27	107.6	6.67				
925	81.23692	25.94609	111.58	111.58	0		Unchahar	Shahjadpur Mu.	229401
926	80.9817	25.63035	100.45	100.45	0	131	Khaga	Jagdishpur	212658
927	80.98223	25.63093	100.88	88.35	12.53				
928	80.98289	25.63163	102.32	91.41	10.91				
929	80.98412	25.63296	101.23	88.96	12.27				
930	80.98499	25.6339	101.31	92.63	8.68				
931	80.98634	25.63537	103.08	99.36	3.72				
932	81.01215	25.66326	110.29	109.15	1.14				
933	81.01321	25.66441	110.02	104.26	5.76				
934	81.01476	25.66608	111.59	101.81	9.78				
935	81.01659	25.66807	105.67	98.14	7.53				
936	81.0193	25.67099	106.13	96.3	9.83				
937	81.02065	25.67245	105.31	98.14	7.17				

938	81.02162	25.6735	103.85	102.42	1.43				
939	81.0223	25.67423	105.09	104.87	0.22		Khaga	Itolipur	212658
940	81.02829	25.6807	106.64	106.09	0.55	132	Khaga	Beyoti	212658
941	81.02926	25.68175	107.43	97.53	9.9				
942	81.03081	25.68342	108.12	95.69	12.43				
943	81.03303	25.68582	107.65	98.14	9.51				
944	81.03371	25.68656	106.33	106.33	0		Khaga	Beyoti	212658
945	81.04174	25.69522	105.63	104.26	1.37	133	Khaga	Niharwa	212622
946	81.0428	25.69637	105.35	96.3	9.05				
947	81.04425	25.69794	102.83	93.25	9.58				
948	81.04512	25.69888	103.81	96.3	7.51				
949	81.04541	25.69919	105.11	101.81	3.3				
950	81.04561	25.6994	105.52	103.03	2.49		Khaga	Ranipur Bahera	212622
951	81.0938	25.75141	116.51	114.05	2.46	134	Khaga	Hardoan	212655
952	81.09496	25.75266	114.93	103.03	11.9				
953	81.09748	25.75537	111.67	95.69	15.98				
954	81.09903	25.75705	113.77	106.09	7.68				
955	81.1	25.75809	115.09	114.05	1.04		Khaga	Hardoan	212655
956	81.13215	25.79275	106.43	106.43	0	135	Khaga	Gopalpuuuuur	212655
957	81.13332	25.794	109.36	101.91	7.45				
958	81.13467	25.79546	107.94	97.63	10.31				
959	81.13642	25.79734	109.09	93.35	15.74				
960	81.13758	25.79859	110.65	93.96	16.69				
961	81.13903	25.80016	111.96	98.24	13.72				
962	81.14029	25.80152	114.47	104.36	10.11				
963	81.14078	25.80204	111.74	108.64	3.1		Khaga	Gopalpuuuuur	212655
964	81.0435	25.65389	110.31	108.03	2.28	136	Khaga	Sarauli	212658

965	81.04477	25.65525	108.27	104.16	4.11				
966	81.0505	25.66138	108.46	102.22	6.24				
967	81.05178	25.66275	111.74	102.22	9.52				
968	81.05284	25.66388	109.54	105.45	4.09				
969	81.05708	25.66842	107.81	104.8	3.01				
970	81.05836	25.66979	104.41	99.64	4.77				
971	81.05963	25.67115	101.03	98.99	2.04				
972	81.06175	25.67342	106.91	101.58	5.33				
973	81.06282	25.67456	108.87	104.8	4.07				
974	81.06388	25.67569	110.78	108.03	2.75		Khaga	Sahabpur	212658
975	81.10295	25.71748	111.87	111.26	0.61	137	Khaga	Bahlolpur Aelai	212655
976	81.10954	25.72452	109.43	109.43	0				
977	81.11145	25.72657	108.82	100.28	8.54				
978	81.11655	25.73202	107.34	97.7	9.64				
979	81.11847	25.73406	108.57	103.51	5.06				
980	81.1208	25.73656	106.87	106.87	0		Khaga	Phulpur	212655
981	81.15035	25.76811	109.72	109.72	0	138	Khaga	Budwan	212655
982	81.15226	25.77016	111.16	101.58	9.58				
983	81.15567	25.77379	108.41	97.7	10.71				
984	81.15822	25.77652	108.22	97.7	10.52				
985	81.16013	25.77856	108.23	102.87	5.36				
986	81.16141	25.77992	108.13	108.13	0		Khaga	Budwan	212655
987	81.17545	25.7949	108.91	108.67	0.24	139	Khaga	Katsuwa	212655
988	81.17609	25.79558	108.62	100.28	8.34				
989	81.178	25.79763	106.83	97.7	9.13				
990	81.18247	25.80239	107.81	96.41	11.4				
991	81.18502	25.80511	109.36	99.64	9.72				

992	81.18608	25.80625	108.94	106.74	2.2		Khaga	Jagjivanpur	212653
993	81.20481	25.82622	110.99	110.61	0.38	140	Khaga	Sultanpur Ghosh	212653
994	81.20651	25.82804	115.2	105.45	9.75				
995	81.21184	25.83371	110.67	102.87	7.8				
996	81.21311	25.83507	111.35	104.16	7.19				
997	81.21524	25.83734	112.7	108.67	4.03		Khaga	Auramha	212653
998	81.06395	25.63498	111.06	111.06	0	141	Khaga	Rari	212658
999	81.06481	25.63591	113.52	108.19	5.33				
1000	81.06546	25.6366	109.52	107.52	2				
1001	81.06891	25.64032	110.68	103.5	7.18				
1002	81.07128	25.64288	109.73	103.5	6.23				
1003	81.07365	25.64543	109.2	104.17	5.03				
1004	81.07602	25.64799	110.29	106.85	3.44				
1005	81.07796	25.65009	108.85	108.85	0		Khaga	Rari	212658
1006	81.19557	25.77672	112.23	107.52	4.71	142	Khaga	Barkatpur	212655
1007	81.19903	25.78044	106.5	101.48	5.02				
1008	81.20011	25.7816	107.71	99.47	8.24				
1009	81.2053	25.78717	108.61	97.46	11.15				
1010	81.20767	25.78973	108.2	94.78	13.42				
1011	81.21048	25.79275	108.77	94.78	13.99				
1012	81.21308	25.79553	109.39	96.12	13.27				
1013	81.2161	25.79878	115.3	101.48	13.82				
1014	81.21891	25.8018	111.85	105.51	6.34				
1015	81.21977	25.80273	110.8	107.52	3.28		Khaga	Arampur Basai	212653
1016	81.05824	25.58509	110.09	105.41	4.68	143	Khaga	Garha	212658
1017	81.0591	25.58601	109.97	100.19	9.78				
1018	81.06146	25.58855	108.67	98.44	10.23				

1019	81.06788	25.59548	106.76	94.96	11.8				
1020	81.07195	25.59987	107.4	100.19	7.21				
1021	81.07388	25.60195	107	105.41	1.59				
1022	81.07474	25.60288	107.88	107.88	0		Khaga	Maheshpur	212658
1023	81.09192	25.62139	103.76	101.74	2.02	144	Khaga	Rari	212658
1024	81.09321	25.62278	103.19	95.09	8.1				
1025	81.09858	25.62857	107.14	88.44	18.7				
1026	81.10094	25.63112	104.75	87.33	17.42				
1027	81.1046	25.63506	109.86	95.09	14.77				
1028	81.10567	25.63622	110.17	102.85	7.32				
1029	81.10675	25.63738	107.77	107.77	0		Khaga	Saidpur Bhurahi	212658
1030	81.12834	25.66063	112.22	111.21	1.01	145	Khaga	Basva	212655
1031	81.12984	25.66224	106.99	104.25	2.74				
1032	81.13327	25.66594	108.12	100.19	7.93				
1033	81.13692	25.66987	107.61	99.6	8.01				
1034	81.13885	25.67194	103.96	103.67	0.29				
1035	81.13928	25.67241	102.55	102.55	0		Khaga	Basva	212655
1036	81.23719	25.77768	110.37	105.99	4.38	146	Khaga	Allipur	212653
1037	81.24041	25.78114	106.73	103.67	3.06				
1038	81.24385	25.78484	106.11	94.96	11.15				
1039	81.24836	25.78968	106.12	93.22	12.9				
1040	81.25331	25.79499	108.32	94.38	13.94				
1041	81.2561	25.79799	113.62	101.93	11.69				
1042	81.25782	25.79984	112.44	110.05	2.39		Khaga	Mohammadpur Gaunti	212653
1043	81.15485	25.64755	107.29	107.29	0	147	Khaga	Chhadaini	212655
1044	81.15636	25.64918	109.33	104.52	4.81				
1045	81.16048	25.65361	107.37	102.13	5.24				

1046	81.16199	25.65523	107.63	105.12	2.51				
1047	81.16329	25.65663	110.63	110.5	0.13		Khaga	Kishunpur Chirai	212655
1048	81.27129	25.77249	108.1	105.72	2.38	148	Khaga	Sonawer Dei	212653
1049	81.27324	25.77458	107.82	101.54	6.28				
1050	81.27519	25.77667	107.4	100.34	7.06				
1051	81.27736	25.779	106.46	100.34	6.12				
1052	81.27997	25.78179	107.1	100.34	6.76				
1053	81.28062	25.78249	105.66	101.54	4.12				
1054	81.28171	25.78365	106.77	103.93	2.84				
1055	81.28236	25.78435	106.9	106.9	0		Khaga	Mohammadpur Gaunti	212653
1056	81.09849	25.54437	96.21	93.47	2.74	149	Khaga	Kot	212656
1057	81.09897	25.54489	94.51	86.8	7.71				
1058	81.10003	25.54604	91.23	83.09	8.14				
1059	81.10147	25.5476	90.99	80.86	10.13				
1060	81.10263	25.54885	88.94	81.61	7.33				
1061	81.10311	25.54937	88.7	83.09	5.61				
1062	81.10349	25.54979	90.39	87.54	2.85		Khaga	Bibharpur	212656
1063	81.17714	25.62948	107.94	105.34	2.6	150	Khaga	Jahangir Nagar	212656
1064	81.17791	25.63031	106.58	101.63	4.95				
1065	81.17897	25.63146	108.05	98.66	9.39				
1066	81.18003	25.6326	109.22	97.18	12.04				
1067	81.18148	25.63416	109.83	98.66	11.17				
1068	81.18235	25.6351	107.39	102.37	5.02				
1069	81.18283	25.63562	107.73	106.82	0.91				
1070	81.18292	25.63572	108.16	107.56	0.6		Khaga	Keshoraipur Kawatmai	212656
1071	81.29529	25.757	105.39	103.11	2.28	151	Sirathu	Chak Koreo Pure Faiz	212205
1072	81.29596	25.75773	105.67	97.18	8.49				

1073	81.29703	25.75888	108.49	93.47	15.02				
1074	81.29867	25.76064	105.74	91.25	14.49				
1075	81.29982	25.76189	106.28	91.25	15.03				
1076	81.3005	25.76262	107.85	93.47	14.38				
1077	81.30127	25.76345	106.82	95.7	11.12				
1078	81.30195	25.76418	108.68	98.66	10.02				
1079	81.30243	25.7647	107.56	101.63	5.93				
1080	81.30359	25.76595	106.21	106.21	0		Sirathu	Kamangarpur Daudmay	212205
1081	81.21141	25.624	106.78	106.65	0.13	152	Khaga	Sandva	212656
1082	81.2142	25.62703	107.92	103.55	4.37				
1083	81.21935	25.6326	107.52	101.4	6.12				
1084	81.22023	25.63356	108.43	102.6	5.83				
1085	81.22258	25.6361	105.38	104.5	0.88		Sirathu	Thon	212217
1086	81.23567	25.65028	105.19	105.19	0	153	Sirathu	Shakha	212217
1087	81.23934	25.65426	103.99	100.93	3.06				
1088	81.24243	25.6576	105.29	100.21	5.08				
1089	81.24332	25.65855	106.4	102.12	4.28				
1090	81.24611	25.66158	104.57	104.57	0		Sirathu	Baripur	212217
1091	81.29777	25.71745	106.12	106.12	0	154	Sirathu	Pathranwa	212205
1092	81.30012	25.71999	108.26	105.7	2.56				
1093	81.30513	25.7254	107.1	102.83	4.27				
1094	81.30808	25.72859	109.61	103.79	5.82				
1095	81.30925	25.72986	108.99	105.22	3.77				
1096	81.31058	25.73129	114.03	108.56	5.47		Sirathu	Bara Haweli Aaima	212205
1097	81.22489	25.59416	106.99	106.99	0	155	Khaga	Jaam	212641
1098	81.22581	25.59517	107.85	104.68	3.17				
1099	81.22736	25.59687	106.18	100.43	5.75				

1100	81.22992	25.59969	106.54	95.58	10.96				
1101	81.23403	25.6042	107.62	94.37	13.25				
1102	81.23732	25.60782	106.56	96.79	9.77				
1103	81.23805	25.60862	108.97	101.65	7.32				
1104	81.2396	25.61033	106.92	106.92	0		Sirathu	Afzalpur Wari	212207
1105	81.33875	25.71911	111.84	106.5	5.34	156	Sirathu	Dariyapur Jita	212204
1106	81.34067	25.72121	108.13	99.22	8.91				
1107	81.34241	25.72312	108.67	91.94	16.73				
1108	81.34461	25.72553	105.73	94.37	11.36				
1109	81.34607	25.72713	106.78	99.83	6.95				
1110	81.34708	25.72824	106.52	105.89	0.63		Sirathu	Alauddinpur Tikari	212205
1111	81.2522	25.58588	108.59	106.7	1.89	157	Sirathu	Fazilpur Gopalpur	212217
1112	81.25293	25.58665	108.19	105.07	3.12				
1113	81.25483	25.58867	107.17	102.75	4.42				
1114	81.25619	25.59012	109.53	102.28	7.25				
1115	81.26289	25.59726	110.31	99.72	10.59				
1116	81.26398	25.59842	110.05	100.88	9.17				
1117	81.26696	25.6016	107.35	101.81	5.54				
1118	81.27222	25.6072	108.4	104.38	4.02				
1119	81.27267	25.60768	110.22	105.54	4.68				
1120	81.27376	25.60883	109.43	107.63	1.8				
1121	81.27403	25.60912	110.53	108.33	2.2		Sirathu	Mohabbatpur Anetha	212217
1122	81.42752	25.77224	107.63	105.54	2.09	158	Kunda	Samapur	230202
1123	81.42879	25.77359	104.71	100.18	4.53				
1124	81.42943	25.77426	103.23	98.79	4.44				
1125	81.43124	25.77619	110.84	99.02	11.82				
1126	81.43252	25.77754	107.27	100.42	6.85				

1127	81.43342	25.7785	108.61	103.68	4.93				
1128	81.43442	25.77956	112.76	108.57	4.19		Kunda	Samapur	230202
1129	81.43165	25.74158	107.1	103.7	3.4	159	Kunda	Launda	230204
1130	81.43284	25.74289	111.62	96.82	14.8				
1131	81.43411	25.7443	108.17	92.44	15.73				
1132	81.43692	25.74739	104.45	91.19	13.26				
1133	81.43802	25.7486	104.66	94.94	9.72				
1134	81.43955	25.75029	108.6	101.83	6.77		Kunda	Samapur	230204



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