REPORT ON

PILOT CENSUS OF PAIRY IRRIGATION PROJECT

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ABBREVIATIONS

AFC	AFC India Limited
BRGF	Backward Regions Grant Fund
CAD WM	Command Area Development and Water Management
CCA	Culturable Command Area
Cumec	Cubic meter per second
cusec	Cubic feet per second
CWC	Central Water Commission
Dn	Division
DPR	Detailed Project Report
DSS	Data Storage System
Dy	Distributory
E	East
ERM	Extension, Renovation and Modernisation
FRL	Full Reservoir Level
GPS	Global Positioning System
Ha	Hectare
IPC	Irrigation Potential Created
IPU	Irrigation Potential Utilized
km	Kilometer
KML	Keyhole Markup Language
L	Left
Lat.	Latitude
LBC	Left Bank Canal
LBMC	Left Bank Main Canal
Long.	Longitude
m	Meter
m^3	cubic meter
MCM	Million Cubic Meter
MDDL	Minimum Draw Down Level

MMI	Major and Medium Irrigation Projects
MNREGA	Mahatma Gandhi National Rural Employment Guarantee Act
Mr	Minor
MW	Megawatts
N	North
NCR	National Capital Region
O & M	Operations and Maintenance
PIM	Participatory Irrigation Management
PSU	Public Sector Units
R	Right
RBC	Right Bank Canal
RBMC	Right Bank Main Canal
RD	Reduced Distance/ Chainage
RFP	Request For Proposal
RL	Reduced Level
SDy	Sub-distributory
SLD	Single Line Diagram
SMr	Sub-minor
Sq. km	Square Kilometer
TAC	Technical Appraisal Committee
UGC	Upper Ganga Canal
UIP	Ultimate Irrigation Potential
WUA	Water Users Association

DEFINITIONS OF TERMS USED IN THE REPORT

AGRICULTURE

Cash Crops

A high value marketable crop such as sugarcane, jute, spices, fruits, tobacco and plantation crops.

Cropping intensity

The percentage of the total crop area during a crop year or season to the culturable command area.

Cropping Pattern

Yearly sequence and spacious arrangement of the crops in a given area.

Gross Cropped Area (GCA) (or Cropped Area)

Gross cropped area is the total cropped area under various crops during the whole agricultural year counting the area as many times as the number of crops grown on the same land. Mixed crops sown simultaneously on the same land are treated as one crop.

Kharif crops

Those crops which are cultivated in the monsoon season. The following are the principal kharif crops: Maize, rice, small millets, peas, groundnut, cotton, tobacco, and sesame.

Mixed Crop

Where more than one crop is raised on the same field in the same season simultaneously, without any definite row arrangement such as gram and wheat.

Net Cropped Area (Net Area Sown)

Net cropped area is the area sown (or cropped) during the agricultural season (July-June), counting the area only once even if two or more crops are grown in different seasons on the same land.

Perennial crops

Crops which last several crop years like plantation or orchard crops.

Rabi Crops

Those crops which are cultivated in the winter season. The following are the principal Rabi crops: Wheat, barley, gram, peas, potatoes, mustard, tobacco and linseed.

Summer Crop

Often represents an intermediate (third) crop between the Rabi and Kharif crops.

HYDRAULIC STRUCTURES

Barrage

A structure built across a river, for diverting water into a canal or for providing a small storage pond. It comprises a series of gates for regulating the river flow and water level, while keeping the afflux during floods within, acceptable limits. The structure may or may not have a raised sill. It is constructed to regulate the water-surface level and to divert the water flow from upstream of the gates.

Composite Dam

A concrete/masonry wall with rockfill or earth-backing in downstream.

Lining

A protective covering (over entire or portion of the perimeter) of a water conductor system or reservoir to reduce seepage losses, to withstand pressure, to reduce and prevent erosion and improve conditions of flow.

Pond Level

The level of water immediately upstream of a structure required to facilitate withdrawal into the canal or for any other purpose.

Sill

a) A structure built under water across deep pools of a river course for counteracting the tendency to excessive scour.

b) A structure built at the outlet of a channel where certain minimum depth of flow is to be maintained in the channel, or a structure built at the head of a channel to prevent flow entering the channel until the main river stage reaches the crest of the structure.

c) The invert of a gate or sluice opening.

Under Sluices

The under sluices are bays in continuation of the weir with a crest at lower level on the same side as the canal to maintain a clear and well defined rives channel towards the canal head regulator, to scour the silt deposlted on the river bed in the pocket upstream of canal head regulator or to pass winter freshness and low floods without dropping the weir shutters.

Weir or Anicut

An ungated barrier across a stream or a river for the purpose of:

a) measuring its discharge, or

b) raising, controlling and maintaining the water level, and/or,

c) diverting part or all the water from the stream/river into a canal or conduit.

Run-of-the River Power Station

A power station utilizing the run-of-the river flows for generation of power with sufficient pondage for supplying water for meeting diurnal or weekly fluctuations of demand. In such stations, the normal course of the river is not materially altered.

IRRIGATION

Classification of Irrigation Projects

The irrigation projects can be classified as:

i. Major Irrigation Scheme - Culturable Command Area (CCA) more than 10,000 hectare (ha)

ii. Medium Irrigation Scheme- Culturable Command Area (CCA) more than 2000 hectare (ha) and up to 10,000 hectare (ha)

iii. Minor Irrigation Scheme - Culturable Command Area (CCA) upto 2000 hectare (ha)

Closure period

The period when the canal is closed for regular maintenance, repairs and other purposes.

Consumptive Use Efficiency

The ratio of consumptive water use by crop and the soil moisture stored in the root zone of the soil during the crop growth period.

Conveyance

The movement of water from its source through the main or secondary canals or conduits to the tertiary or distributory offtakes.

Conveyance Losses or Transmission Losses

Losses of water in transit from the source of supply to the point of field turn out whether in natural channels or in artificial ones, such as canals, distributaries or watercourses. They comprise evaporation from the water surface, seepage and incidental transpiration by vegetation growing in or along the canals network. These also include the operation losses in the canal system.

Crop Water Requirement

The total water needed for evapo-transpiration from planting to harvest for a given crop in a specific climate regime, when adequate soil water is maintained, by rainfall and/or irrigation so that it does not limit plant growth or crop yield.

Culturable Command Area

It is the area which can be physically irrigated from the scheme and is fit for cultivation **or** The difference between the gross command area and the unculturable area falling under the command **or** Total area in which cultivation is possible.

Distributary or Tertiary

Canal or conduit taking water from the con-veyance system and supply it to one tertiary unit.

Diversion Structure

The structure that diverts water from the water sources and supplies it to the irrigation system.

Drip/Trickle Irrigation

It comprises the application of water in drops close to the plant. The entire space between the plants is not watered.

Field Channel

Channel usually taking water from the watercourse and supplying it to one or more forms or fields.

Field Irrigation Requirements

The requirements of irrigation water for crops at the diversion point of supply channel.

Flow Irrigated Area

Area which can be irrigated from the source of water, by flow under gravity alone.

Gross Command Area

The total geographical area which can normally be commanded or serviced from a irrigation project without consideration of water supplies available for irrigation. It is the total area covered by an irrigation project including unculturable area under habitation, road, tanks, waste land, forest land etc.

Gross Irrigated Area

The gross irrigated area is the total irrigated area under various crops during the whole agricultural year, counting the area irrigated under more than one crop during the same year as many times as the number of crops grown. Inter-cultured or mixed crops are treated as one crop.

Irrigation

The supply of water by artificial means for raising crops.

Irrigated Area

The area to which irrigation water has been applied.

Irrigation Potential Created - (As per Planning Commission)

a. The irrigation potential created by a project at a given time during or after its construction is the aggregate gross area that can be irrigated annually by the quantity of water that could be made available by all connected and completed works upto the end of the water courses or the last point in the water delivery system upto which the Government is responsible for construction.

b. Before an area is included and reported under 'Potential Created', it may be ensured that the storage, head-works as well as the distribution system including irrigation outlets to serve the area are completed together with necessary water courses covering chaks or blocks upto 40 hectares in area and that works completed will make available the requisite water for the purpose in a design year for the assumed cropping pattern. The irrigation outlets should be of a capacity of about 0.03 cumec. The capacity may, however, vary depending on local conditions relating to topography, crop pattern, etc. but it should not normally exceed 0.06 cumec. The figures of the potential which relate to the gross irrigated 'new area' and 'old area stabilized' should be reported separately. The potential which refers to the 'old areas stabilized' should, however, not be considered as adding to the total irrigation potential created since this area would have already counted earlier once.

Irrigation Potential Utilized - (As per Planning Commission)

a. The irrigation potential utilized is the total gross area actually irrigated by a project during the year under consideration. The figures relating to the stabilization of 'old area' should be furnished separately in this case also since these will not be additive to the gross area irrigated.

b. As, generally, the utilzation of irrigation potential created can take place only in the year following the creation of such potential, it will be appropriate if the irrigation potential utilized in a particular year is considered with the potential created upto the end of the preceding year for the purpose of comparison.

Irrigation System

It includes storage and diversion structure, main canal, distributory, minors, water courses, field channels, and allied structures including head regulator, cross drainage works and control structures.

Irrigation Water Requirement

The amount of crop water requirement that is not provided by effective rainfall, utilization of stored soil moisture or upward flow of water to the root zone from a saturated zone.

Rostering of Channels

It is the sequencing of water delivery in different channels as a part of regulation.

Surface Irrigation

Method of irrigation where the water flows on to the field surface by gravity from the head to the tail end.

Surface Irrigation Method

It is the application of water by surface method such as wild flooding, border strip, check basis, and furrows for raising crops.

Ultimate Irrigation Potential -(As per Planning Commission)

i. It is the gross area that can be irrigated from a project in a design year for the projected cropping pattern and assumed water allowance on its full development. The gross irrigated area will be aggregate of the areas irrigated in different crop seasons, the areas under two-seasonal and perennial crops being counted only once in the year.

ii.The following considerations have to be taken into account in estimating the ultimate irrigation potential expected from a project in terms of area:

a) It will not be correct to assume the culturable command area as an arbitrary percentage of the gross command area. The CCA should be assessed from actual and by consulting land records.

b) A part of the area being proposed to be brought under irrigation from a project may be already receiving irrigation from other sources, whether major, medium

or minor irrigation works, which might have been commissioned earlier. The benefits from the new project may be by way of an additional water allowance to irrigation more secure or to stabilize irrigation the area. Such area should not be counted in new irrigation potential but considered only as stabilize of irrigation in an old area. The Ultimate irrigation potential should indicate only figures of gross irrigation of new area whether in the new command area or in the existing command (by increasing the intensity of cropping). The old area stabilized may be reported separately.

FINAL REPORT ON
PILOT CENSUS OF PAIRY IRRIGATION PROJECT

1. Background

1.1 The growing gap between Irrigation Potential Created (IPC) and that Utilized (IPU) is becoming a matter of great concern. Though there exists a gap between IPC and IPU, which need to be bridged, but often this gap gets over-estimated since the same command area is counted as potential created under surface water major/medium project and again under supplementary minor project (surface lift/ groundwater project). To assess the actual scenario of irrigation in the country, CWC considered necessary to undertake a census of completed major and medium irrigation projects to collect the following information:

a. Culturable Command Area (CCA) and their geographical extent

b. Irrigated area by season

c. Irrigation Potential created and utilized (IPC & IPU)

d. Cropping pattern

e. Other project related information

1.2 CWC has decided to take up the pilot census for standardizing the methodology for the main census of MMI projects by taking one project (major or medium) from each of different regions namely North, South, East, West, North-West, South-East, South-West & Central. As such about 8 projects would be covered in the pilot census. The Pilot Census is to be covered in two phases described as below:

Phase-I: Collection of data pertaining to inventory detail of 8 selected projects from project authorities.

Phase-II: Collection of data through outsourcing up to outlet level (i.e. data on utilization part) of the 8 projects covered in the Phase-I.

1.3 **Progress achieved by CWC:** CWC has selected 8 projects covered in the Phase-I for collecting inventory-details. The list of 8 selected projects is as below:

S. No.	Name of Project	Type (Major/Medium)	Region	State
1	Upper Ganga Canal	Major	North	Uttar Pradesh
2	Sethiathope Anicut System	Major	South	Tamilnadu
3	Mangalam	Medium	South	Kerala
4	Midnapur Canal	Major	East	West Bengal
5	Damanganga	Major	West	Gujarat
6	Fulzar-I	Medium	West	Gujarat
7	Pairi	Major	Central	Chhattisgarh
8	Sukla	Major	North-East	Assam

1.4 The data pertaining to inventory details has been collected by CWC in a prescribed schedule while executing Phase – I of the Pilot Census.

1.5 CWC has called for expression of Interest in January 2016 and AFC India Limited (AFC) has expressed its interest to carry out the proposed phase- II of pilot census of selected Major and Medium irrigation projects. Thereafter CWC issued the RFP in April 2016 and AFC submitted its offer online on 5th May 2016 for the 8 selected projects. CWC has awarded the assignment of conducting Census survey for the following five projects to AFC.

S. No.	Name of Project	Type (Major/ Medium)	Region	State
1	Upper Ganga Canal	Major	North	Uttar Pradesh
2	Midnapur Canal	Major	East	West Bengal
3	Fulzar-I	Medium	West	Gujarat
4	Pairi	Major	Central	Chhattisgarh

5	Sukla	Major	North-East	Assam

Subsequently, CWC assigned two more projects to AFC India Limited for carrying out the Pilot Census Survey.

1	Mangalam	Medium	South	Kerala
2	Sethiatope Anicut Irrigation Project	Major	South	Tamilnadu

2. Scope of Work

2.1 AFC has carried out a comprehensive and critical review of the existing irrigation scenario in the field with the following scope of work.

i. To identify the gaps as reported by project-authorities in each project.

ii. To assess the reasons of reported gaps.

iii. To diagnose the constraints and difficulties if any in achieving the targets of achieving IPC as envisaged.

iv. To suggest remedial measures for minimizing the identified gaps of IPC and IPU.

v. To suggest suitable methodology for carrying out the main census of major and medium irrigation projects in the country.

vi. To prepare a command area map including canals.

vii. To prepare Canal Network diagram with attributes attached and types of canal structures marked along with chainage. The output map will be given in *.pdf and *.kml form.

3. Objectives

3.1 The main objectives of this study are as follows:

i. To develop a command area map including canals;

ii. To develop Canal Network Diagram up to outlet level;

iii. To identify the gap between IPC and IPU.

iv. To suggest remedial measures to bridge the gap between IPC and IPU.

4. Project Details

Pairi project in Raipur district of Chhattisgarh is a major irrigation project in Mahanadi Basin. The Sikaser Dam, Pairi pickup weir, Sargi weir and Maasul weir are located in Gariaband District of Chattisgarh. The project serves two districts viz., Gariaband and Dhamtari in Chattisgarh State. Gariaband District is one of the nine new districts formed in Chhattisgarh, operational from January 1, 2012. Gariaband district was carved out of Raipur district and has its headquarters at Gariaband town. Dhamtari and Mahasamund are the neighbour district. The district covers an area of 5822.861 sq km is full of natural resources. "Pairi" and "Sodhur" river flows north from here and makes "Triveni Sangam" at Rajim together. Rajim is a famous pilgrimage center of the district. Every year a "Kumbh Mela" is held from Magh Purnima to Maha Shivaratri. The district is divided into geographical area of the five taluk as Gariaband (726.12 sqkm), Chhura (714.62 sqkm), Mainpur (670.52 sqkm), Devbhog(301.53sqkm) and Rajim (474.27 sqkm) respectively. The Gariaband, Chhura and Mainpur blocks are Multiplicity of Tribals. There are four urban bodies in the district in which one Municipality (Gariaband) and three Nagar Panchayat (Rajim, Chhura and Fingeshwar). Area of "Gariaband Forest" is 1951.861 sqkm and "Udanti Sita Nadi Tiger Reserve" covers 983.94 sqkm. Being a plan area Figenshwar development block is an irrigated and equipped with modern agriculture methods. Chhura block has created his name as famous tourist places such as "Jatmayi" and "Ghatarani. Baruka Aniket, Tonhidabri, Ramaipot including Rasela are forest and plain areas near Malaygiri mountain of Orissa border. Gariaband block has rich resources such as Saal and Teak including forest area from the confluence of the Pairi and Sodhur river. The location of the project area has been given in **Fig. 4.1.**

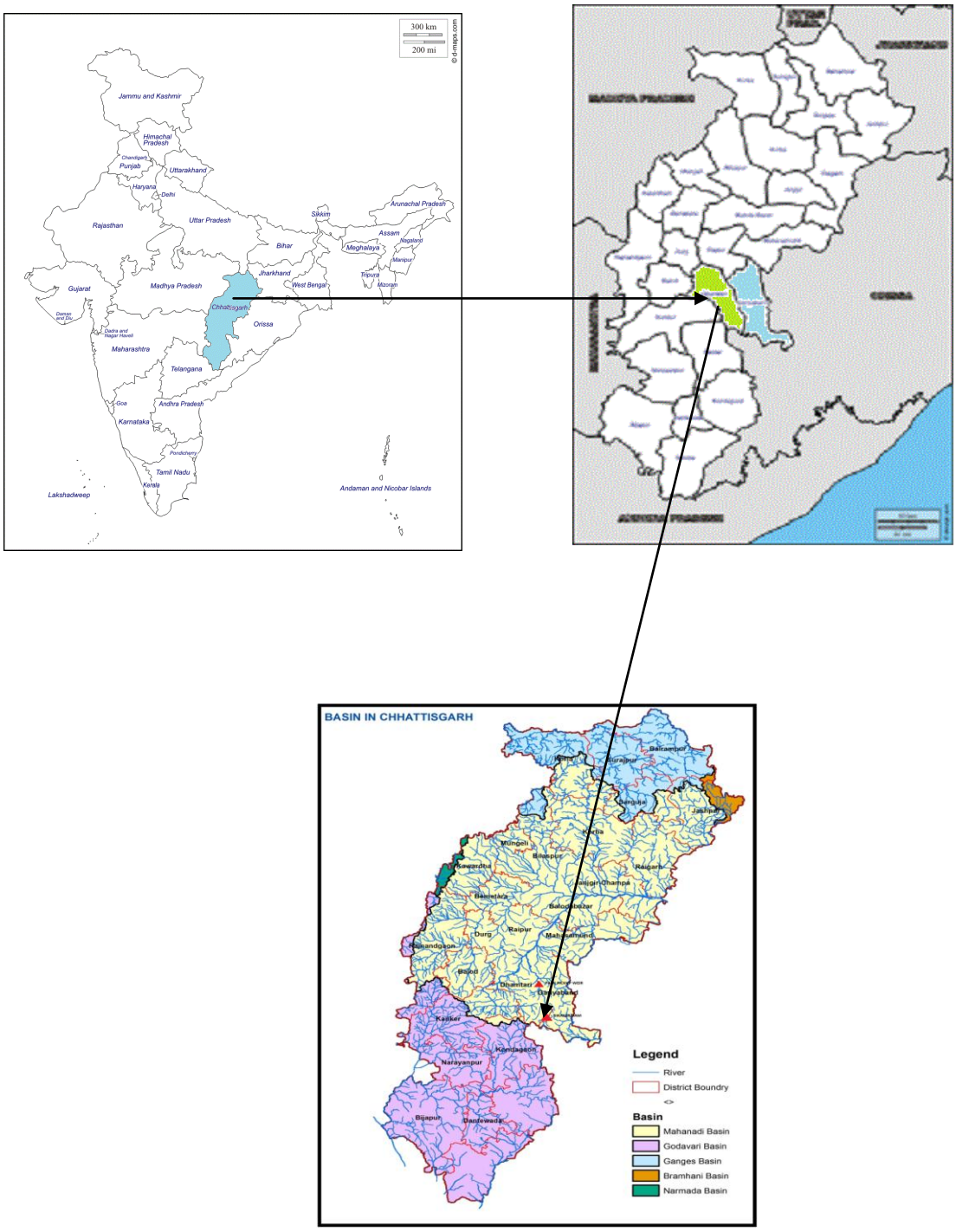


Figure 4.1 Location of Pairi Irrigation Project

Dhamtari is a district in the state of Chhattisgarh. It was officially formed on 6 July 1998. The district headquarters is Dhamtari. It is situated at 20°42' north latitude and 81°33' east longitude. The total area of the district is 2029 km^2 and it is 305 meters above the sea level. In the east, Satpura range is located. It is popularly known as Sihawa Pahad.

The Mahanadi River is the principal river of this district and till this area it is named as Kankannadi, Chitrotpala, Neelotpala, Mandvahini, Jairath, etc. Its tributaries are Sendur, Pairy, Sondur, Joan, Kharun and Shivnath. The fertility of lands of Dhamtari district can be attributed to the presence of these rivers. The chief crop of this region is paddy. Mahanadi one of the major river in central India originates in the hills of Sihawa flows in an easterly direction into the Bay of Bengal. The National Highway No. 30 Raipur – Vijaynagaram (Andhra Pradesh) passes through Dhamtari. Raipur is 78 km from Dhamtari.

Dhamtari has over 136 rice mills. Ravishankar Sagar dam (Gangrel Dam) that irrigates almost 570 square kilometres of land and also acts as a main supply unit of safe drinking water resource for state capital Raipur as well as supply to Bhilai Steel Plant lies almost 11 km from the district capital. Two hydro-power plants of 10 MW and 1.2 MW are installed there. Asia's first ever Syphen dam was built in 1914 at Madamsilli. Besides Madamsilli, Sondhur dam and Dudhawa dam are the major projects. Approximately 52 per cent of the geographic area is covered by forests. The district has a tropical climate.

According to the 2011 census Dhamtari district has a population of 799,199, roughly equal to the nation of Comoros or the US state of South Dakota. This gives it a ranking of 485th in India (out of a total of 640). The district has a population density of 236 inhabitants per square kilometre. Its population growth rate over the decade 2001-2011 was 13.11%. Dhamtari has a sex ratio of 1012 females for every 1000 males, and a literacy rate of 78.95%.

This district is situated at 20°42' N latitude and 81°33' longitude. Dhamtari district was officially formed on 6 July 1998 dividing the Raipur district currently the capital of Chhattisgarh along with Mahasamund. Raipur district was broken up into the districts of Raipur, Mahasamund and Dhamtari. Dhamtari, Kurud and Nagari are included in

Dhamtari district as tehsils, and blocks. The total area of the district is 2029 km², and its altitude is 305 m above sea level. The district is surrounded by Raipur District to the north and south, and part of Orissa state to the east and west. Dhamtari district falls between two Lok Sabha constituencies (Kanker and Mahasamund) and three assembly constituencies: Dhamtari, Kurud, and Sihawa.

Salient Features of the Project

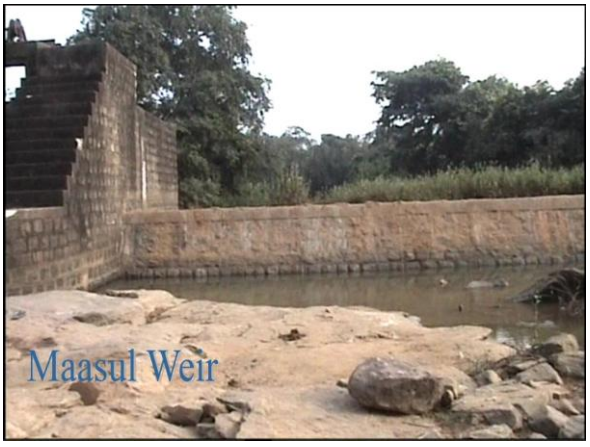
Pairi project is comprising of Sikasar dam across river Pairy, a tributary of river Mahanadi near village Sikasar and a pairi pickup weir about 40 km downstream of the dam. Project started in 1973 and completed in 1999. The canal system takes off from both the flank of pickup weir to provide irrigation to a CCA of 39,741 hectares. The project serves two districts viz. Gariaband and Dhamtari of Chattisgarh.

The Sikasar dam comprises of 876.31meter long earthen dam, with maximum height of 31.70 meter and 663.86meter long saddle dam with maximum height of 9.32 meter. The dam has 162.765meter long waste weir with 22 gates of 9.14x3.96meter size to pass peak flood of 5947 cumec and an outlet vent to pass designed regulated releases of 37.22 cumec.

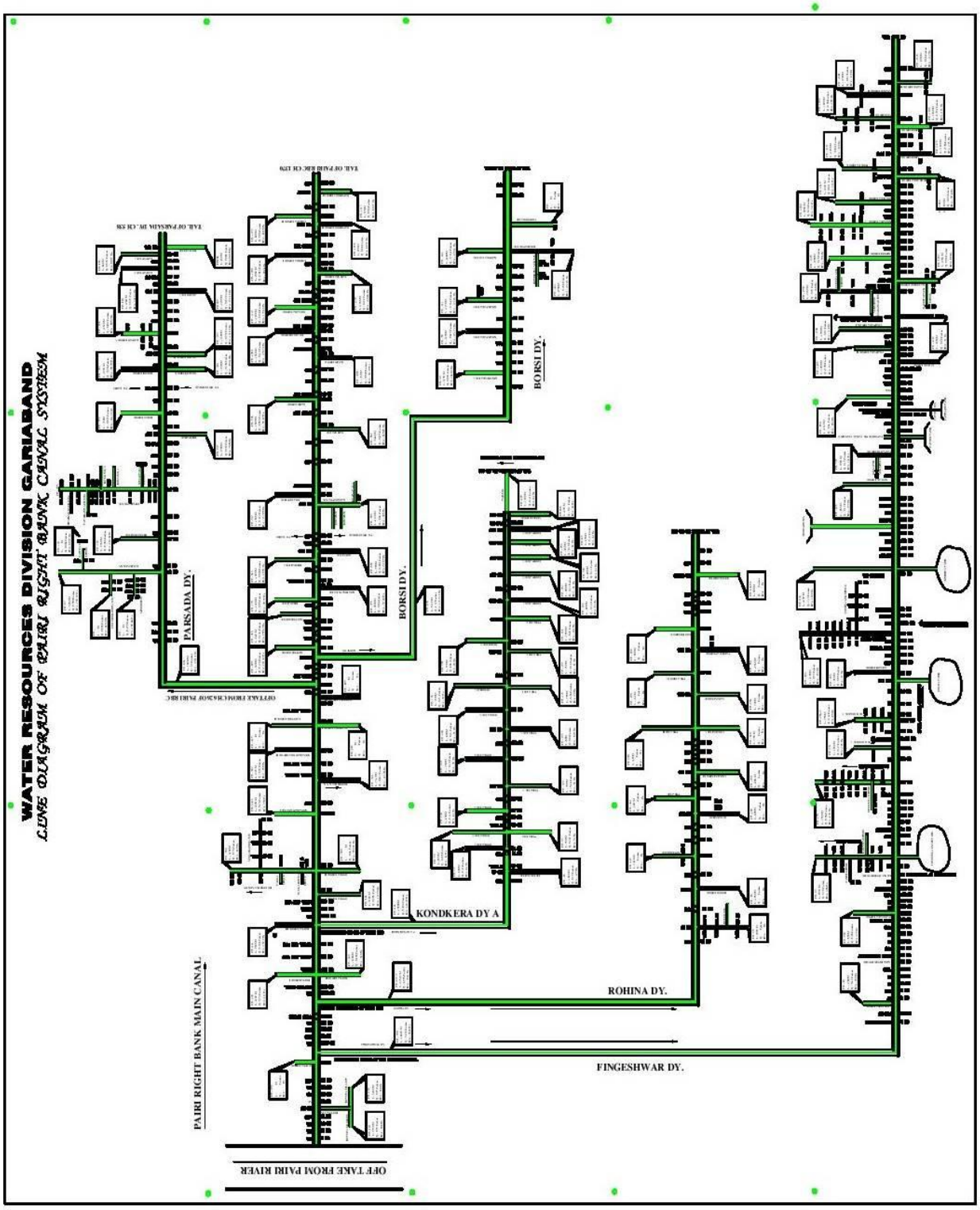
The Pairi pickup weir located 40 km downstream of the dam is provided with two head regulators on either flank with head discharge of 12.43 cumec (LBC) and 24.79 cumec (RBC). The length of Left bank canal (LBC) is 25.76 km and that of Right bank canal (RBC) is 27.37 km.

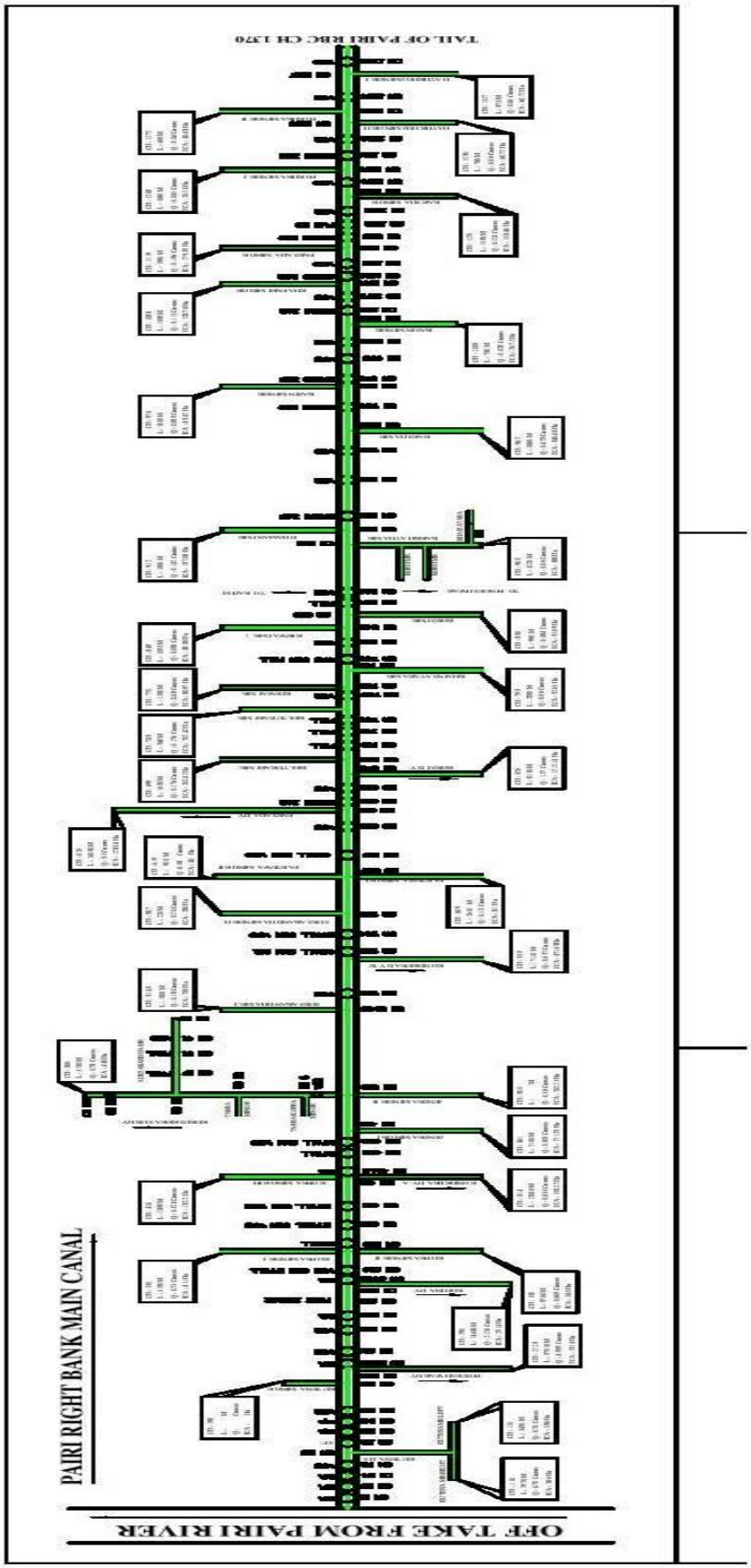
Name of the Project	Pairi Project
Type of Project	Storage
Category of Project	Major
Name of Basin	Mahanadi Basin
Start of Project	1973
End of Project	1999
Districts Benefitted	Gariaband , Dhamtari
Year of Commencement of Project	1973
Year of Completion	1999

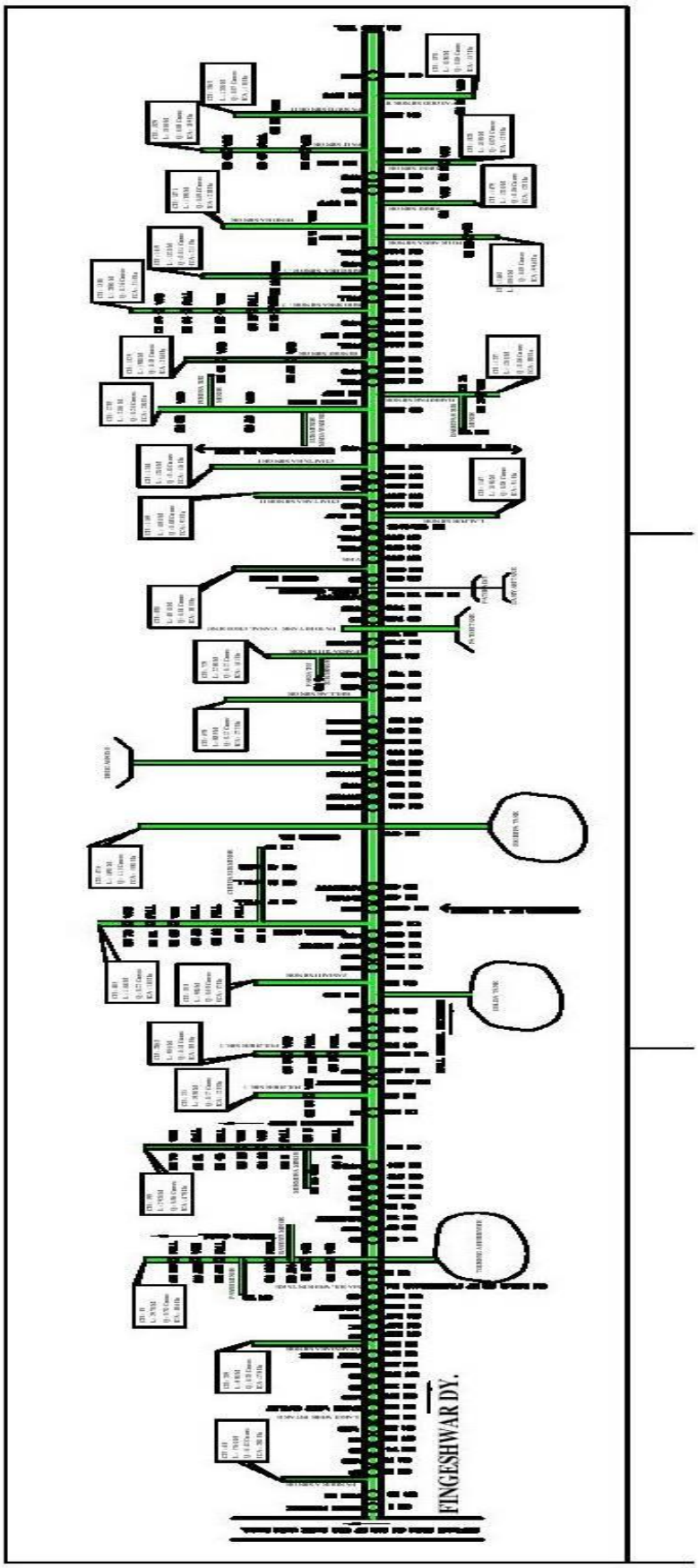
Address of Project Headquarters	EE , WRD ,Pairi Colony , District – Gariaband Chhattisgarh 07706-241240
Number of Head Regulators	2
Location of head regulators	Right Bank, Left Bank
Volume of Water Released through head regulators (MCM)	
2012-13: Kharif	89.98
2012-13 : Rabi	78.15
Total	168.13
CCA of the project as per DPR	40503 ha
Actual Irrigation Potential upto March 2013	73736 ha
Area Irrigated during 2014-15	
Kharif	36977 ha
Rabi	5212 ha
Total	42189 ha

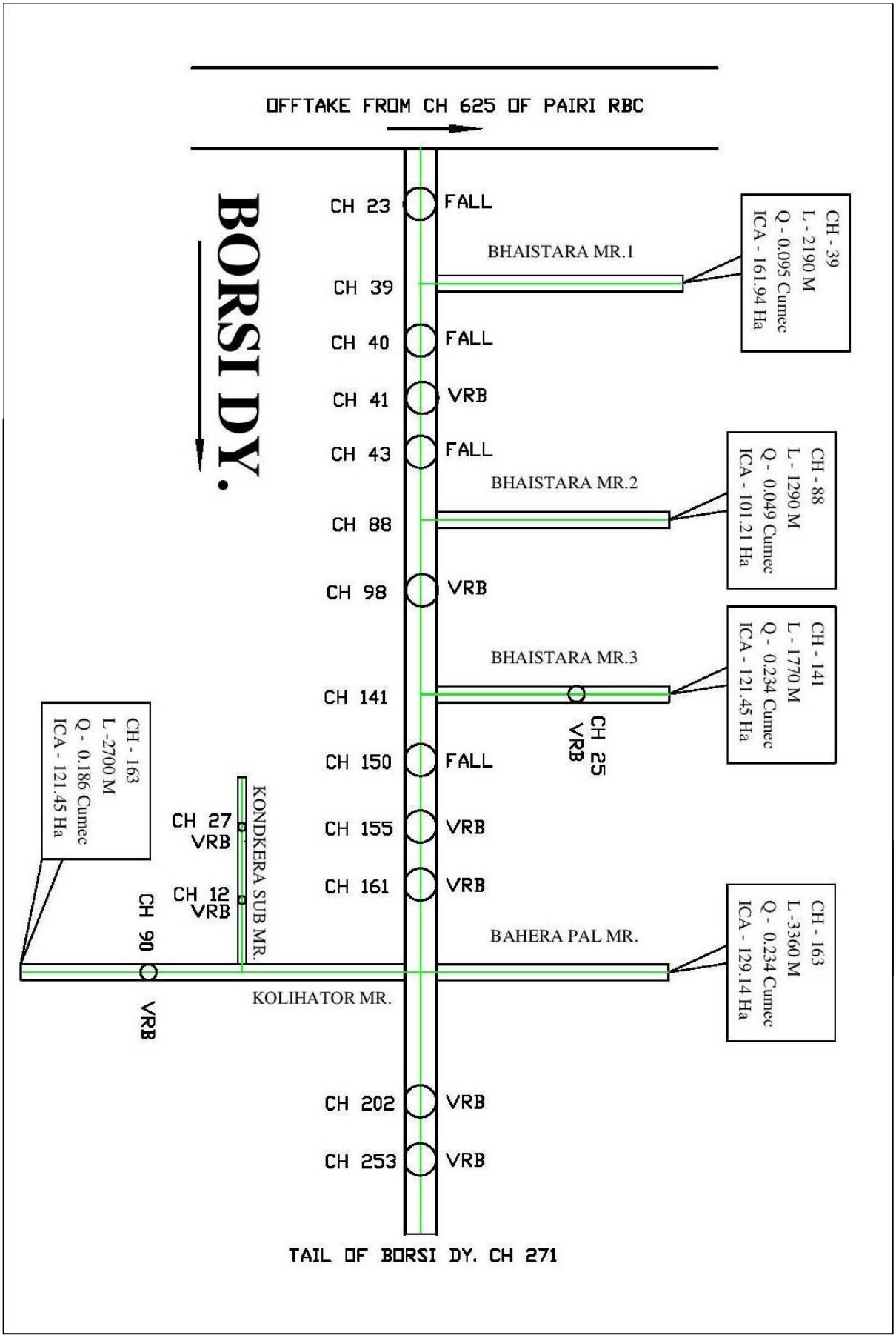


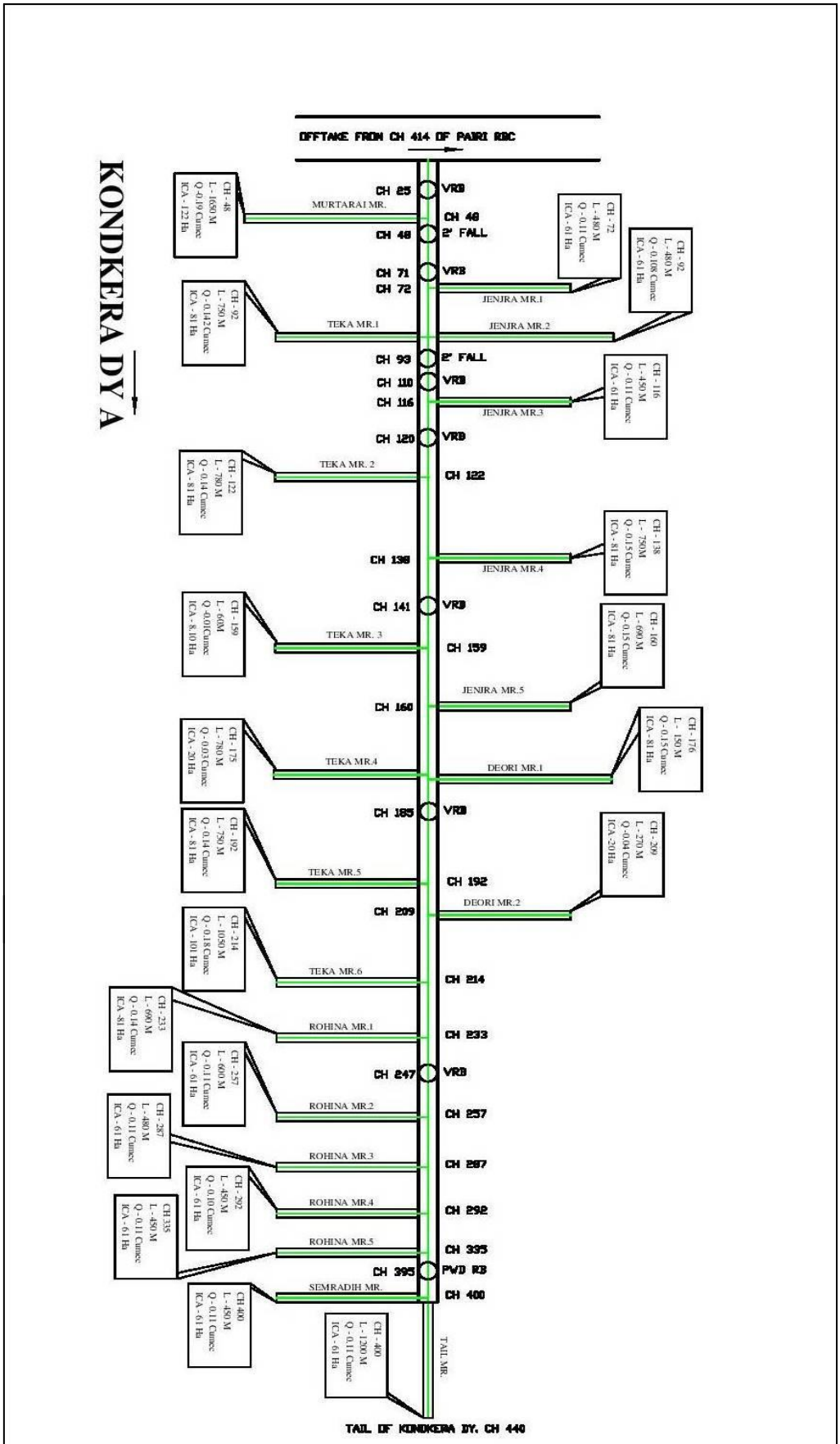
Photographs of Sikasar Dam, Pairy Pickup Weir, Maasuli Weir and Sargi Weir

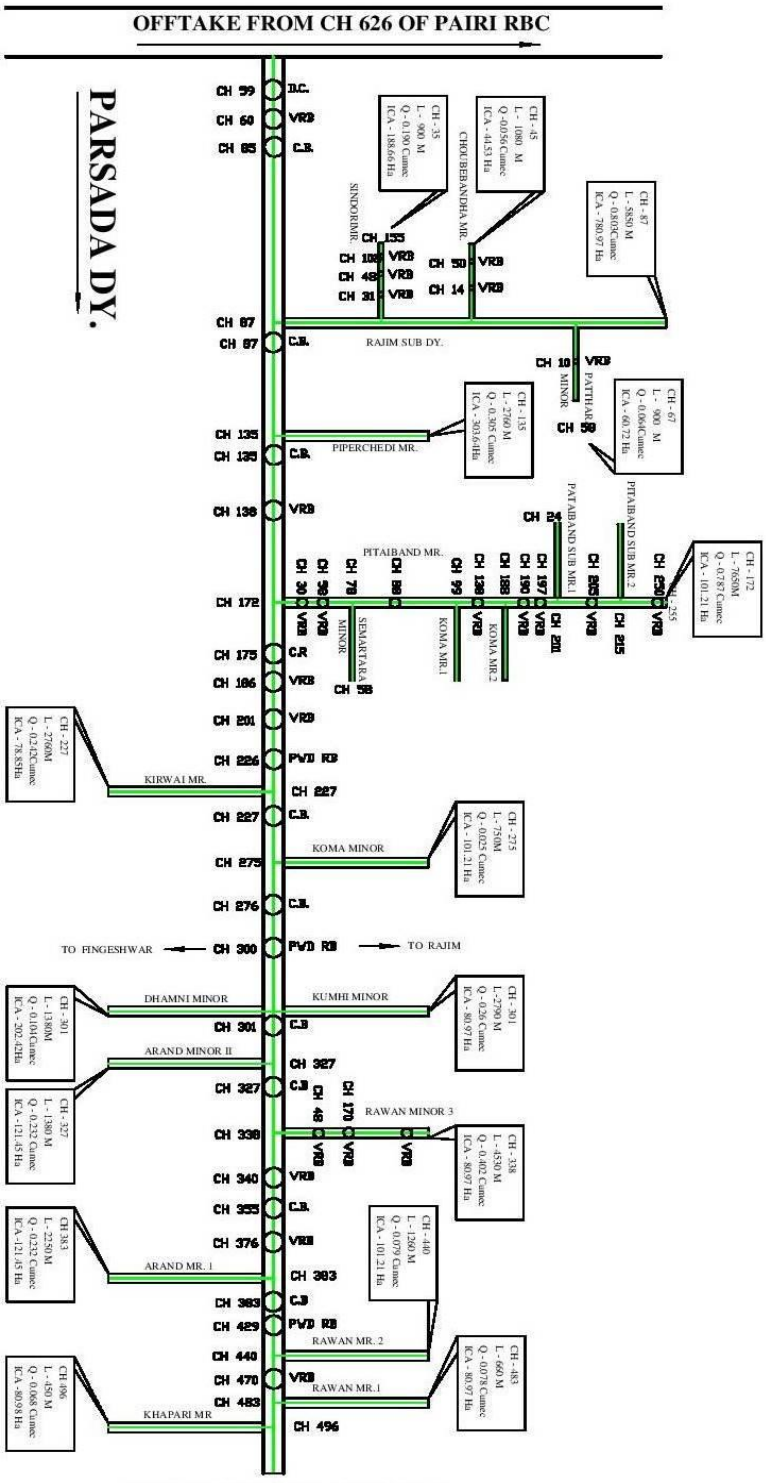

WATER RESOURCES DIVISION GARIABAND
LINE DIAGRAM OF PAIRI RIGHT BANK CANAL SYSTEM
PARSADA DY.
BORSI DY.
BORSI DY.
KONDKERA DY A
ROHINA DY.
FINGESHWAR DY.
PAIRI RIGHT BANK MAIN CANAL
OFF TAKE FROM PAIRI RIVER

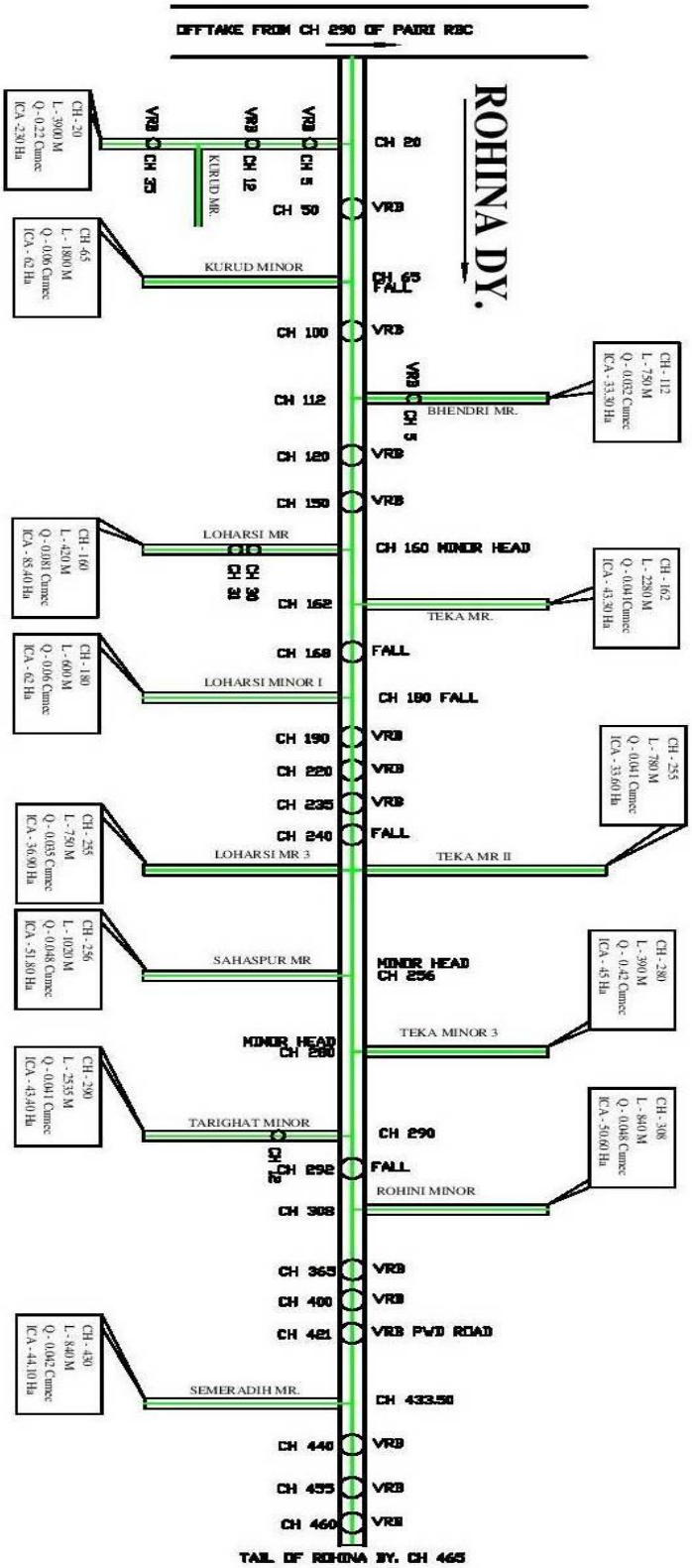

TAIL OF PAIRI RBC CH 1370
PAIRI RIGHT BANK MAIN CANAL
OFF TAKE FROM PAIRI RIVER

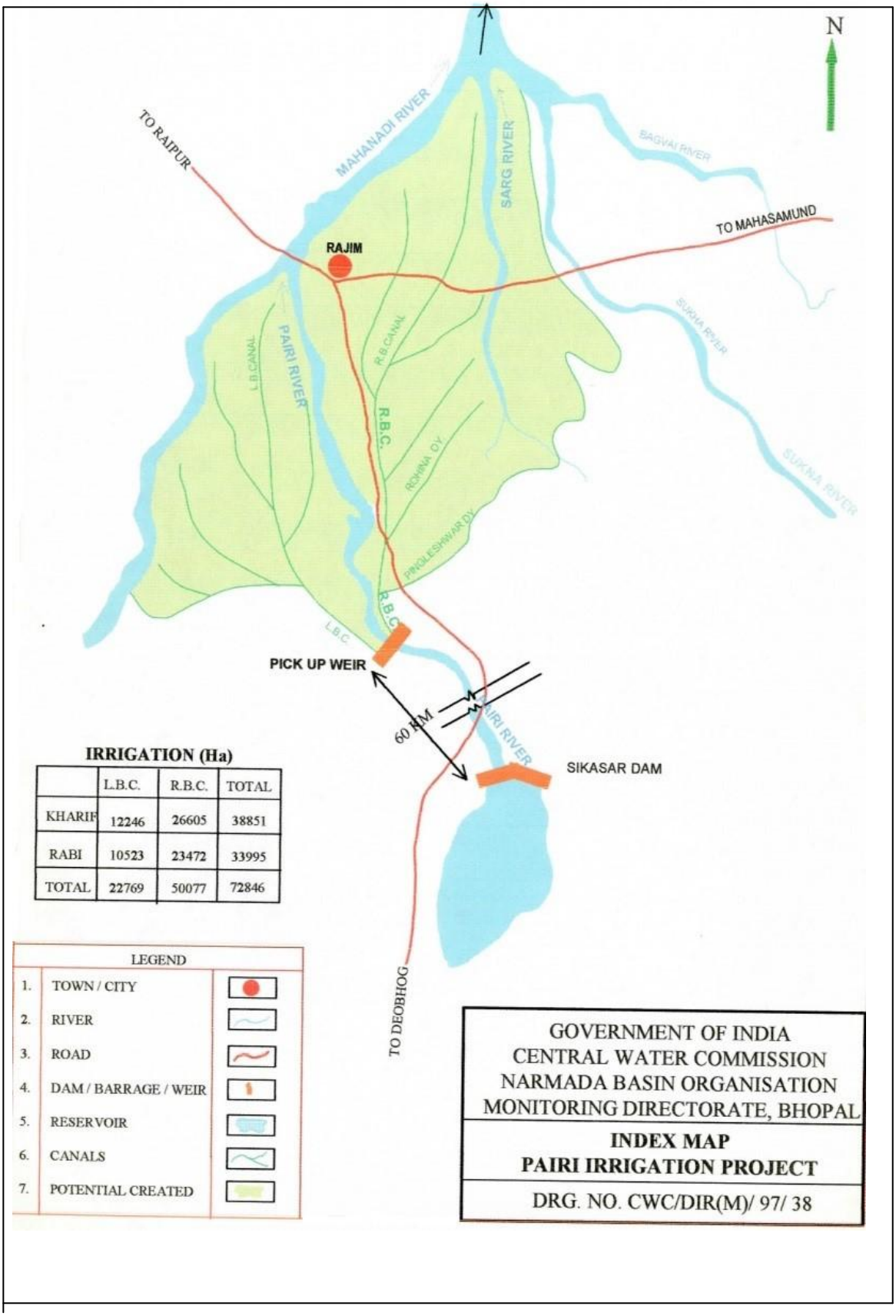

FINGESHWAR DY.


OFFTAKE FROM CH 625 OF PAIRI RBC
BORSI DY.
CH 23
FALL
CH - 39
L - 2190 M
Q - 0.095 Cumec
ICA - 161.94 Ha
BHAISTARA MR.1
CH 39
CH 40
FALL
CH 41
VRB
CH 43
FALL
CH - 88
L - 1290 M
Q - 0.049 Cumec
ICA - 101.21 Ha
BHAISTARA MR.2
CH 88
CH 98
VRB
CH - 141
L - 1770 M
Q - 0.234 Cumec
ICA - 121.45 Ha
BHAISTARA MR.3
CH 141
CH 25
VRB
CH - 163
L - 2700 M
Q - 0.186 Cumec
ICA - 121.45 Ha
CH 150
FALL
KONDKERA SUB MR.
CH 27
VRB
CH 155
VRB
CH 161
VRB
CH 12
VRB
CH 90
VRB
BAHERA PAL MR.
CH - 163
L - 3360 M
Q - 0.234 Cumec
ICA - 129.14 Ha
KOLIHATOR MR.
CH 202
VRB
CH 253
VRB
TAIL OF BORSI DY. CH 271


OFFTAKE FROM CH 414 OF PAIRI RBC
KONDKERA DY A
CH 25
VRB
MURTARAI MR.
CH 48
2' FALL
CH 71
VRB
CH 72
JENJRA MR.1
TEKA MR.1
JENJRA MR.2
CH 93
2' FALL
CH 110
VRB
CH 116
JENJRA MR.3
CH 120
VRB
TEKA MR. 2
CH 122
CH 138
JENJRA MR.4
CH 141
VRB
TEKA MR. 3
CH 159
JENJRA MR.5
CH 160
TEKA MR.4
DEORI MR.1
CH 185
VRB
TEKA MR.5
CH 192
DEORI MR.2
CH 209
TEKA MR.6
CH 214
ROHINA MR.1
CH 233
CH 247
VRB
ROHINA MR.2
CH 257
ROHINA MR.3
CH 287
ROHINA MR.4
CH 292
ROHINA MR.5
CH 335
CH 395
PWD RB
SEMRADIH MR.
CH 400
TAIL MR.
TAIL OF KONDKERA DY. CH 440


OFFTAKE FROM CH 626 OF PAIRI RBC
PARSADA DY.
CH 59
D.C.
CH 60
VRB
CH 65
C.R.
CH - 35
L - 900 M
Q - 0.190 Cumec
ICA - 188.66 Ha
SINDORIMR.
CH - 45
L - 1080 M
Q - 0.0556 Cumec
ICA - 44.53 Ha
CHOUBERANDHA MR.
CH - 87
L - 5850 M
Q - 0.8026Cumec
ICA - 780.97 Ha
CH 155
CH 108
CH 48
CH 31
CH 50
CH 14
CH 87
C.R.
RAJIM SUB DY.
CH 10
MINOR
PATTHAR
CH - 67
L - 900 M
Q - 0.0646Cumec
ICA - 60.72 Ha
CH 59
CH - 135
L - 2760 M
Q - 0.305 Cumec
ICA - 303.6 Ha
CH 135
C.R.
PIPERCHEDI MR.
CH 136
VRB
PATAIBAND SUB MR.1
PITAIBAND SUB MR.2
CH 24
PITAIBAND MR.
CH - 172
L - 7650M
Q - 0.785 Cumec
ICA - 101.21 Ha
CH 172
CH 175
C.R
CH 186
VRB
MINOR
SEMARTARA
CH 58
KOMA MR.1
KOMA MR.2
CH 201
CH 205
CH 215
CH 235
CH 201
VRB
CH 226
PWD RB
CH - 227
L - 2760M
Q - 0.243Cumec
ICA - 78.85Ha
KIRWAI MR.
CH 227
CH 227
C.R.
KOMA MINOR
CH - 275
L - 750M
Q - 0.025 Cumec
ICA - 101.21 Ha
CH 275
CH 276
C.R.
TO FINGESHWAR
CH 300
PWD RB
TO RAJIM
DHAMNI MINOR
KUMHI MINOR
CH - 301
L - 1380M
Q - 0.1161Cumec
ICA - 202.42Ha
CH - 301
L - 2790 M
Q - 0.026 Cumec
ICA - 80.97 Ha
CH 301
C.R
ARAND MINOR II
CH 327
CH 327
C.R
CH - 327
L - 1380 M
Q - 0.232 Cumec
ICA - 121.45 Ha
CH 48
CH 179
RAWAN MINOR 3
CH 338
CH - 338
L - 4530 M
Q - 0.402 Cumec
ICA - 80.97 Ha
CH 340
VRB
CH 355
C.R.
CH 376
VRB
CH - 383
L - 2230 M
Q - 0.232 Cumec
ICA - 121.45 Ha
ARAND MR. 1
CH - 440
L - 1260 M
Q - 0.079 Cumec
ICA - 101.21 Ha
CH 383
CH 383
C.R
CH 429
PWD RB
RAWAN MR. 2
CH 440
CH 470
VRB
CH 483
RAWAN MR. 1
CH - 483
L - 660 M
Q - 0.078 Cumec
ICA - 80.97 Ha
CH - 496
L - 450 M
Q - 0.068 Cumec
ICA - 80.98 Ha
KHAPARI MR
CH 496
TAIL OF PARSADA DY. CH 538


OFFTAKE FROM CH 290 OF PAIRI RBC
ROHINA DY.
CH - 20
L - 3900 M
Q - 0.22 Cumec
ICA - 230 Ha
VRB CH 25
VRB CH 12
VRB CH 5
CH 20
KURUD MR.
CH 50
VRB
CH - 65
L - 1800 M
Q - 0.06 Cumec
ICA - 62 Ha
KURUD MINOR
CH 65 FALL
CH 100
VRB
CH - 112
L - 750 M
Q - 0.032 Cumec
ICA - 33.30 Ha
VRB CH 5
CH 112
BHENDRI MR.
CH 120
VRB
CH 150
VRB
CH - 160
L - 420 M
Q - 0.081 Cumec
ICA - 85.40 Ha
LOHARSI MR
CH 160 MINOR HEAD
CH - 162
L - 2280 M
Q - 0.041Cumec
ICA - 43.30 Ha
CH 162
TEKA MR.
CH 168
FALL
CH - 180
L - 600 M
Q - 0.06 Cumec
ICA - 62 Ha
LOHARSI MINOR I
CH 180 FALL
CH 190
VRB
CH - 255
L - 780 M
Q - 0.041 Cumec
ICA - 33.60 Ha
CH 220
VRB
CH 235
VRB
CH 240
FALL
CH - 255
L - 750 M
Q - 0.035 Cumec
ICA - 36.90 Ha
LOHARSI MR 3
TEKA MR II
CH - 256
L - 1020 M
Q - 0.048 Cumec
ICA - 51.80 Ha
SAHASPUR MR
MINOR HEAD CH 256
CH - 280
L - 390 M
Q - 0.42 Cumec
ICA - 45 Ha
TEKA MINOR 3
MINOR HEAD CH 280
CH - 290
L - 2535 M
Q - 0.041 Cumec
ICA - 43.40 Ha
TARIGHAT MINOR
CH - 308
L - 840 M
Q - 0.048 Cumec
ICA - 50.60 Ha
CH 290
CH 292
FALL
ROHINI MINOR
CH 308
CH 365
VRB
CH 400
VRB
CH 421
VRB PWD ROAD
CH - 430
L - 840 M
Q - 0.042 Cumec
ICA - 44.10 Ha
SEMERADIH MR.
CH 433.50
CH 440
VRB
CH 455
VRB
CH 460
VRB
TAIL OF ROHINA BY. CH 465


N
TO RAIPUR
MAHANADI RIVER
SARG RIVER
BAGVAI RIVER
TO MAHASAMUND
RAJIM
PAIRI RIVER
L.B.CANAL
R.B.CANAL
R.B.C.
ROHNA DY.
PRALESHWAR DY.
SUKHA RIVER
SUKNA RIVER
L.B.C.
PICK UP WEIR
60 KM
PAIRI RIVER
SIKASAR DAM
TO DEOBHOG
IRRIGATION (Ha)
L.B.C. R.B.C. TOTAL
KHARIF 12246 26605 38851
RABI 10523 23472 33995
TOTAL 22769 50077 72846
LEGEND
1. TOWN / CITY
2. RIVER
3. ROAD
4. DAM / BARRAGE / WEIR
5. RESERVOIR
6. CANALS
7. POTENTIAL CREATED
GOVERNMENT OF INDIA
CENTRAL WATER COMMISSION
NARMADA BASIN ORGANISATION
MONITORING DIRECTORATE, BHOPAL
INDEX MAP
PAIRI IRRIGATION PROJECT
DRG. NO. CWC/DIR(M)/ 97/ 38

5. Approach and Methodology

5.1 Methodology Envisaged

In order to accomplish the task the following methodology was envisaged to be adopted.

i. Constitution and deployment of a Multi-Disciplinary Team of Experts and required field teams;

ii. Orientation and training programme for the Field Teams (Supervisors and Enumerators) for field survey. The Field teams, so deployed, will be working under the overall guidance and supervision of the Core Team deployed at Head Quarters;

iii. Discussions with State Level Departmental Heads as well as CWC Regional Heads by personnel of Core Team and Field Team;

iv. Discussions with Senior Irrigation/Water Resources Department Officials at different levels;

v. Secondary data as available with state Govt. Including area irrigated under each crop, amount of water released in main canal, branch canal, distributary, minor up to outlet level etc. in each crop season was envisaged to be collected. Additionally, the data was proposed to be collected for Head, middle and tail reach of the canal network

vi. Index and Canal Network Map was to be procured. Additionally, list of outlets for entire system of each of the projects along with their chainage/RD was also proposed to be procured;

vii. It was envisaged to collect information on storage versus water released during the year so as to correlate the same with the rainfall, existing cropping pattern to estimate the gap between potential created and potential utilized.

viii. CWC had collected inventory details the project in structured format under Phase I**.** Filled in schedule prescribed for Data Collection by CWC for Phase I is given in (Annexure-1). CWC desired that the information collected by them earlier and supplied to AFC India Limited (Annexure-1) shall be vetted while

carrying out the survey. It was also desired by CWC that the data gaps, if any, identified in the project shall be filled in during the interactions and from various records maintained with the project officials at different levels.

ix. However detailed project information including outlet details are to be collected by the consultant during interaction with stakeholders as envisaged by CWC vide their Proforma specifically designed for Phase-II of the study.

x. During interactions with CWC officials it was desired that while carrying out the survey for collection of information as solicited in Proforma -II to identify the gaps as reported by project-authorities and reasons thereof, constraints and difficulties, if any.

xi. The team would visit the project area to get the first-hand information on the status of canal distribution system including outlet details as per Proforma II and have discussions with state govt officials, farmers, water user associations etc., to identify the lacunas in achievement of full utilization of created potential.

xii. During interactions with state govt. officials, efforts may be made to identify remedial measures for minimizing the identified gaps of IPC and IPU;

x. Coordinates (Latitude and Longitude) of the each of the outlets will be recorded by the Field Team at the sill level of each outlets using GPS meters for the respective canal systems;

xi. The collected data will be geo-referenced to get the SLD and KML files for the canal network;

xii. Study teams will interact with the officials/departmental staff as well as group of the farmers in the outlet command villages to identify the gaps as reported by the department and actual ground situation reported by the farmers. The Group of Farmers will be representative of the Head, Middle and Tail reaches of the system, individually (minors/distributary), as well as overall (complete canal system).

xiii. The data collected under Proforma I and II shall be shared by CWC with the key functionaries of the respective project authorities to develop a suitable

methodology to carry out the main census of major and medium irrigation projects in the country;

5.2 Methodology Adopted

- CWC provided the project details vide filled up Proforma-I as collected from project authorities by them. The same was examined by the AFC team and shortcomings therein were identified for collection during field visits and interaction with state govt officials.
- A multidisciplinary team visited the senior officer at State level and appraised them about the study being carried out by CWC and the benefits thereof. The senior officials agreed and assured to provide all available information to the team members and directed the field formations to help the team members during their visit to the project area.
- The core Team comprised of Dr. S.K. Jain, MR. R.K. Chaubey, Mr. Deepak Kumar, Mr. Ashwini Kumar etc.
- The team visited the project area and interacted with the concerned Executive Engineer and his team of officials at Rajim, Chattisgarh. Detailed discussions were held and the data available at the project office was shared with the AFC team.
- The team met with officials at different levels to procure the data and support for field work. The field work continued with the support of departmental officials for data collection.
- Subsequently, an official was nominated and deputed by Executive Engineer for providing the relevant information and also to accompany the field team for identification of canal network including outlets located thereof.
- The team along with the nominated official traversed along the whole canal network including main canal, distributaries and minors. Cent- percent tracking along the network was made to identify the outlets including their geo-referencing

(latitude and longitude) with a hand-held GPS system. The condition and status of the canal, outlet etc., was observed and recorded.

- The Team had an active interaction with the farmers during the survey along the main canal, distributaries and minors and also discuss the state of affair of irrigation/ water availability in the command area and to identify the constraints.
- Data was also collected from Office of the Subdivision Engineer, Mr. KP. Sahu, at Rajim, Chattisgarh.
- The data so collected has been scrutinized at AFC, Delhi office and shortcomings identified for fulfilling the information in Proforma -II prescribed by CWC.
- The AFC team also interacted with the state govt officials to bridge/ procure the deficient information. However, some information was reportedly not available with the department which have been indicated in the filled up Proforma-I as well as Proforma-II also.
- The data collected by the AFC field teams has been entered in a structured database system. Relevant attribute table has been generated.
- The collected data has been georeferenced for the canal network system for the project.
- The AFC team asked project officials to provide the copy of DPR of the project but it was not available with project officials at different levels.
- After completion of data collection and its analysis the core team interacted with senior project officials to take
- ArcGIS software has been used to create canal network, attachment of attributes and generation of *.kml file to view the network components along with attached attributes on google earth.
- Soft copy of the same is enclosed.

6. Generation of Canal Network

On the basis of field survey using prescribed proforma wherein details of canal network up to outlet level have been captured using the GPS device Zuno- SB of M/s Trimble of USA. The canal network along with command area and the outlets have been shown in **Fig. 6.1 to 6.14.**

Dry outlets have been demarcated by separate colour in *kml files. All other outlets are wet outlets (liable to receive irrigation water). Farmers also corroborated it during interaction.

Since the command area map based on Google Earth is quite big and when attempted to print on A0 size the map was pixelated and was not readable. Accordingly, efforts were made and Grid has been formed on Command Area Map. The print of each grid is given along with Index map for easy readability.

Since a large number of minor irrigation schemes exist in the command area, the data for them about the location and area covered by them are not available, the same could not be demarcated.

The project DPR is not available with project officials. However, salient features of the project were made available by project authorities. The designed details about IPC, Cropping Pattern, IPU were not available.

Data of Phase I and Phase-II have been collected as per prescribed format and has been given in Annexure-I and II respectively.

The findings are base on field observations and discussions with various groups. The opinion of project officials was also considered while reporting.

The data in the form of network diagram depicting the canal network has been generated on the basis of field survey and geo-referencing of field observations.

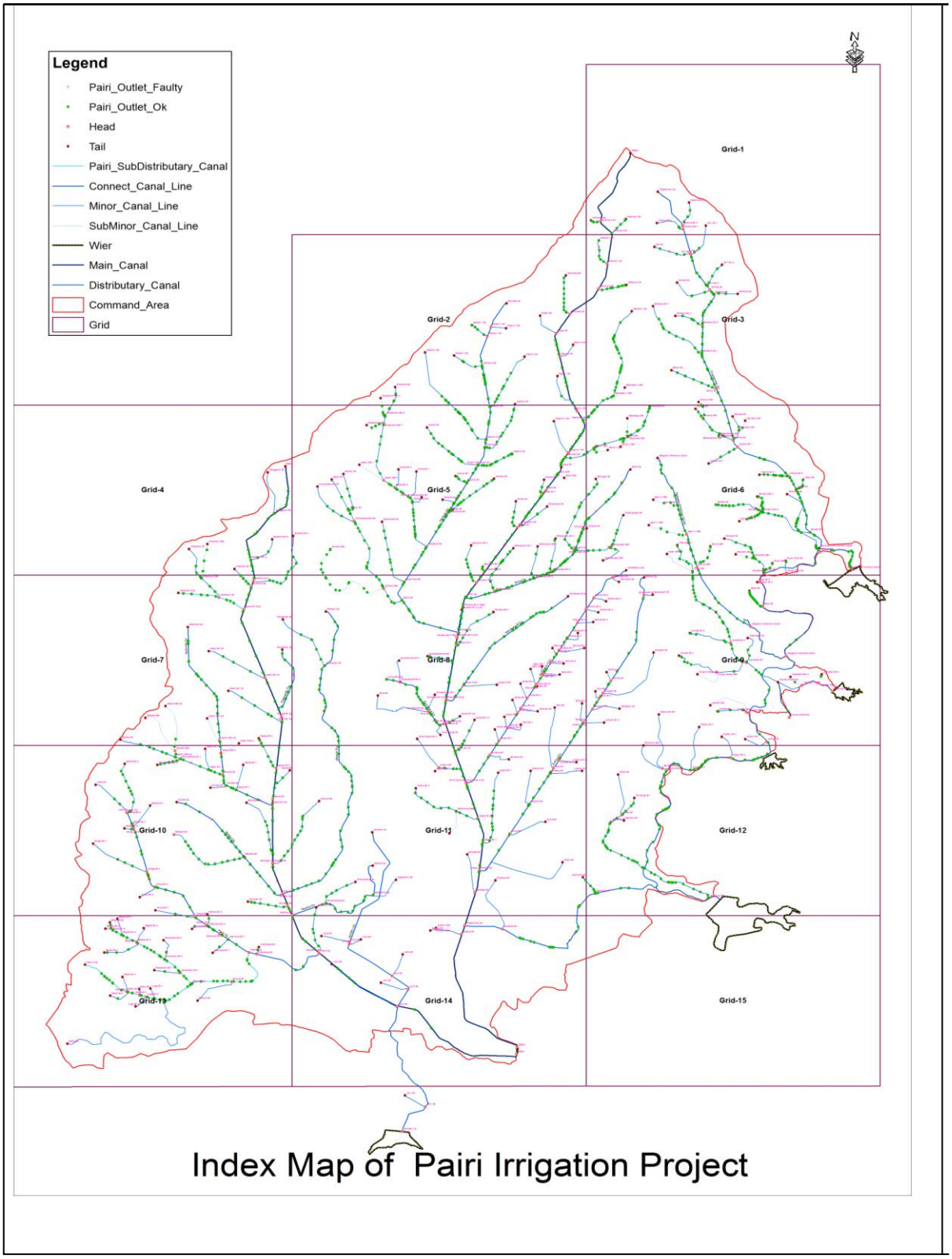


Fig. 6.1 Command Area and Canal Network of Pairi Irrigation Project

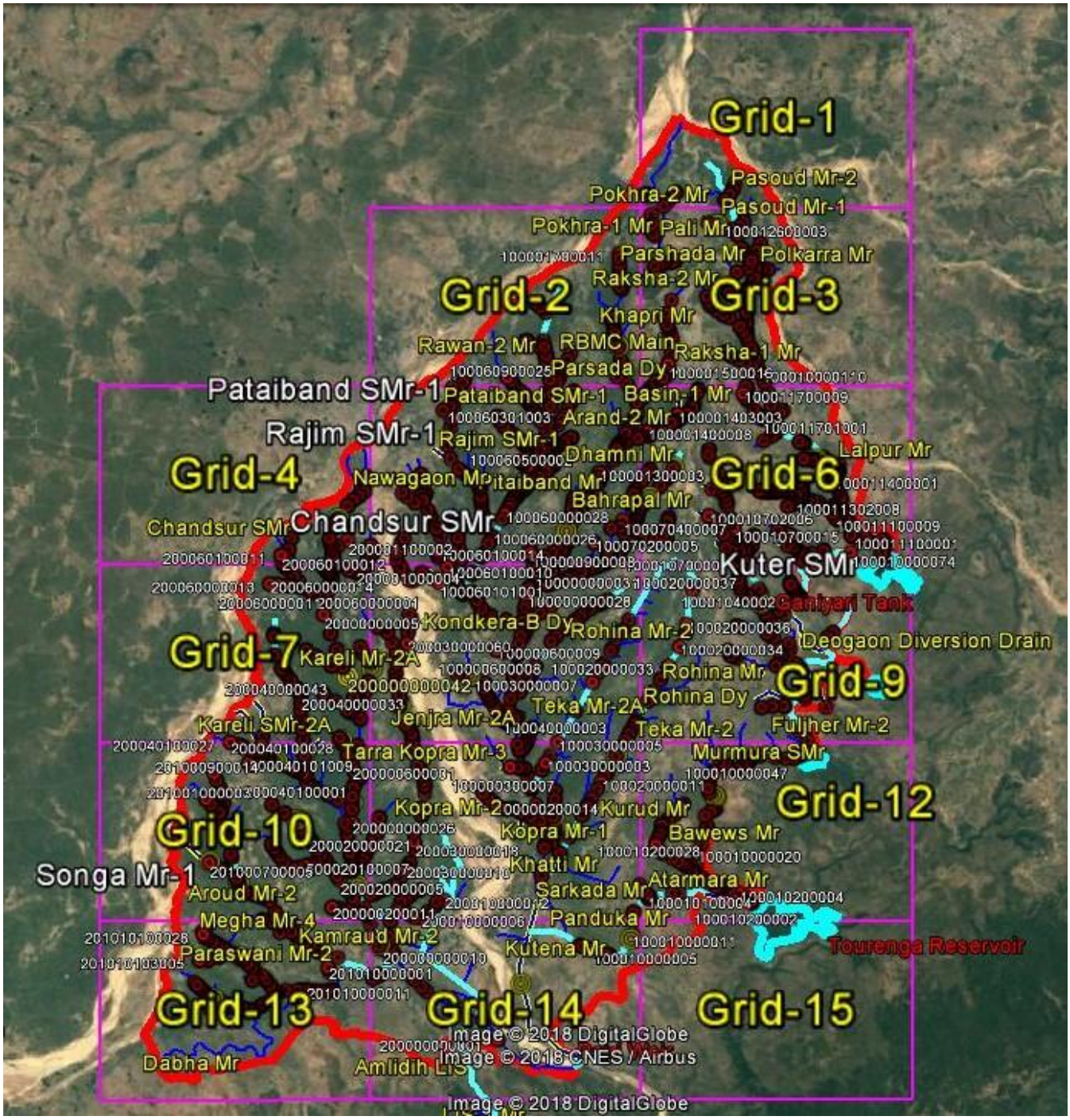


Fig. 6.2 Command Area and Canal Network of Pairi Irrigation Project with Head and Tails

Fig. 6.3 Command Area and Canal Network of Pairi Irrigation Project with outlets Grid-1

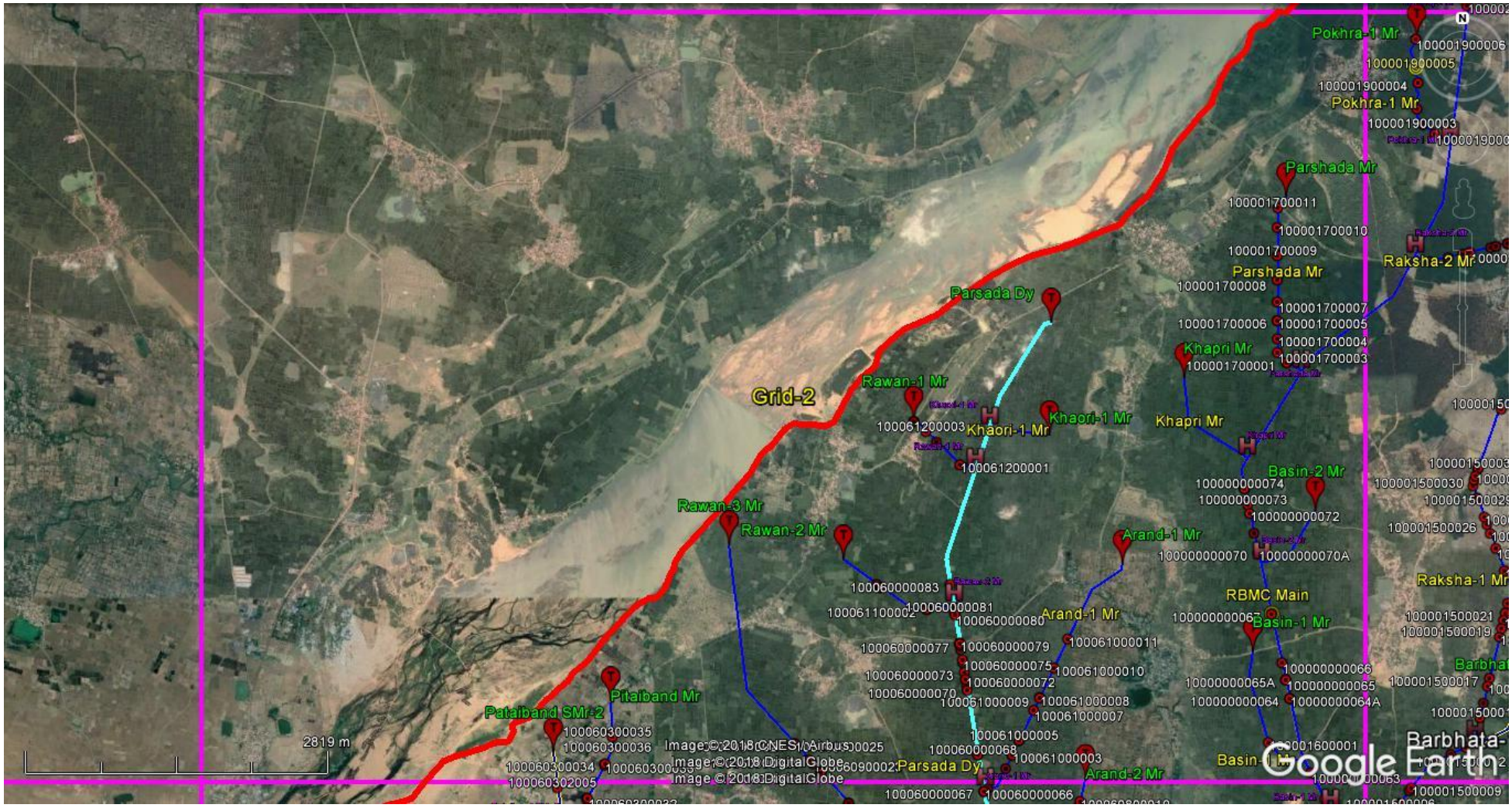


Fig. 6.4 Command Area and Canal Network of Pairi Irrigation Project with outlets- Grid-2

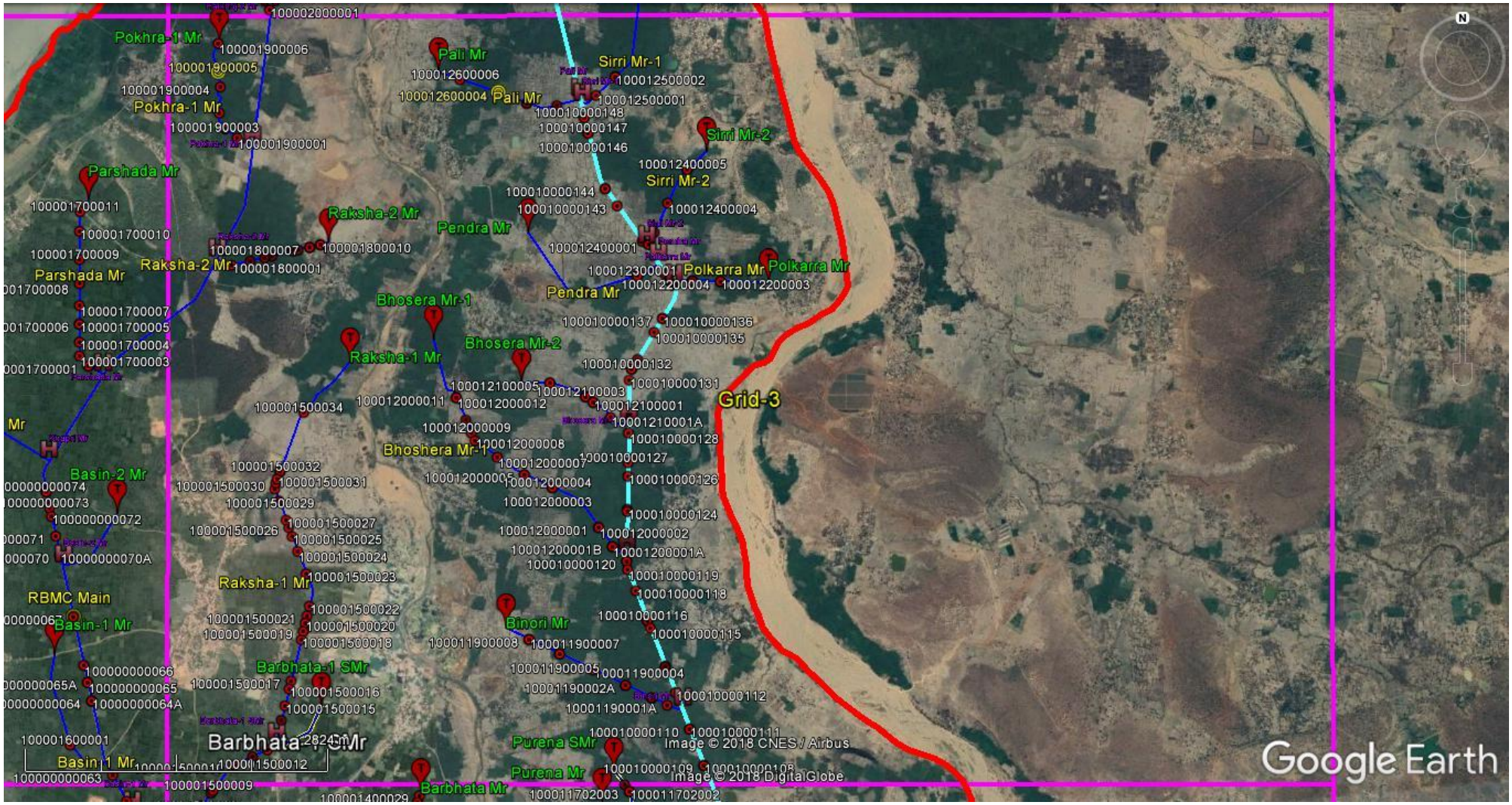


Fig. 6.5 Command Area and Canal Network of Pairi Irrigation Project with outlets- Grid-3

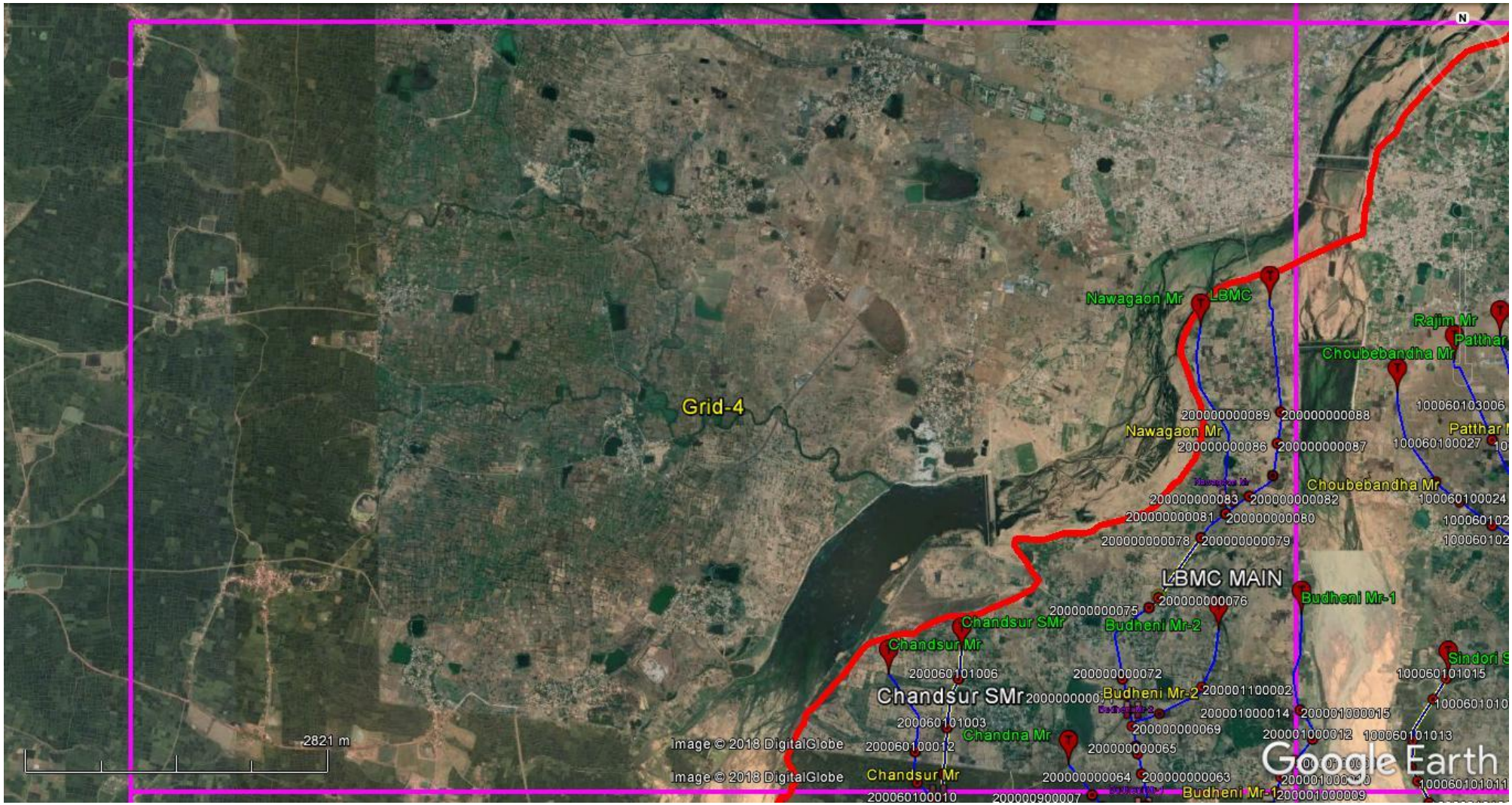


Fig. 6.6 Command Area and Canal Network of Pairi Irrigation Project with outlets- Grid-4

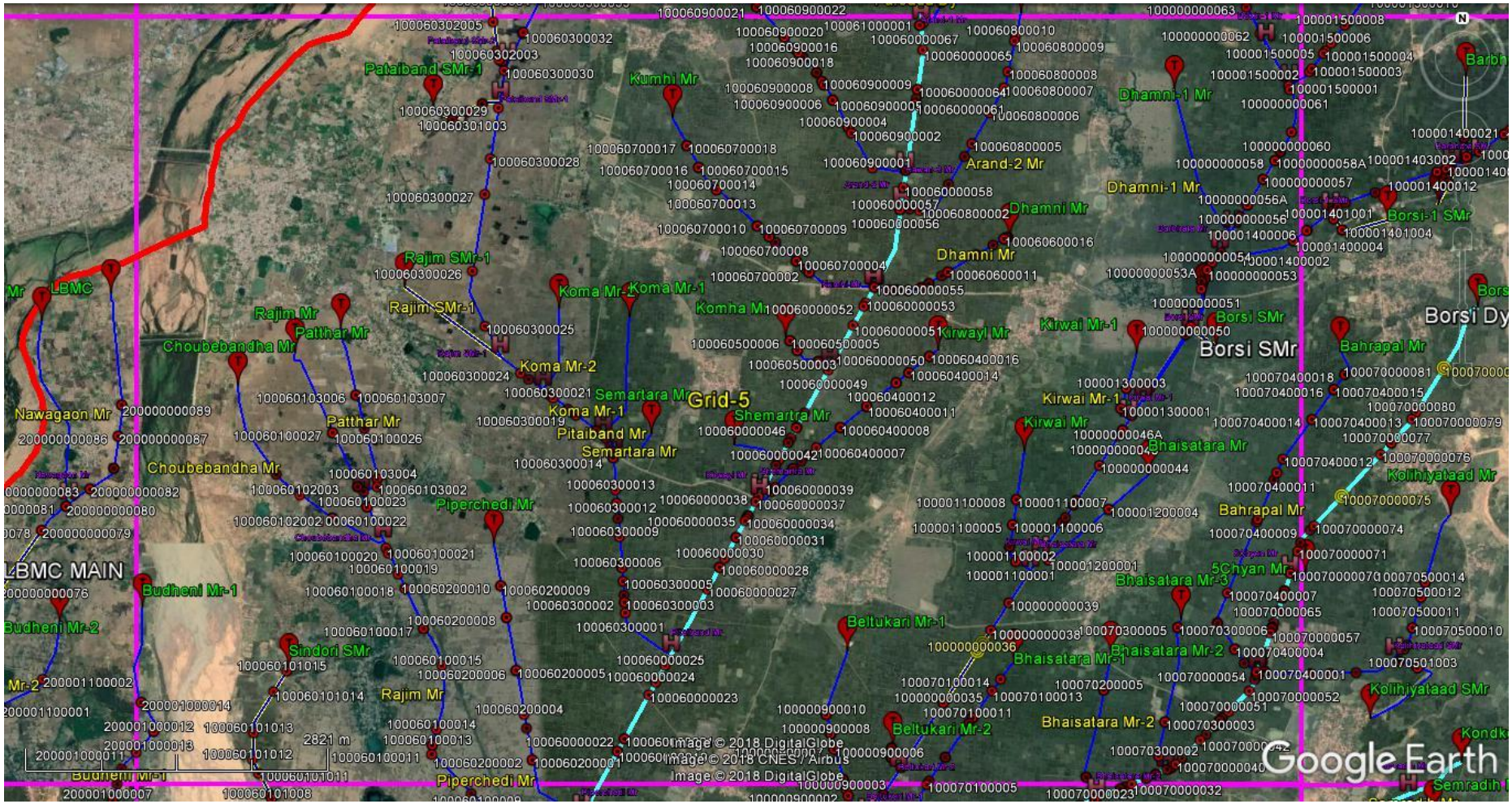


Fig. 6.7 Command Area and Canal Network of Pairi Irrigation Project with outlets- Grid-5

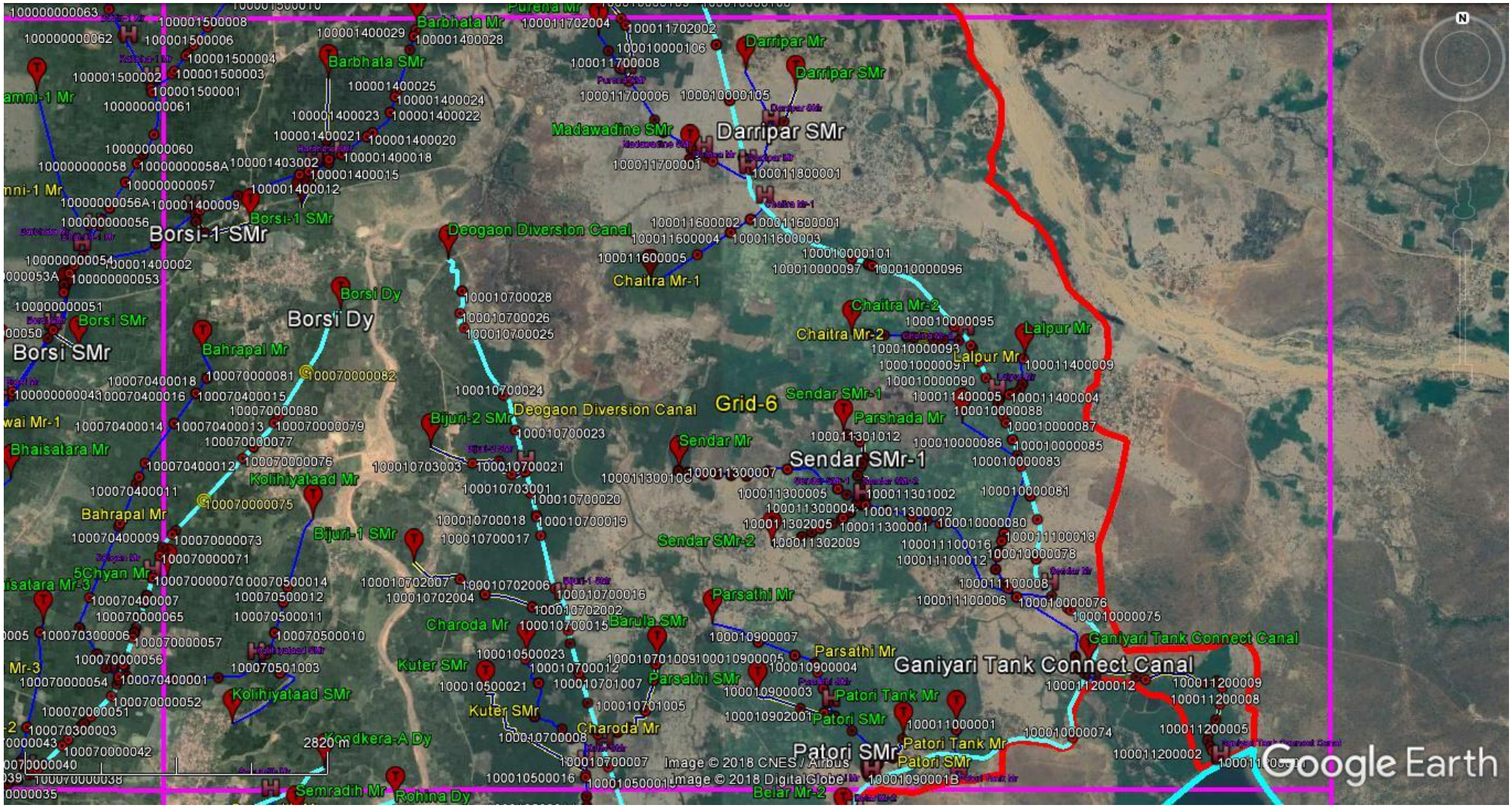


Fig. 6.8 Command Area and Canal Network of Pairi Irrigation Project with outlets- Grid-6

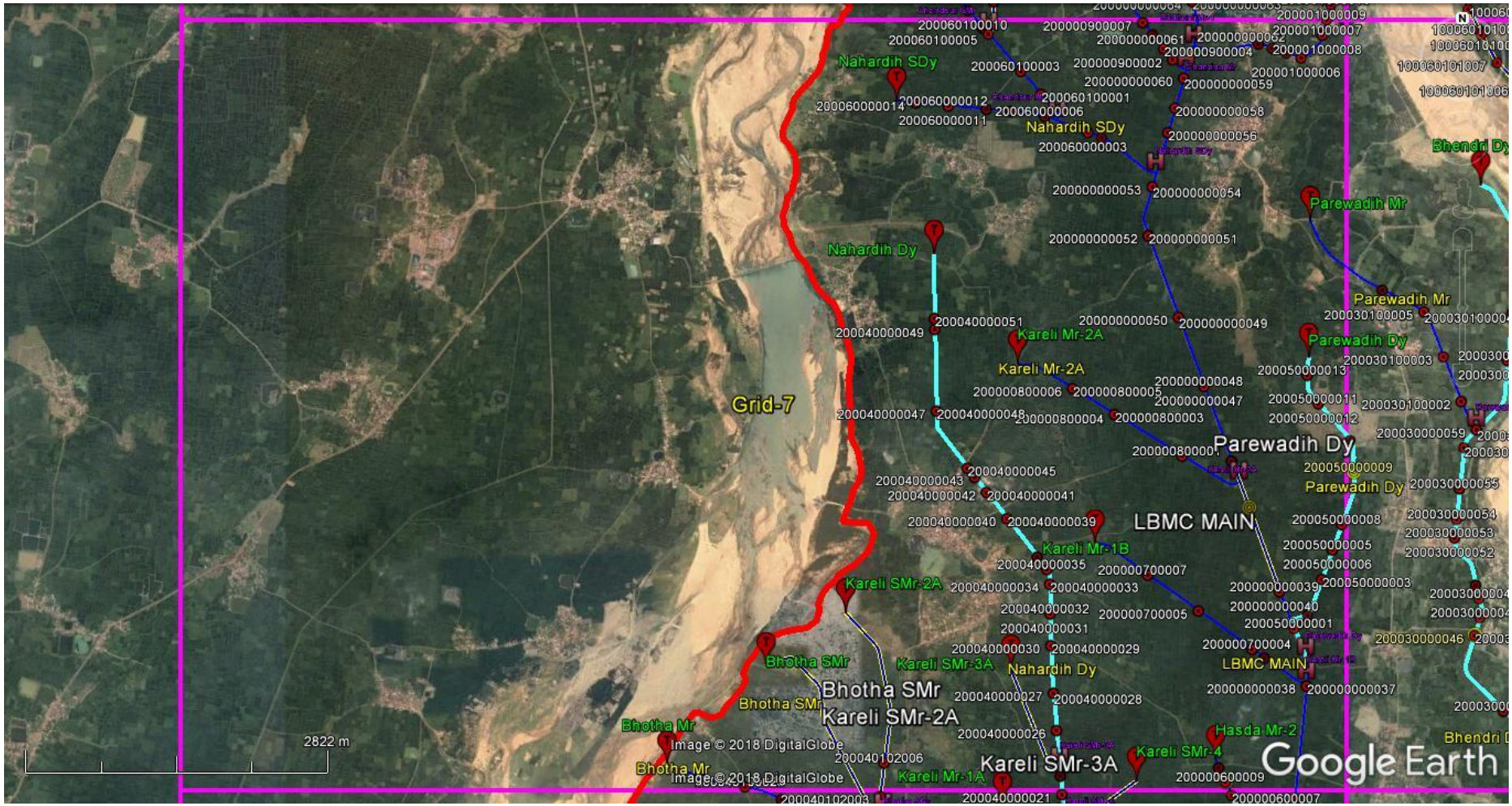


Fig. 6.9 Command Area and Canal Network of Pairi Irrigation Project with outlets- Grid-7

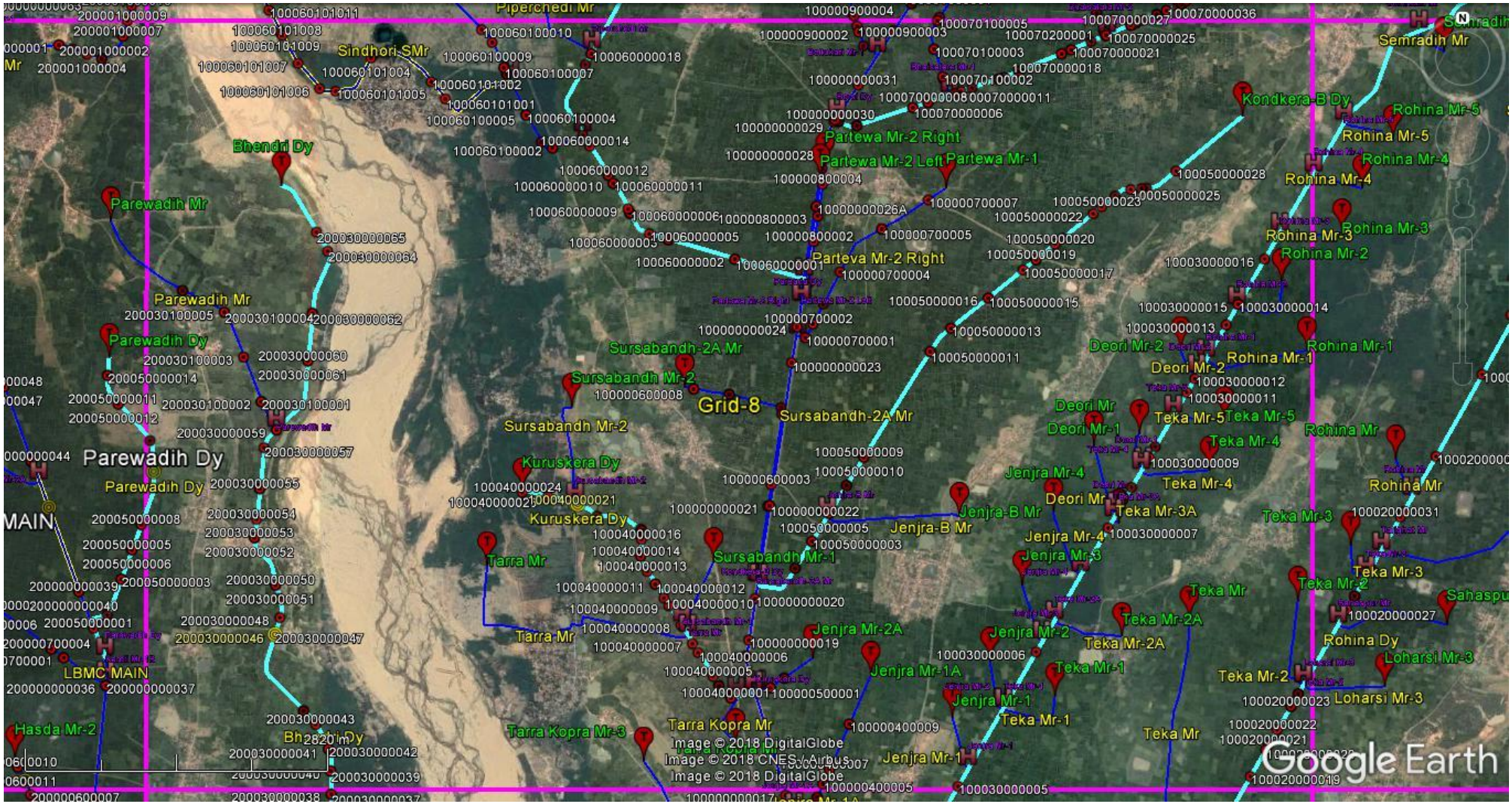


Fig. 6.10 Command Area and Canal Network of Pairi Irrigation Project with outlets- Grid-8

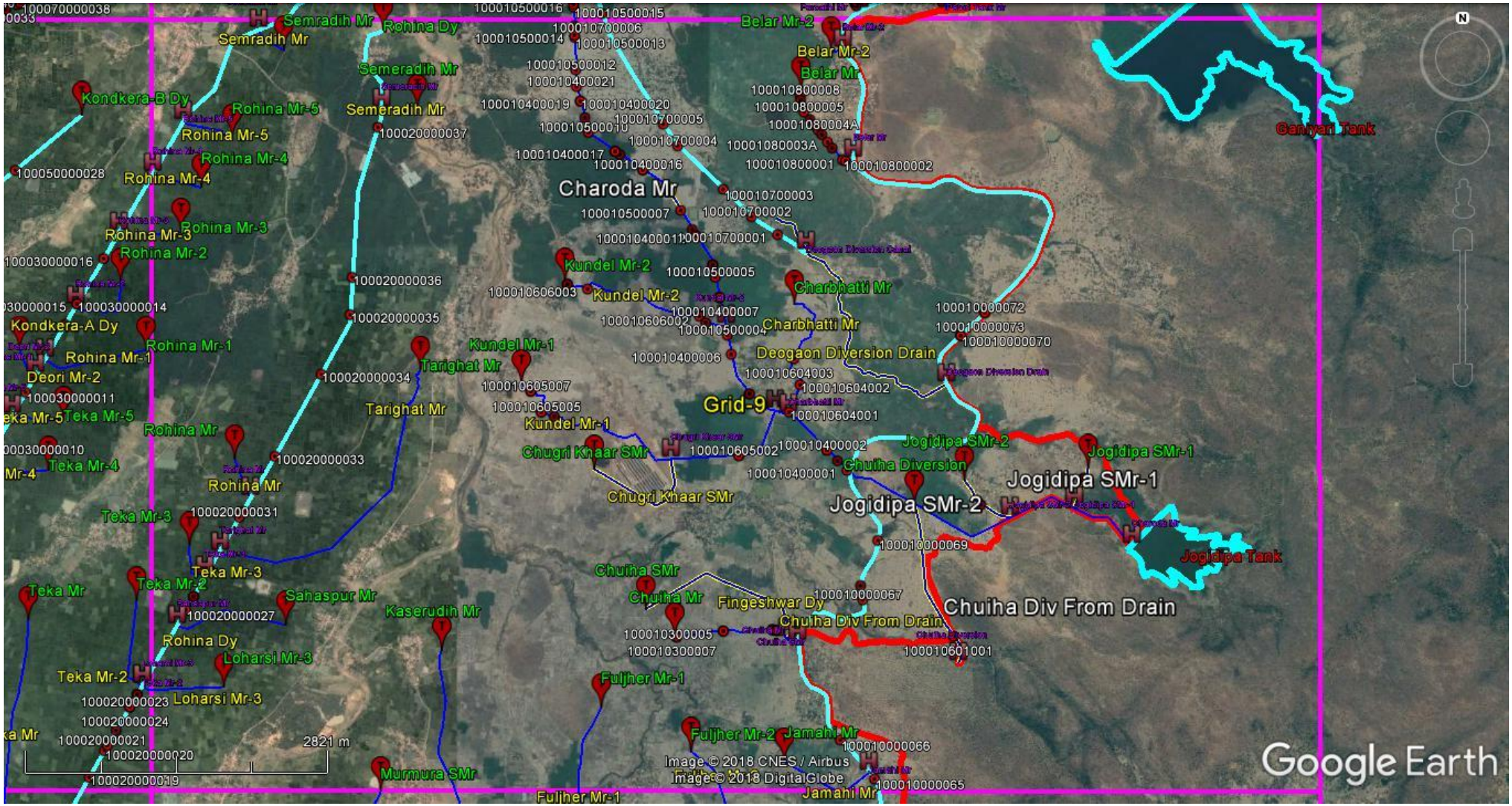


Fig. 6.11 Command Area and Canal Network of Pairi Irrigation Project with outlets- Grid-9

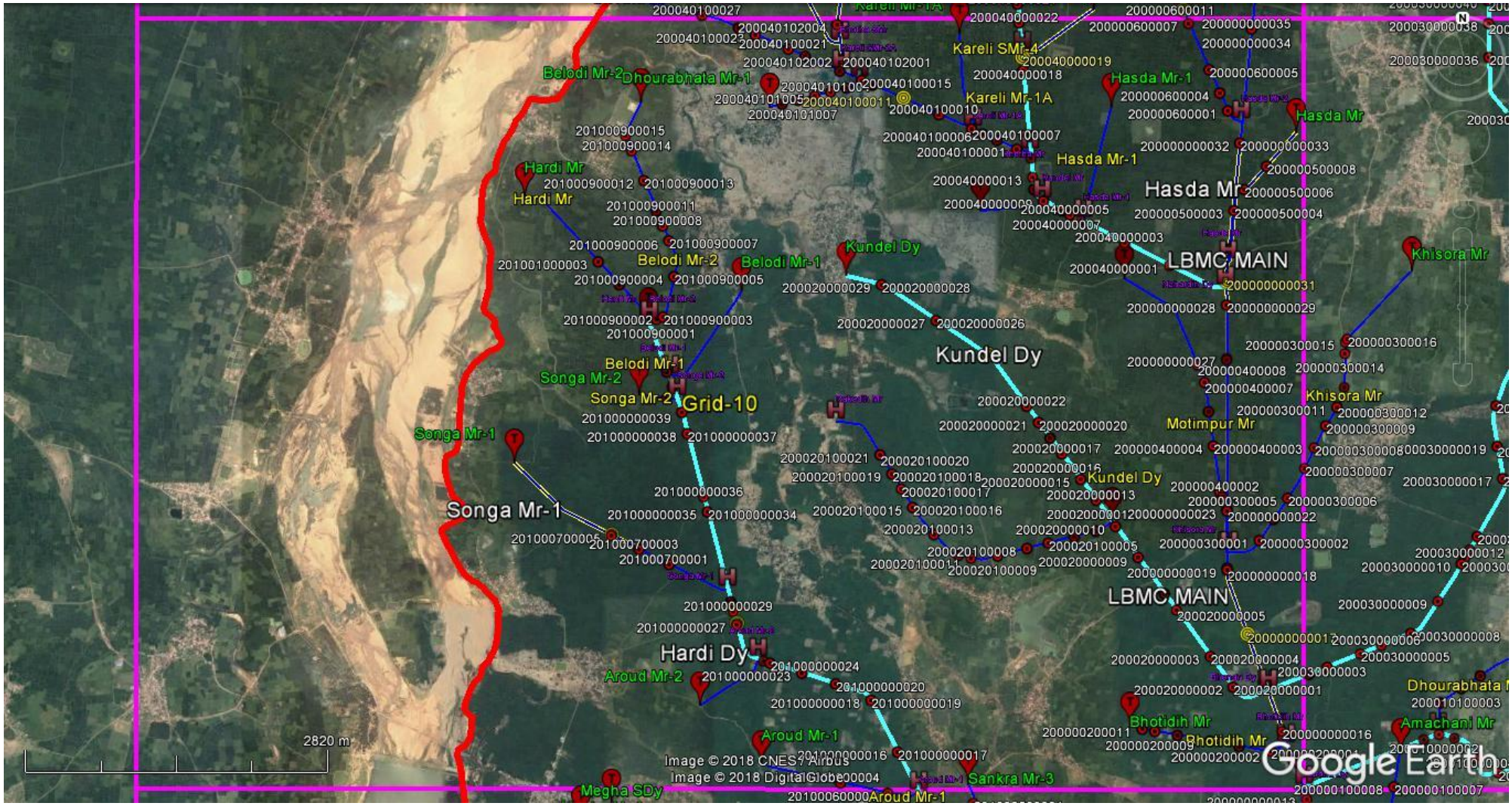


Fig. 6.12 Command Area and Canal Network of Pairi Irrigation Project with outlets – Grid-10

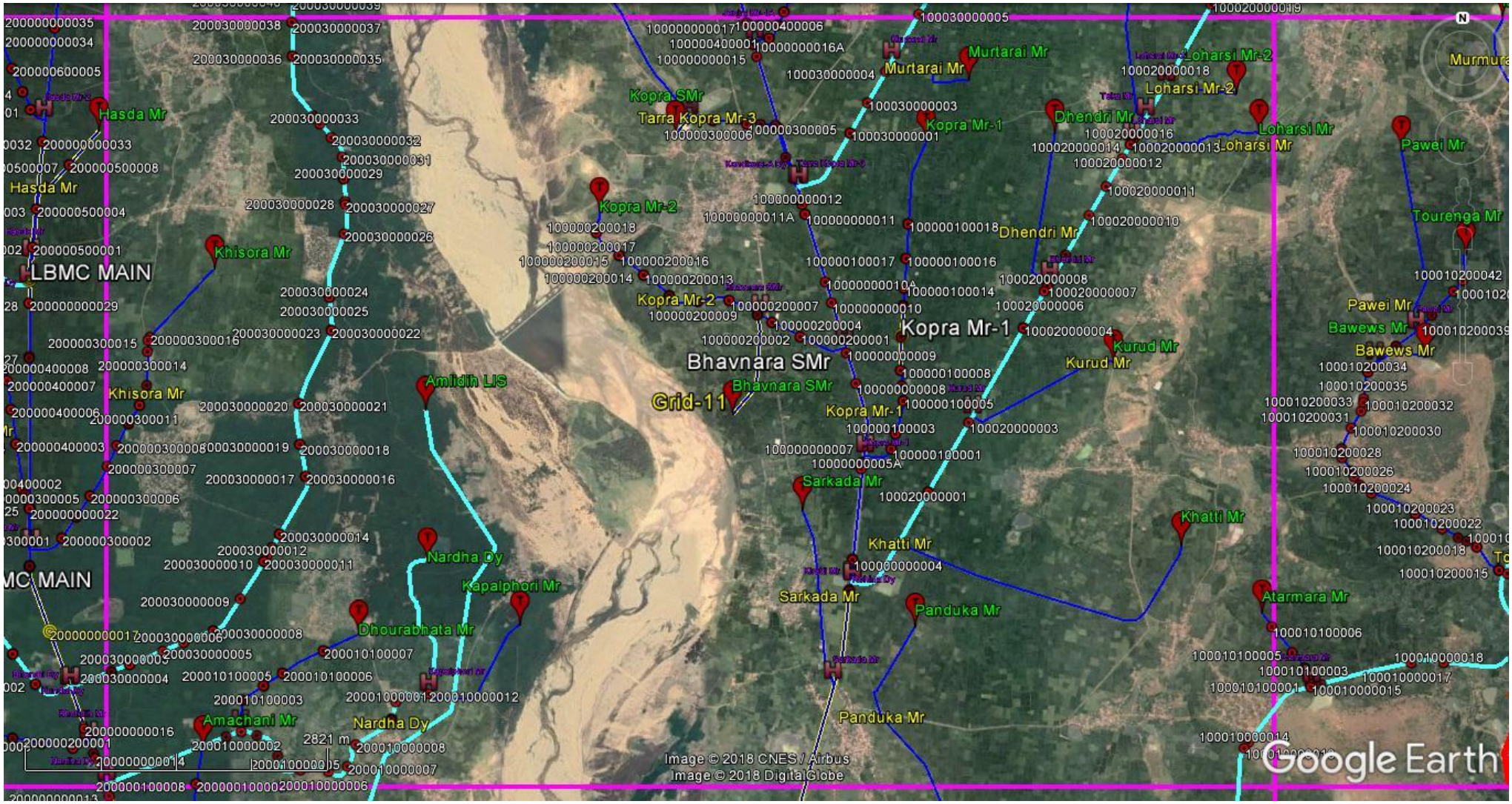


Fig. 6.13 Command Area and Canal Network of Pairi Irrigation Project with outlets- Grid-11

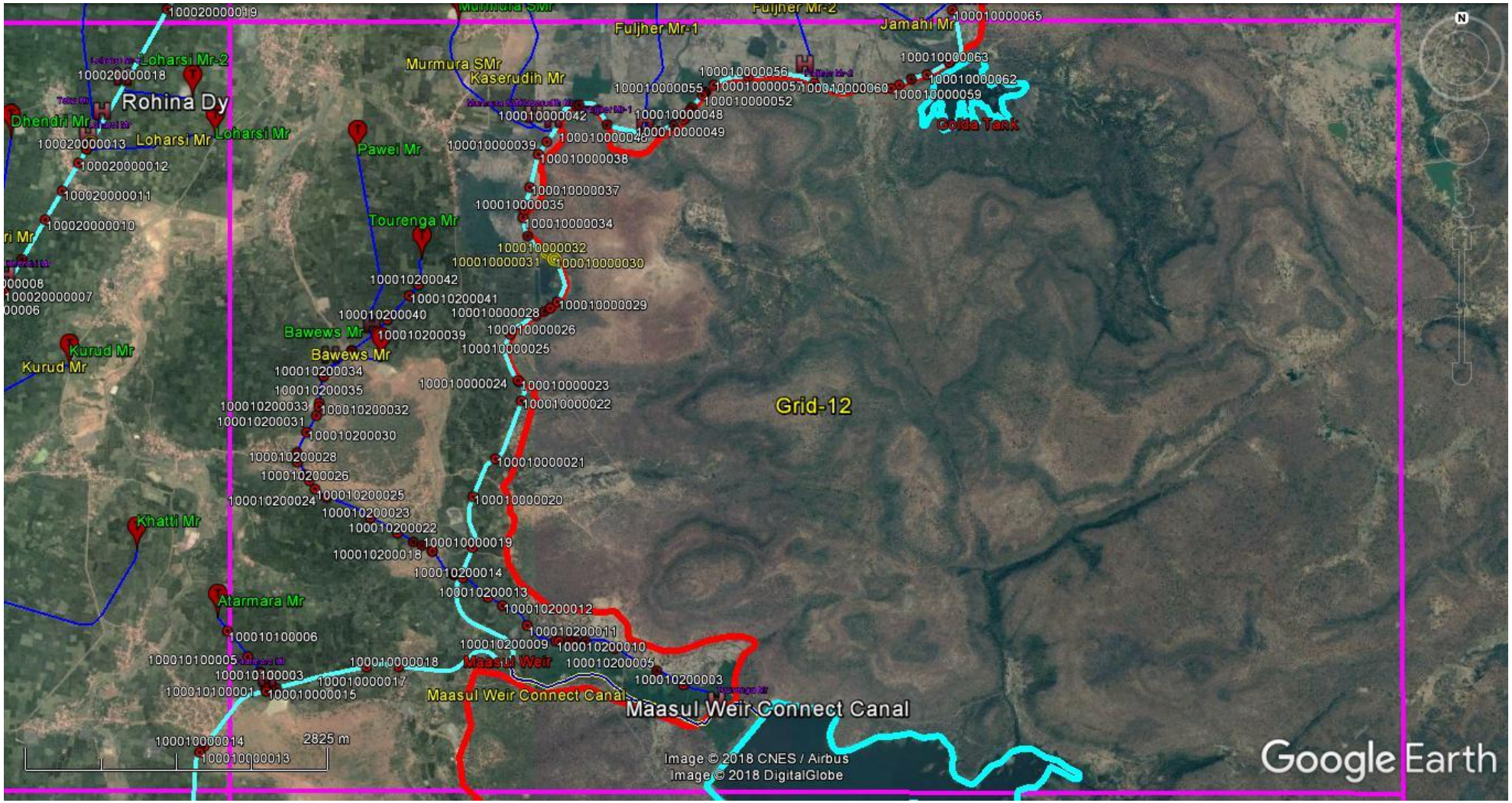


Fig. 6.14 Command Area and Canal Network of Pairi Irrigation Project with outlets- Grid-12

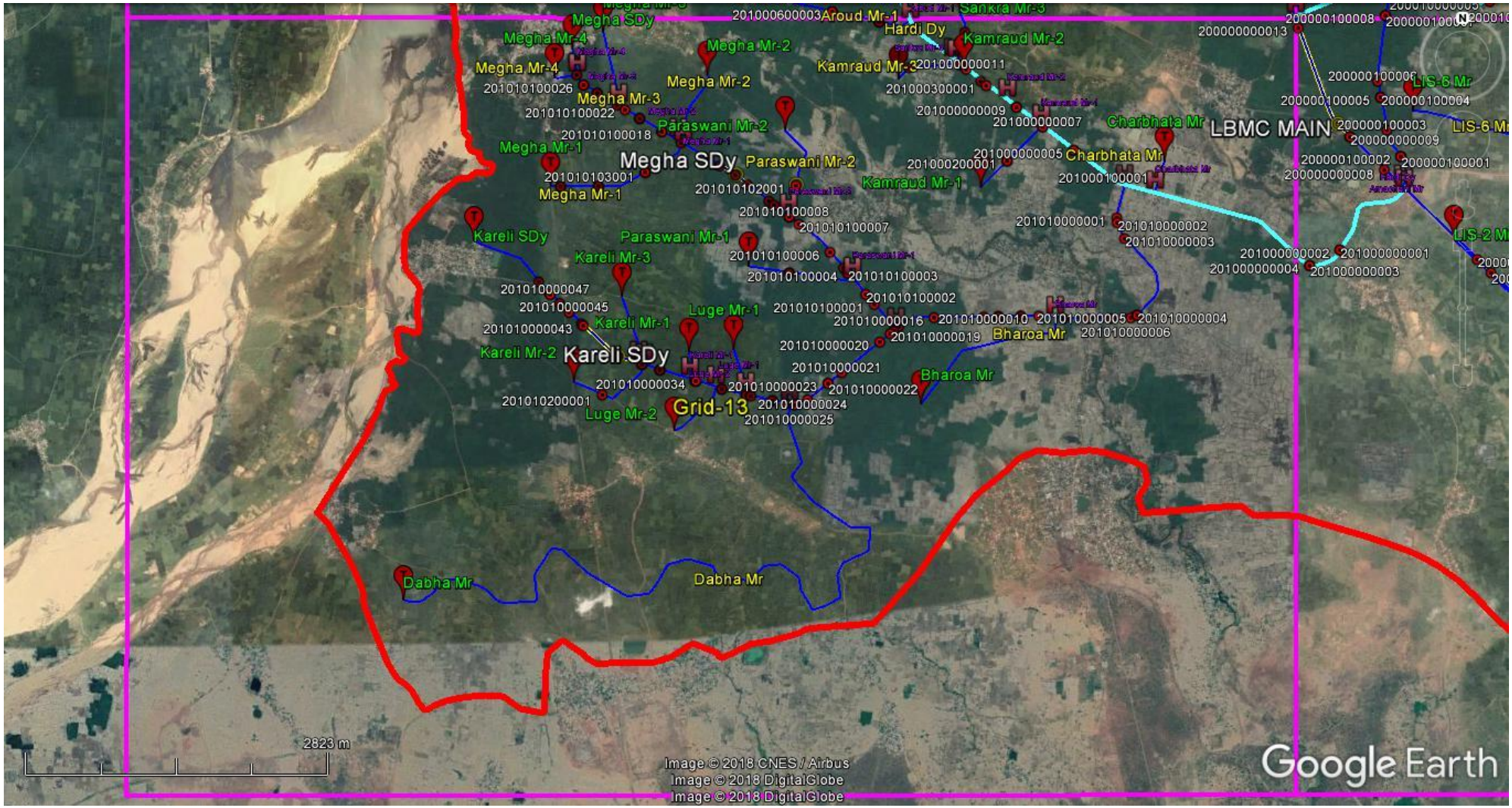


Fig. 6.15 Command Area and Canal Network of Pairi Irrigation Project with outlets- Grid-13

Fig. 6.16 Command Area and Canal Network of Pairi Irrigation Project with outlets- Grid-14

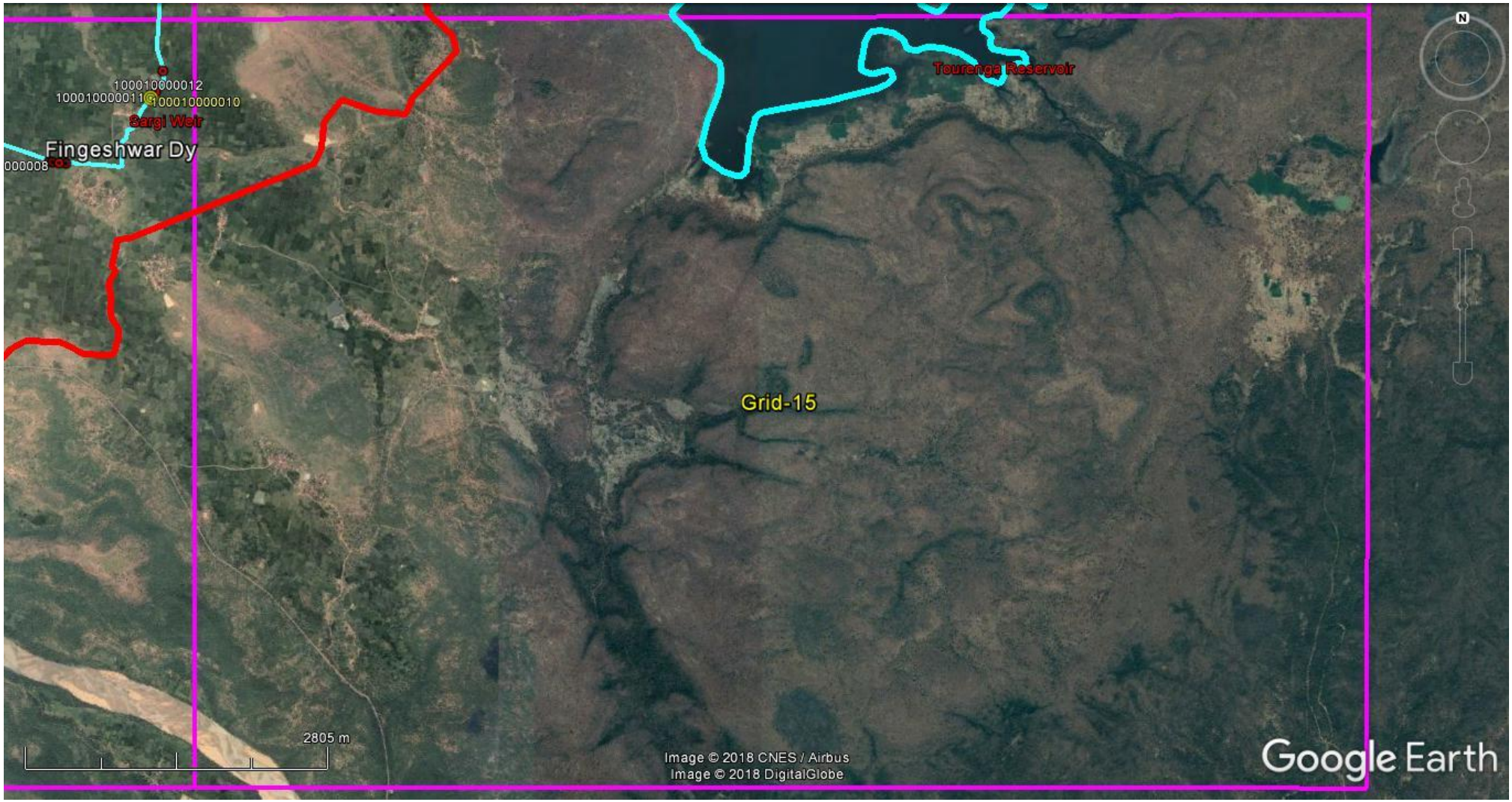


Fig. 6.17 Command Area and Canal Network of Pairi Irrigation Project with outlets- Grid-15

7. Results and Findings

- There is a gap of 31547 ha between IPC (73736 ha) and IPU(42189 ha) in Pairi Irrigation Project in 2012-13. This is about 42.78% of total IPC of the project.
- The data on IPU has been collected from the project officials on the basis of their records. It was reported that field functionaries of the project note down the area irrigated in their jurisdiction which is then aggregated at higher levels and the figures for the project level is worked out by them.
- In the absence of DPR, designed cropping pattern was not available. However actual cropping pattern as ascertained from the project has been reported in Annexure-I.
- The cropping pattern in the command area of Pairi irrigation project in the year 2012-13 is given in Table 7.1

Table 7.1 Cropping Pattern in Command area of Pairi (2012-13)

Season	Name of the Crop	Cropped Area (in ha)
Kharif	Paddy	33280
	wheat	1110
	Vegitables	1840
	Maize	640
	Other	107
Total		**36977**
Rabi	Paddy	4952
	wheat	130
	Vegitables	118
	Maize	12
Total		**5212**
Total		**42189**

- The naming of the canals, distributaries, minors and outlets have been made by project officials as per their own norms.
- Head reaches farmers grow cash crop, abundant water crops and refuse to go for water efficient or low water consuming crops in next season. It gets aggravated due to non-availability of measuring devices/ practice of not measuring and keeping track of actual water flow through structures.

- During the survey, it was noticed that the earthen canal/ distributary in general are having weed growth and broken outlets on canal resulting in leakage and seepage of water.
- There is no incentive to save precious water.
- Canal maintenance is not there so weed growth, breakage occurs leading to obstruction in water reaching tail end.
- Outlets are broken at many places due to which water divert and do not flow in the direction it was planned.
- Shortage of manpower and resources was reported to be a major reason for gap in maintenance of canal system.
- There is no Warabandi system in the area leading to gaps.
- Water User Associations (WUA) are non-functional.
- There is lack of monitoring of canal operations.
- Water reaches upto tail when it is not required by farmers at higher reaches.
- Neglect and lack of annual budget for operation and maintenance (O& M) so the system deteriorates.
- Theft of water and revenue on mass scale.
- During the survey, it was noticed that the earthen canal/ distributary in general are having weed growth and broken outlets on canal resulting in leakage and seepage of water.
- The project functionaries reported that due to canal being unlined there is problem of seepage all along the canal.
- Outlets are broken at many places (some typical illustrations are given in photograph section) due to which water divert and do not flow in the direction it was planned.
- There were 2083 outlets in the project area. RBMC had 1438 outlets while LBMC had 645 outlets.

- It was also observed that 42 outlets were broken/ damaged/ weeded/silted which is 2.01% of total outlets.
- It was also reported that due to scanty rainfall adequate water is not received due to which water do not reach up to tail.
- Shortage of manpower and resources was also reported to be a major reason for gap in maintenance of canal system.
- Farmers reported that their main crop was paddy.
- There is lack of monitoring of canal operations.
- Due to clogging of canals there is disruption of normal flow in canals leading to decrease in irrigation potential utilized.

Table 7.1 List of Affected Outlets

S. No.	Main canal	Branch canal	Distributary	Minor	Sub - Minor	Chainage_m	Outlet No.	Outlet ID *	Block / Tehsil	Village	**Canal Status (Reach wise)	Remarks
1	RBMC	NA	NA	NA	NA	4200	001	100000000001	Chhura	Kutena	RBMC-001	Broken
2	RBMC	NA	NA	NA	NA	23153	036	100000000036	Fingeshwar	Bhaisatara	RBMC-036	Broken
3	RBMC	NA	NA	NA	NA	23243	037	100000000037	Fingeshwar	Beltukari	RBMC-037	Broken
4	RBMC	NA	NA	NA	NA	31665	068	100000000068	Fingeshwar	Basin	RBMC-068	Siltation
5	RBMC	NA	NA	NA	NA	31665	069	100000000069	Fingeshwar	Basin	RBMC-069	Siltation
6	RBMC	NA	Fingeshwar Dy	NA	NA	4800	010	100010000010	Chhura	Mohtara	Fin Dy-010	Broken
7	RBMC	NA	Fingeshwar Dy	NA	NA	13860	030	100010000030	Chhura	Charoda	Fin Dy-030	Weeds
8	RBMC	NA	Fingeshwar Dy	NA	NA	13890	031	100010000031	Chhura	Murmura	Fin Dy-031	Weeds
9	RBMC	NA	Fingeshwar Dy	NA	NA	13950	032	100010000032	Chhura	Charoda	Fin Dy-032	Weeds
10	RBMC	NA	Fingeshwar Dy	Charoda Mr	NA	3300	013	100010400013	Fingeshwar	Sirri Khurda	Cha. Mr-013	Broken
11	RBMC	NA	Fingeshwar Dy	Charoda Mr	NA	3300	014	100010400014	Fingeshwar	Deogaon	Cha. Mr-014	Broken
12	RBMC	NA	Fingeshwar Dy	Chaitra Mr-2	NA	390	003	100011500003	Fingeshwar	Chaitra	Chai. Mr-2-003	Broken
13	RBMC	NA	Fingeshwar Dy	Pali Mr	NA	810	004	100012600004	Rajim	Pali	Pali Mr-004	Siltation
14	RBMC	NA	Fingeshwar Dy	Pali Mr	NA	810	005	100012600005	Rajim	Pali	Pali Mr-005	Siltation
15	RBMC	NA	Rohina Dy	NA	NA	5040	015	100020000015	Fingeshwar	Bhendri	Rohina Dy-015	Broken
16	RBMC	NA	Rohina Dy	NA	NA	5700	017	100020000017	Fingeshwar	Loharsing	Rohina Dy-017	Broken
17	RBMC	NA	NA	Kopra Mr-1	NA	1350	011	100000100011	Fingeshwar	Kopra	Kopra Mr-1-011	Broken
18	RBMC	NA	Kuruskera Dy	NA	NA	2700	021	100040000021	Fingeshwar	Sursabandha	Kuruskera Dy-021	Siltation
19	RBMC	NA	Kuruskera Dy	NA	NA	2730	022	100040000022	Fingeshwar	Sursabandha	Kuruskera Dy-022	Siltation
20	RBMC	NA	Borsi Dy	NA	NA	6510	075	100070000075	Fingeshwar	Baherapal	Borsi Dy-075	Weeds
21	RBMC	NA	Borsi Dy	NA	NA	8040	082	100070000082	Fingeshwar	Baherapal	Borsi Dy-082	Broken

22	RBMC	NA	NA	Pokhra-1 Mr	NA	900	005	100001900005	Fingeshwar	Pokhara	Pokhra-1 Mr-005	Siltation
23	LBMC	NA	NA	NA	NA	9900	011	200000000011	Magarlod	Bodki	LBMC-011	Broken
24	LBMC	NA	NA	NA	NA	12510	017	200000000017	Magarlod	Bhotidih	LBMC-017	Broken
25	LBMC	NA	NA	NA	NA	15810	031	200000000031	Magarlod	Khisora	LBMC-031	Broken
26	LBMC	NA	NA	NA	NA	21000	042	200000000042	Magarlod	Moheranga	LBMC-042	Broken
27	LBMC	NA	NA	NA	NA	27810	077	200000000077	Magarlod	Budeni	LBMC-077	Broken
28	LBMC	Hardi Dy	NA	NA	NA	8220	028	201000000028	Magarlod	Khair Jheeti	Hardi Dy-028	Broken
29	LBMC	Hardi Dy	NA	NA	NA	8340	030	201000000030	Magarlod	Khair Jheeti	Hardi Dy-030	Broken
30	LBMC	Hardi Dy	Kareli SDy	NA	NA	6600	042	201010000042	Magarlod	Chhipli	Kareli SDy-042	Broken
31	LBMC	Hardi Dy	Kareli SDy	Megha SDy	NA	2100	014	201010100014	Magarlod	Megha	Megha SDy-014	Broken
32	LBMC	Hardi Dy	Kareli SDy	Megha SDy	Paraswani Mr-2	360	002	201010102002	Kurud	Paraswani	Paraswani Mr-2-002	Siltation
33	LBMC	Hardi Dy	NA	Songa Mr-1	NA	1200	006	201000700006	Magarlod	Giroud	Songa Mr-1-006	Broken
34	LBMC	NA	Kundel Dy	NA	NA	4200	024	200020000024	Magarlod	Kundel	Kundel Dy-024	Broken
35	LBMC	NA	Kundel Dy	NA	NA	4200	025	200020000025	Magarlod	Kundel	Kundel Dy-025	Broken
36	LBMC	NA	Bhendri Dy	NA	NA	9360	046	200030000046	Magarlod	Moheranga	Bhendri Dy-046	Siltation
37	LBMC	NA	Nahardih Dy	NA	NA	3270	019	200040000019	Magarlod	Kareli	Nahardih Dy-019	Weeds
38	LBMC	NA	Nahardih Dy	NA	NA	3270	020	200040000020	Magarlod	Kareli	Nahardih Dy-020	Weeds
39	LBMC	NA	Nahardih Dy	Bhotha Mr	NA	1260	011	200040100011	Magarlod	Kundel	Bhotha Mr-011	Weeds
40	LBMC	NA	Nahardih Dy	Bhotha Mr	NA	1260	012	200040100012	Magarlod	Kundel	Bhotha Mr-012	Weeds
41	LBMC	NA	NA	Hasda Mr-2	NA	1200	008	200000600008	Magarlod	Hasda	Hasda Mr-1-008	Weeds
42	LBMC	NA	Parewadih Dy	NA	NA	1950	009	200050000009	Magarlod	Parewadih	Parewadih Dy-009	Broken

8. Constraints/ Reasons for Gap

The reasons for Gap may be categorised as follows:

i. Technical Reasons;

ii. Socio-economic Reasons;

iii. Institutional/ Managerial Reasons;

iv. Policy related Reasons and

v. Agriculture Related Reasons

Technical Reasons

- Non-maintenance of water courses/ distributaries, growth of weed, collapse of side slopes, damage to sides and bed, reduced waterways, seepage and leakages of canal waters etc are responsible for gap between IPC and IPU.
- Water supplied once is considered for IPU while Farmers resort to groundwater to supplement water needs for crop. This is disguised gap in IPC and IPU.
- Non-availability of required infrastructure such as Headworks, Control/ measuring devices, broken outlets etc
- Earthen water distribution channels
- Frequent breaches
- Irregular de-silting of distribution channels
- Operation & Maintenance budget being inadequate

Socio-economic Reasons

- Excessive use of irrigation water many a times results in water-logging
- Deliberate damage to water outlets
- Deliberate utilization of area under field channels by farmers as field channels were constructed in their fields.
- Farmers resort to flood irrigation.
- Lack of cooperation among farmers, villages, blocks, districts and departments.

- Often minor disputes related to distribution are blown out of proportion
- Wastage on account of over irrigation
- Water not released at the time of requirement

Institutional/ Managerial Reasons

- Non-existence of effective functional WUAs
- Low technical exposure of the officials of Irrigation Department at grass root level.
- Modern Managerial capabilities of the Irrigation Department staff for conflict resolution is lacking
- Lack of staff
- Lack of Operation & Maintenance Budget
- Low motivation of Irrigation Department staff
- Lack of supervision by Irrigation Department staff
- Lack of facilities for Movement along canal network for staff and officers of Irrigation Department
- Safety considerations of staff

Policy Related Reasons

- Lack of administrative powers to Irrigation Department staff
- Number of watering not accounted for IPU computation
- Lack of coordination between line departments including CADA, Agriculture, Revenue etc.

Agriculture Related Reasons

- Change in demand of irrigation water due to change of cropping pattern over time in the command area
- Increased demand of irrigation water due to use of chemical fertilizers and high yield varieties seeds

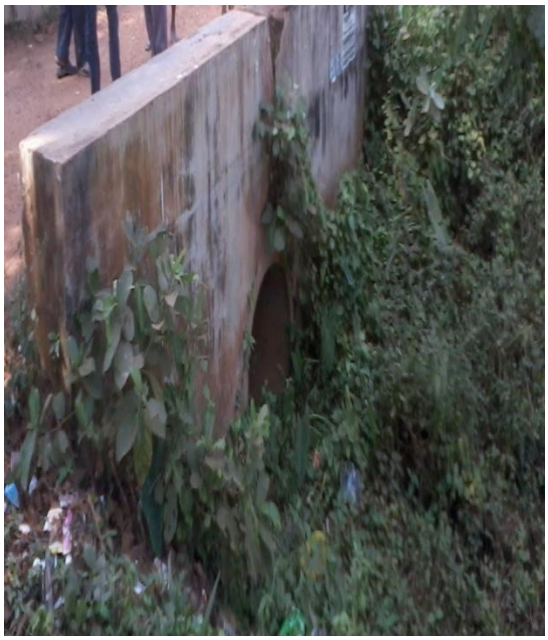
9. Recommendations:

- Canal system needs restoration of structures, canal cross sections, gradients, embankments, outlets etc.
- Regular maintenance of canal system including weed eradication,
- Control of leakage/ theft from canal system to be enforced.
- Control and Measuring devices including modular outlets to be installed to prevent pilferage
- Selective lining in vulnerable reaches should be carried out.
- Propagation of less water intensive crops through modified cropping pattern.
- The Pairi irrigation project was initiated in 1973 and completed in the year 1999. The system is in a dilapidated condition and needs restoration in the distribution system, outlets etc. Since almost 2 decades have elapsed the data is also not maintained systematically.
- It is recommended that suitable data acquisition system along with proper data storage system (DSS) may be evolved for the project to keep track of the precious water resource storage and distribution through the system.
- Adequate monitoring of the system is required.
- Selective lining in vulnerable reaches should be carried out.
- Propagation of less water intensive crops through modified cropping pattern.
- Proper monitoring system also needs to be evolved to keep a track of leakage and theft of water.
- Adequate trained manpower to be provided.
- Capacity building of field functionaries including orientation programs through classroom and field exposure together with adequate staff to keep the system in order.
- Field visits of successful projects in other states for on spot visualization.
- Women's participation in water management to be promoted.

- Data to be generated and maintained digitally in a properly designed Data Storage System (DSS) at Division and above levels.
- Transparency in data maintenance.
- Easy accessibility of data to officials and farmers.
- Renovation of system is required. Selective lining of canal may be undertaken.
- Night irrigation shall be propagated to minimize evaporation losses.
- Practice of giving incentive for less water consuming crop cultivation.
- Heavy penalties need to be imposed for blocking and breaching the canal system.
- Conveyance efficiency shall be enhanced by adopting selective lining of canal.
- Adequate budget commensurate with proper maintenance of canal system to be ascertained annually.
- Third party technical and financial monitoring to ascertain proper utilization of manpower, budget and upkeep of system at project level on regular basis.

10. Photographs of Damaged/ Broken Outlets

		
Photograph Outlet No : RBMC-001		Photograph Outlet No : RBMC-036
		
Photograph Outlet No : RBMC-037		Photograph Outlet No : RBMC-068

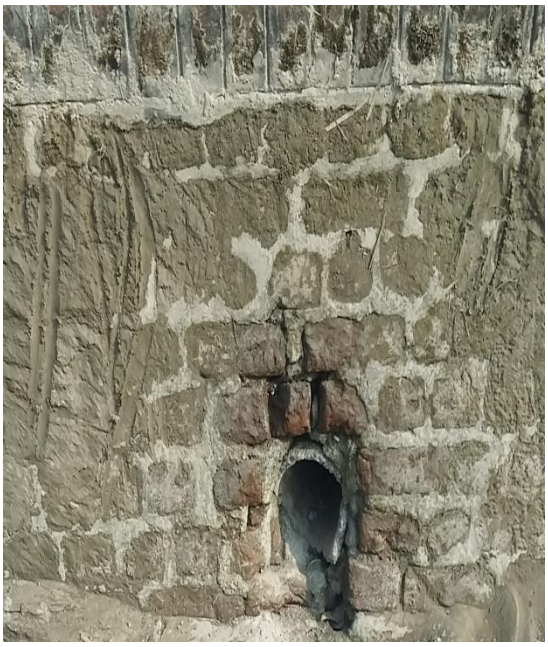
		
Photograph Outlet No : RBMC-069		Photograph Outlet No : Fingeshwar Dy-010
		
Photograph Outlet No : Fingeshwar Dy-030		Photograph Outlet No : Fingeshwar Dy-031

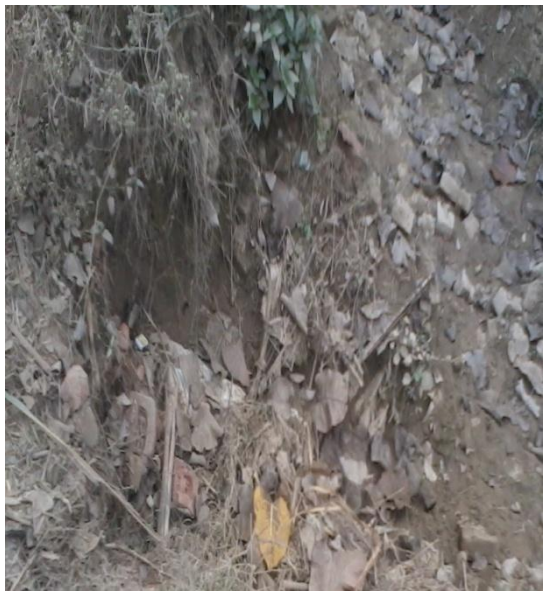
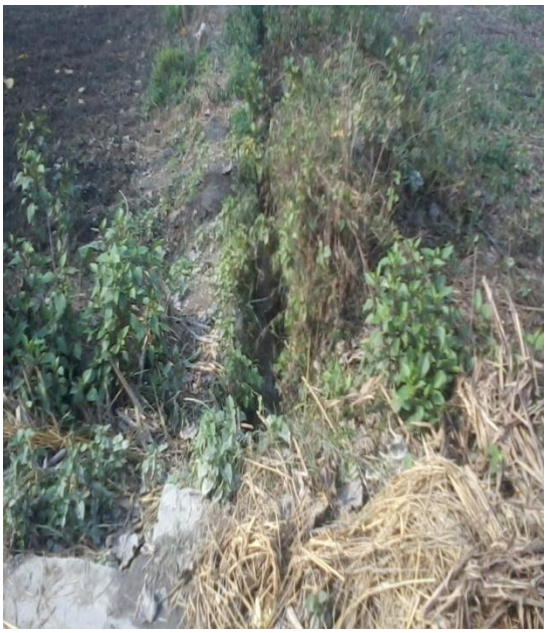
		
Photograph Outlet No : Fingeshwar Dy-032		Photograph Outlet No : Charoda Mr-013
		
Photograph Outlet No : Charoda Mr-014		Photograph Outlet No : Chaitra Mr-2-003

		
Photograph Outlet No : Pali Mr-004		Photograph Outlet No : Pali Mr-005
		
Photograph Outlet No : Rohina Dy-015		Photograph Outlet No : Rohina Dy-017

		
Photograph Outlet No : Kopra Mr-1-011		Photograph Outlet No : Kuruskera Dy-021
		
Photograph Outlet No : Kuruskera Dy-022		Photograph Outlet No : Borsi Dy-075

		
Photograph Outlet No : Borsi Dy-082		Photograph Outlet No : Pokhra-1 Mr-005
		
Photograph Outlet No : LBMC-011		Photograph Outlet No : LBMC-017

		
Photograph Outlet No : LBMC-031		Photograph Outlet No : LBMC-042
		
Photograph Outlet No : LBMC-077		Photograph Outlet No : Hardi Dy-028

		
Photograph Outlet No : Hardi Dy-030		Photograph Outlet No : Kareli SDy-042
		
Photograph Outlet No : Megha SDy-014		Photograph Outlet No : Paraswani Mr-2-002

		
Photograph Outlet No : Songa Mr-1-006		Photograph Outlet No : Kundel Dy-024
		
Photograph Outlet No : Kundel Dy-025		Photograph Outlet No : Bhendri Dy-046

		
Photograph Outlet No : Nahardih Dy-019		Photograph Outlet No : Nahardih Dy-020
		
Photograph Outlet No : Bhotha Mr-011		Photograph Outlet No : Bhotha Mr-012

Appendix-I

Farmer Interaction Format

Name:

Father's Name:

Village:

Canal Details:

Other Irrigation Source:

Crops Cultivated: Rabi:

Kharif

How many times you get canal water: Rabi

Kharif:

Timely availability of water:

Adequate Availability of Water:

Has any official of Irrigation/ Agriculture:

Appendix-II

Compliance of CWC Comments

S. No.	Comments	Compliance
1	The report should give a detailed diagnostic of the canal network. Gap reporting needs to be done RD/Chainage wise in the complete network with specific reasons for the gap supported by Satellite imagery/ Google Earth. The gap should be clearly marked on T diagram in red and the T diagram should have all the attributes like structures, etc.As per Scope of Work, the Agency has to give Command Area Map including canals, Canal Network diagram with all attributes attached and types of canal structures marked along with chainage. The Agency may be therefore, advised to reflect all items as per scope of work agreed upon.	Detailed command area and canal network map has been prepared by georeferencing canal network as *.kml file which is based on Google earth. The broken/ affected outlets and canal network have been demarcated by different colours at their geographical location. All the attributes of canal network have been attached in *.kml file.
2	The status of outlets needs to be clearly mentioned (dry or wet). This needs to be corroborated with farmers interaction.	Dry outlets have been demarcated in *kml files. All other outlets are wet outlets (liable to receive irrigation water). Farmers also corroborated it during interaction.
3	Details of constitution of the core team that went to the field along with the State govt officials with whom the meeting was conducted needs to be incorporated in the report along with photographs.	Please refer to para 5.2 of the report for details. The relevant photographs have been given in para 8 of the report.
4	The methodology to assess the IPU should be given.	The data for IPU has been collected from the project officials on the basis of their records. Field functionaries record the area irrigated under his jurisdiction which is aggregated at higher levels upto project level.

5	Detailed command area map in Ao size clearly excluding the area/CCA being served by other Minor irrigation schemes within the command should be given.	Since the command area map based on Google earth is quite big and when attempted the print on A0 size it was pixlet and was not readable. Accordingly efforts were made and Grid has been formed on Command Area Map. The print of each grid is given alongwith Index map for easy readability. Since a large number of minor irrigation schemes exists in the command area, the same could not be demarcated
6	Designed IPC vs actual IPC achieved alongwith reasons should be given.	Old DPRs could not be traced. As such designed IPC could not be sacertained. The IPC details as provided by project officials have been considered and indicated in the report.
7	Filled in schedules of Phase-I and Phase-Il should be parts of the reports.	The filled in schedule of Phase I and Phase II with relevant data are given as Annexure I and Annexure II in the report.
8	It is observed from initial 4 to 5 pages of the reports, the Agency is focussing on the Approach & Methodology etc rather than giving details of the project concerned. It would be better that these reports start by giving highlights on features of the project concerned along with agriculture & irrigation profiles of the districts/states being benefited by the project.	Project details including location, salient features, districts benefitted, command area map etc have been indicated in para 4 of the report.
9	It is noted that the most of the findings stated in the reports are based on the opinions taken from the State-Govts officials concerned instead of their own.	The findings are based on the field observations and discussions with various groups. The opinion of project officials was also considered while reporting.
10	Hydrologic analysis scenario may be carried out by collecting storage position of water for the five year under reference to correlate the same with the potential utilised and findings	Potential utilized during last five years are given in Annexure-I however storage position in the reservoir and utilization was not available . As such simulation study could not be carried out.

	based thereon may be given.	
11	The Agency has reportedly met farmers but nothing has been pointed about their interactions/views in regard to potential utilized/working conditions in regard to availability of water to their fieids.The format devised by AFC for interaction with the farmers should be given.	Farmer's Interaction format has been given in Annexure-III. Outcome of discussions and interaction with the farmers has been considered while reporting. Broadly the farmers opined that timely adequate water is not available and the condition of distribution need improvement
12	It is observed that in some cases, the data of IPC & IPU at outlet level has been indicated as not maintained. In such cases, the Agency may be advised to give detail at least at Minor Level.	Data at outlet level is not available. The IPC data at Minor level is available and given in Annexure I. Consolidated IPU data is available. It indicates a gap of 2764 ha which is 6.9 %.
13	The designed v/s actual cropping pattern should be given in the project command. The Agency may be advised to point out whether any change in the cropping patterns has occurred in the absence of nil/scanty rainfall (as stated in case of Fulzar-l project).	Designed cropping pattern is not available in the absence of DPR. Actual cropping pattern as provided by project officials on the basis of their records have been reported.
14	The Agency may be asked to give photographs of headworks/canal/distributary/minors wherever conditions are in dilapidated states.	Photographs are given in Para 8 of the report
15	Names of the two projects that were awarded later on to the Agency have not been mentioned correctly in draft reports of Sukla and Midnapur Canal (vide page 4 and page 3 respectively). These names should be (i) Sethiathope Anicut System and (ii) Mangalam.	NA
16	The general status of O&M of the project, funds being made available to the project authorities and expenditure being made may be provided.	Project officials reported that they are short of funds for O & M. Financial details not collected as per TOR
17	Abbreviations should be given in the	As suggested, Symbols and

	beginning. Units in tables are missing.	Abbreviations have been given. Units in tables have been indicated appropriately.
18	Bed slope should be 1 in 500 instead of 500.	NA
19	Units in tables are missing.	Units in tables have been indicated appropriately.
20	The basis for naming the canals, distributaries, minors and outlets has not been given	The naming of canals, distributories, minors and outlets have been done by project officials as per their own norms
21	Para-wise description of scope of work should be given.	The uderstanding of Scope of work by AFC and the brief details are given in para 2 of the report

APPENDIX-II

भारत सरकार Government of India
केन्द्रीय जल आयोग Central Water Commission
परियोजना प्रबोधन संगठन Project Monitoring Organisation
आयोजना एवं प्रगति निदेशालय Planning and Progress Directorate
*****
कमरा नं0 411 (एस), सेवा भवन Room No. 411(S), Sewa Bhawan,
रामाकृष्णपुरम, नई दिल्ली - 110066 R.K. Puram, New Delhi-110066
फोन / फेक्स नं0. 011-26109425
इमेल: ppdtecwc@gmail.com, ppdte@nic.in

To,
G.S.Yadav
AFC India Ltd.
B-19, Community Centre,
Janakpuri, New Delhi-110058

This has reference to your submission of the draft reply of Fulzar-I, Sukla, Pairi and Midnapure projects. The said reports were discussed in the meeting of Monitoring Committee for Pilot Census and many short comings were observed. The same are annexed as Annexure I.

You are requested to kindly submit the draft final report accordingly.

एस. के. राजन
14/3/17
(एस. के. राजन)
निदेशक (आ0 एवं प्र0)

संलग्नक : यथोक्त

Annexure I

i. The report should give a detailed diagnostic of the canal network. Gap reporting needs to be done RD/Chainage wise in the complete network with specific reasons for the gap supported by Satellite imagery/ Google Earth. The gap should be clearly marked on T diagram in red and the T diagram should have all the attributes like structures, etc.As per Scope of Work, the Agency has to give Command Area Map including canals, Canal Network diagram with all attributes attached and types of canal structures marked along with chainage. The Agency may be therefore, advised to reflect all items as per scope of work agreed upon.

ii. The status of outlets needs to be clearly mentioned (dry or wet). This needs to be corroborated with farmers interaction.

iii. Details of constitution of the core team that went to the field along with the State govt officials with whom the meeting was conducted needs to be incorporated in the report along with photographs.

iv. The methodology to assess the IPU should be given.

v. Detailed command area map in Ao size clearly excluding the area/CCA being served by other Minor irrigation schemes within the command should be given.

vi. Designed IPC vs actual IPC achieved alongwith reasons should be given.

vii. Filled in schedules of Phase-I and Phase-II should be parts of the reports.

viii. It is observed from initial 4 to 5 pages of the reports, *the Agency is focussing on the Approach & Methodology etc rather than giving details of the project concerned.* It would be better that these reports start by giving highlights on features of the project concerned along with agriculture & irrigation profiles of the districts/states being benefited by the project.

ix. It is noted that the most of the findings stated in the reports are based on the opinions taken from the State-Govts officials concerned instead of their own.

x. Hydrologic analysis scenario may be carried out by collecting storage position of water for the five year under reference to correlate the same with the potential utilised and findings based thereon may be given.

xi. The Agency has reportedly met farmers but nothing has been pointed about their interactions/views in regard to potential utilized/working conditions in regard to availability of water to their fields.**The format devised by AFC for interaction with the farmers should be given.**

xii. It is observed that in some cases, the data of IPC & IPU at outlet level has been indicated as *not maintained.* In such cases, the Agency may be advised to give detail at least at Minor Level.

xiii. The designed v/s actual cropping pattern should be given in the project command. The Agency may be advised to point out whether any change in the cropping patterns has occurred in the absence of nil/scanty rainfall (as stated in case of Fulzar-I project).

xiv. The Agency may be asked to give photographs of headworks/canal/distributary/minors wherever conditions are in dilapidated states.

xv. Names of the two projects that were awarded later on to the Agency have not been mentioned correctly in draft reports of Sukla and Midnapur Canal (vide page 4 and page 3 respectively). These names should be (i) Sethiathope Anicut System and (ii) Mangalam.

xvi. The general status of O&M of the project, funds being made available to the project authorities and expenditure being made may be provided.
xvii. Abbreviations should be given in the beginning.
xviii. Bed slope should be 1 in 500 instead of 500.
xix. Units in tables are missing.
xx. The basis for naming the canals, distributaries, minors and outlets has not been given.
xxi. Para-wise description of scope of work should be given.

Fulzar I

i. Storage position of the reservoir for the year in which maximum IPU was achieved should be given.
ii. In the column of location, what is the meaning of B.
iii. How volumetric measurement has been done for ungated outlets.

Midnapore

i. On page 15 and 59 CCA given is different.
ii. Cropping pattern is not given.
iii. It is not stated whether the river is perennial or not.

Besides, you are also requested to do the verification of the data presented after carrying out the necessary arithmetical checks in Block No 7 of Phase I of the Schedule so that it is ensured that the data presented are internally consistent. This is required for payment of submission of data for Phase I.