

Irrigation Modernization to Build Resilience and Adapt to Climate Change

ADB's Experience in Irrigation Modernization in India



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Technical Assistance supported by ADB

- National Water Use Efficiency Improvement Support Program (**NWUEISP**) (2013-14): Identified measures to assess and improve water use efficiencies on MMI schemes, and
- The Innovations for More Food with Less Water (**MFLW**) studies (2015): Proposed integrated management of surface and groundwater, and introduction of modern irrigation technologies including SCADA, micro irrigation, electrification and pre-paid metering.
- Support for Irrigation Modernization (**SIMP**) (2020-ongoing) A technical assistance led by Ministry of Jal Shakti (MOJS), Govt of India.



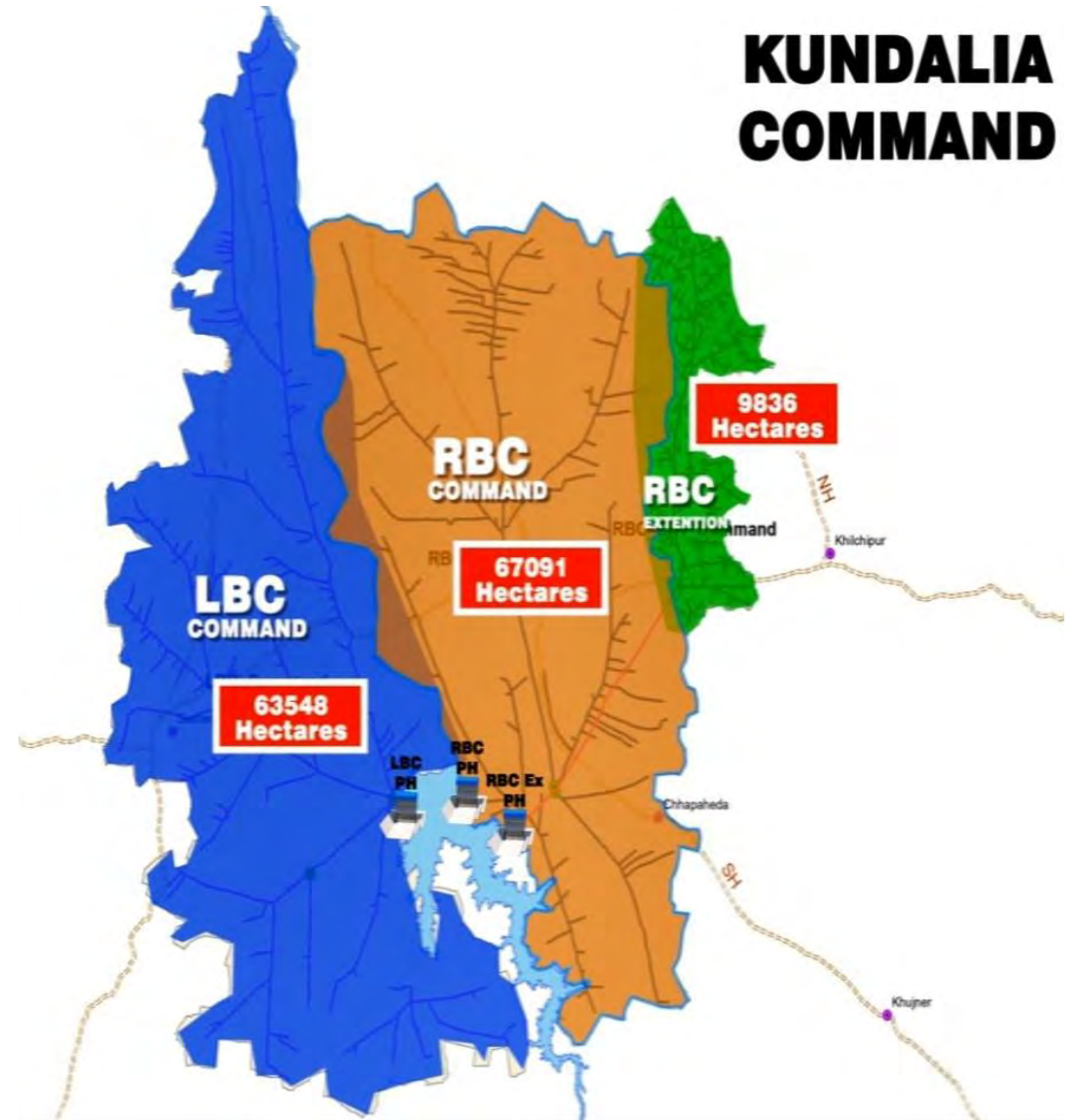
Support for Irrigation Modernization Program (SIMP)

- ✓ Led by India's Ministry of Jal Shakti (MOJS) and supported by ADB technical assistance
- ✓ Central program office under Central Water Commission MOJS and project offices in the State Water Resources Departments
- ✓ Team members comprised government staff and international and national consultants
- ✓ The SIMP was launched in December 2020 to support Indian states in designing modernization investments
- ✓ A framework for MMI modernization and strategy developed in a phased manner:
 - ✓ Phase 1: SIMP framework developed
 - ✓ Phase 2: Irrigation Modernization Plans (IMPs) prepared for 1st batch projects
 - ✓ Phase 3: Project design and readiness for investment
 - ✓ Phase 4: Implementation, monitoring and evaluation
- ✓ 57 proposals received from 14 States and 2 Union Territories
- ✓ Four schemes selected for modernization, with total command area of 246,000 ha and investment amounts estimated to be \$569 million or \$2,332/ha
 - ✓ Loharu, Haryana (130,000 ha)
 - ✓ Palkhed, Maharashtra (42,000 ha)
 - ✓ Purna, Maharashtra (58,000 ha)
 - ✓ Vanivilasa Sagara, Karnataka (16,000 ha)



Loan 3662-IND: Madhya Pradesh Irrigation Efficiency Improvement Project (MPIEIP)

- ADB project, commissioned in July 2024.
- Pumped LIS schemes on LB and RB supply water to Delivery Chambers for distribution by gravity pipelines to about 125,000 ha.
- Pipes: MS, HDPE.
- Duty: 0.45 l/s/ha. Mixed cropping.
- Full SCADA with Outlet Management System (OMS) with flow and pressure control.
- Also, Rotation Management System (RMS) at Zones and Village Units.
- Operation: 24/7 flow of 13.5 l/s to 30 ha Chaks.
- Rotational supply of 4.5 l/s to 2 subchaks at a time.
- WUA – 3,000 to 4,000 ha
- Layout Tiers: - ~6,000 ha, Zones - 300 ha Village Units- 30 ha Chaks (OMS)- 5 ha Subchaks-1 ha Farms



Summary

Topic	Description
Financing Plan	Project Cost: \$535.71 Million (ADB: \$375 million and Counterpart: \$160.71million)
Project Description	The MPIEIP is designed to support higher irrigation efficiency and expansion of irrigation in MP. It will focus on developing 125,000 hectares of new, highly efficient and climate resilient irrigation networks and productive command area under the Kundalia Irrigation Project (KIP).
Impact	<ul style="list-style-type: none"> • India farmers' income doubled by 2023 ; India's "more crop per drop" achieved • Resilience of farmers in the project area to ongoing and uncertain future climate change increased
Outcome	Higher irrigation efficiency, agricultural water productivity and climate resilience in MP achieved
Outputs	<ul style="list-style-type: none"> • KIP infrastructure constructed • KIP performance-based operation and maintenance established • Farmers capacity for rapid uptake of micro-irrigation technology in the KIP command enhanced
Finance PLUS	<p>Introduction of innovative irrigation system: The project involves designing and constructing a very large scale pressurized and automated irrigation system allowing considerable gains in WUE.</p> <p>Design-build-operate (DBO) contract modality: There are very few examples of irrigation DBO contracts in India and none on such large systems and with such a long MOM period.</p>
Climate Finance	It is a climate adaptation Type 2B category project based on water savings through higher irrigation efficiency and agricultural water productivity resulting in climate resilience.

Components of Project

KUNDALIA IRRIGATION PROJECT



Client

Govt. of M.P. Water Resource Department

Funded by

Asian Development Bank

DBO Contractor

Larsen & Toubro Limited

Kundalia LB

Kundalia RB

Contract Agreement No

CW-1, Dated: 18.04.2018

CW-2, Dated: 06.09.2018

Contract Start

Start: 18.04.2018

Start: 06.09.2018

Contract Start

Exp. Completion 30.04.2024

Exp. Completion 30.04.2024

Contract Value

₹1200 Cr (incl O&M 10.5Cr)

₹1394 Cr (incl O&M 33.5Cr)

Culturable Command Area

63,548 Hectares

67,091 Hectares

Beneficiary Villages

146 Nos. Villages

210 Nos. Villages

Beneficiary Farmers

1.71 Lacs Farmers

1.78 Lacs Farmers



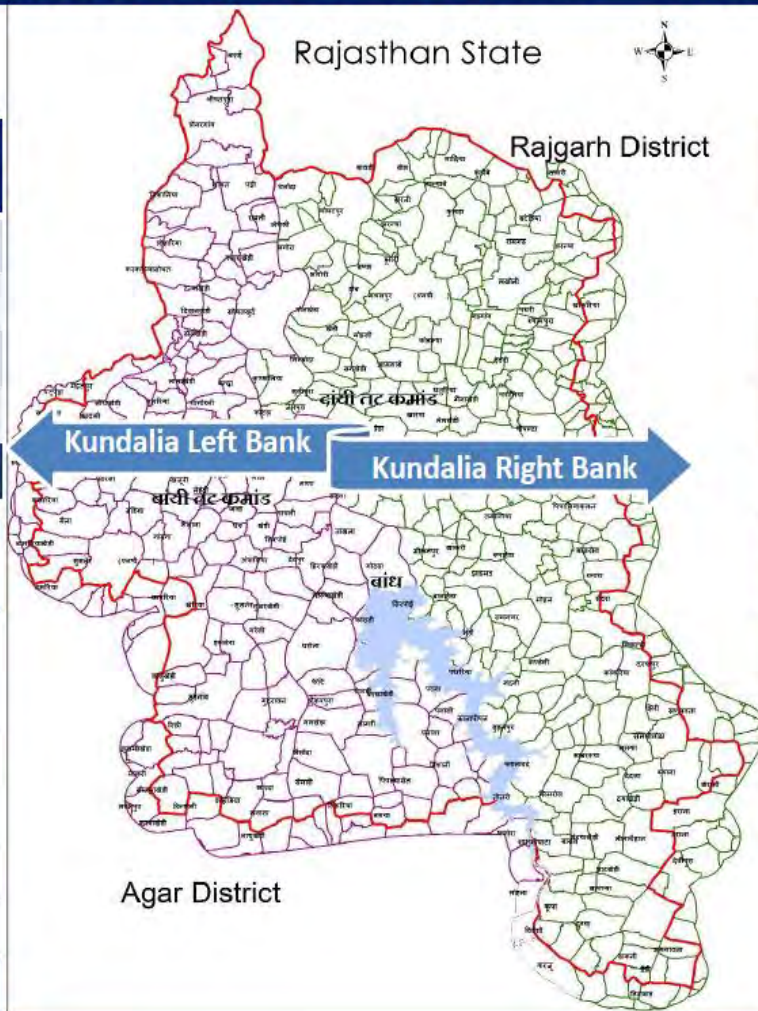
Components of Project

KUNDALIA IRRIGATION PROJECT – Command Area

Kundalia LB

District	Tehsil	CCA in HA	Village In Nos
Agar-Malwa	Susner	35185	88
	Nalkheda	25795	54
	Agar	199	1
Rajgarh	Jirapur	1416	3
Total →		62,595	146

Water from	Zone	CCA in HA	Village In Nos
DC-1B	3	6598	54
	2	5518	12
DC-1A	4	7033	11
	1	22926	17
DC-2	5	13927	36
DC-3	6	6593	16
Total →		62,595	146

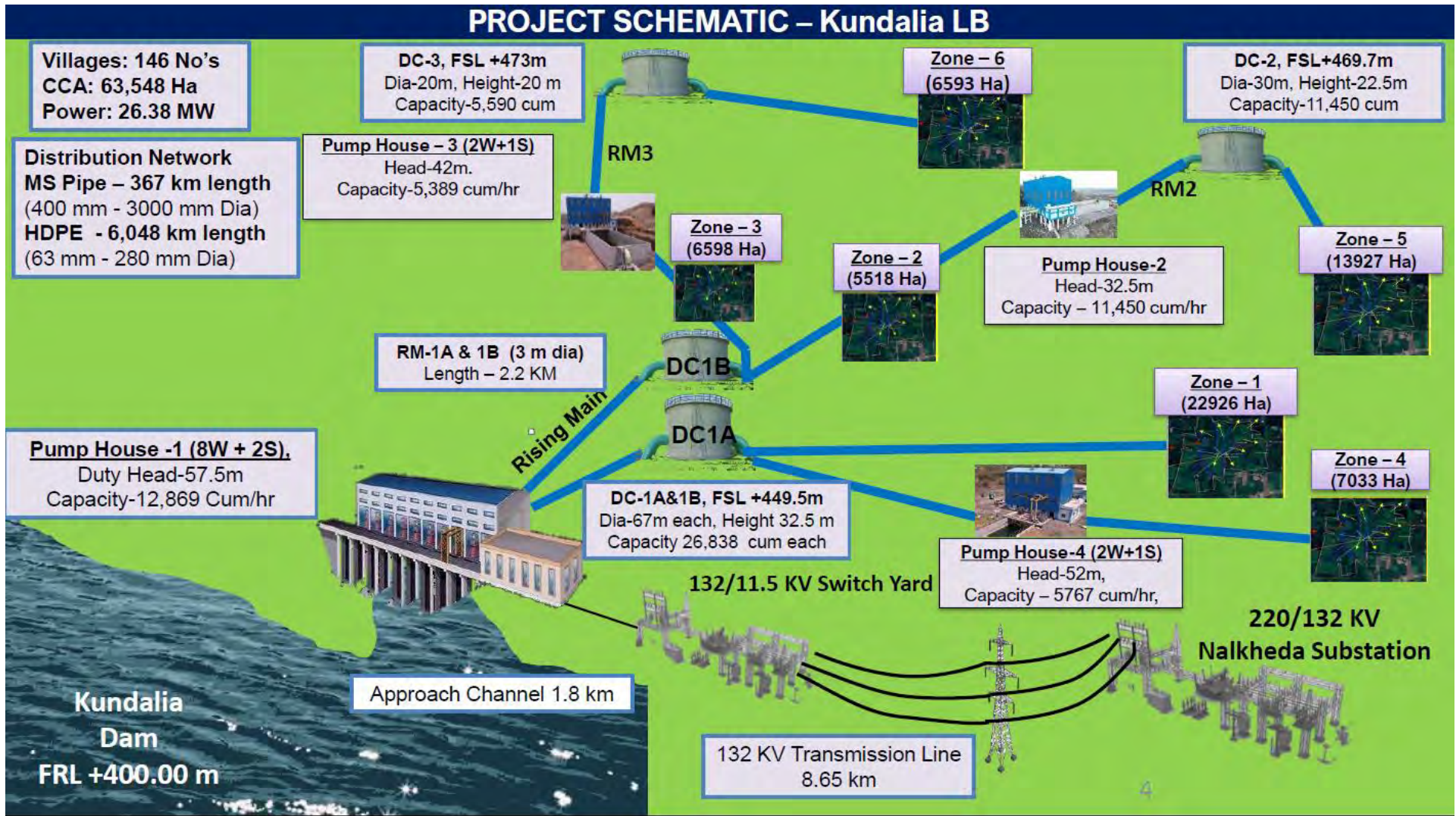


Kundalia RB

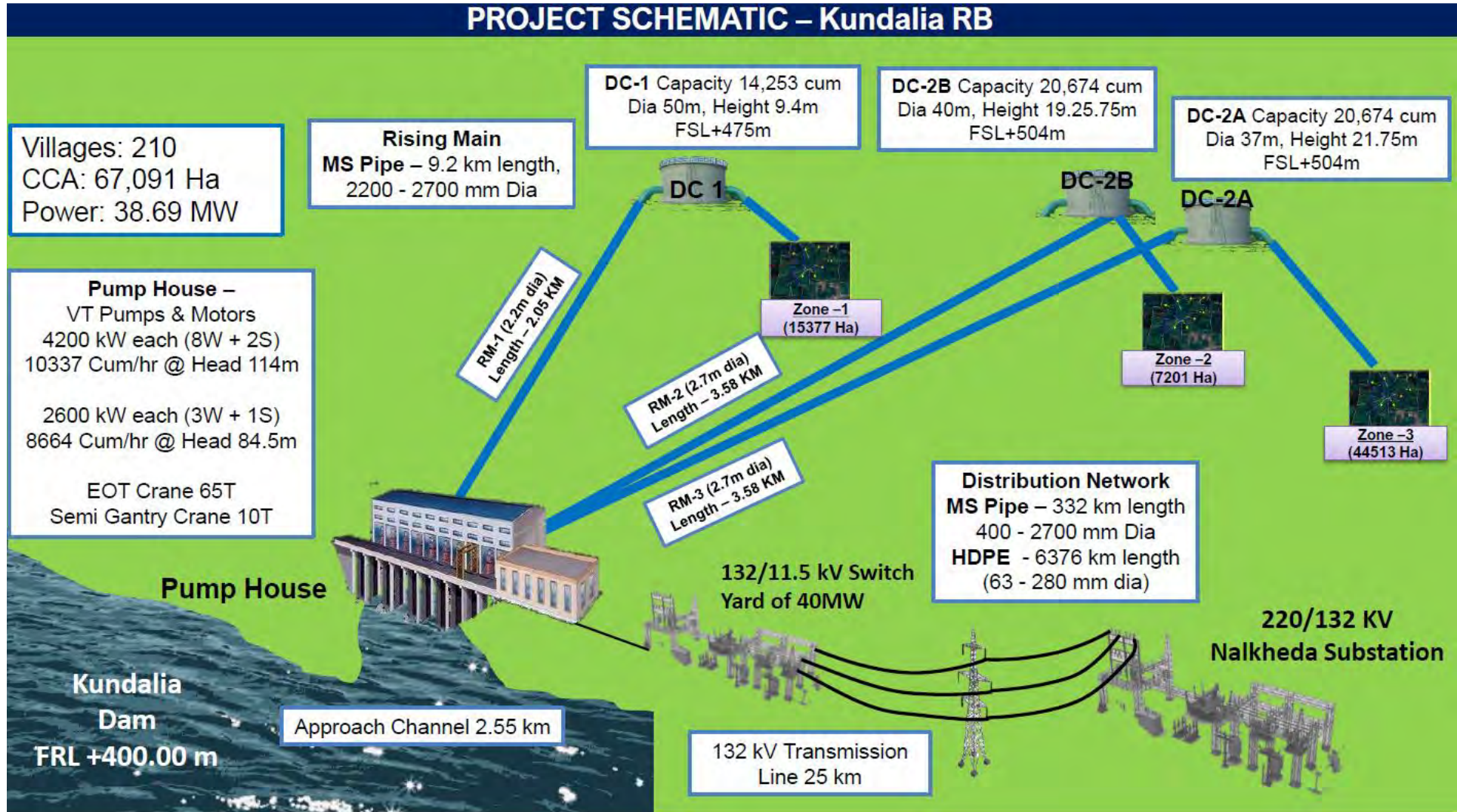
District	Tehsil	CCA in HA	Villages In Nos
Rajgarh	Jirapur	55,884	181
	Sarangpur	5,761	16
	Khilchipur	5,446	13
Total →		67,091	210

Water from	Zone	CCA in HA	Villages In Nos
DC-1	1	15,377	51
DC-2A & DC-2B	2	7,201	16
	3	44,513	143
Total →		67,091	210

Components of Project



Components of Project



Components of Project

MAJOR COMPONENTS		
	Kundalia LB	Kundalia RB
1	Pump Houses: 4 No's	Pump Houses: 1 No's
2	Distribution Chambers: 4 No's	Distribution Chambers: 3 No's
3	Transmission Lines 132 KV: 8.65 Km	Transmission Lines 132 KV: 24.12 Km
4	Switchyard (132/11 KV): 1 No.	Switchyard (132/11 KV): 1 No.
5	Pumps & Motors : 19 No's	Pumps & Motors : 14 No's
6	Primary Filters: 26 No's	Primary Filters: 29 No's
7	Surge Vessels : 3 No's	Surge Vessels : 3 No's
8	Outlet Management System: 2168 No's	Outlet Management System: 2224 No's
9	Remote Management System: 239 No's	Remote Management System: 244 No's
10	Air Management System: 669 No's	Air Management System: 551 No's
11	Gateway Towers: 12 No's	Gateway Towers: 11 No's

Components of Project



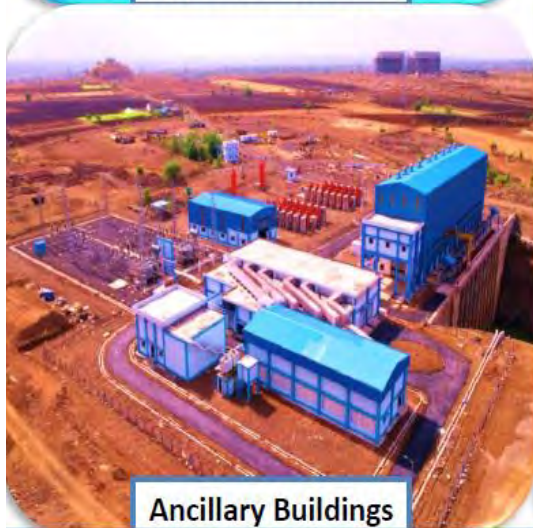
KUNDALIA IRRIGATION PROJECT - LEFT BANK (PUMP HOUSE & ANCILLARY BUILDINGS)



Approach Channel



Pump House-1



Ancillary Buildings



Panel Room



PLC Room

Pump House - 1 (Salient Features)

Approach Channel	1.78 Km
PH-1 Dimensions	L- 81.6m x W-26.8m, 31.2 m BGL)
Vertical Turbine Pump	10 No's (12,869 Cum/hr)
Duty Head & Speed	57.5m & 597 rpm
Governing Water Levels	Max +400m & Min+380m
Induction Motor (11KV)	10 No's (2,650 KW)
EOT Crane	1 No (60 Ton, Span-15m, Bay L-71.5 m)
Trash Rack Screen	10 Sets
Power Requirement	26.38 MW
Switch Yard	1 No (132/11.5 KV)
Transformers	2 Nos (30 MVA each)
Electrical Building	4 No's (each at PH)
VFD Panel & Soft Starter	14 No's VFD and 5 No's Soft Starter
Workshop Building	1 No
Air Handling Unit	4 No's (each at PH)
Fire Water PH & Tank	1 No + 1 No

Components of Project



KUNDALIA IRRIGATION PROJECT - RIGHT BANK (PUMP HOUSE & ANCILLARY BUILDINGS)



Pump House - 1 (Salient Features)

Approach Channel	2.55 Km
Pump House	1 No (L-105mxW-17m,28.7m BGL,18 m AGL)
Vertical Turbine Pump	10 Nos(10,337cum/hr)&4Nos (8.664cum/hr)
VT Pump Head & Speed	114m & 84.5m
Lifting Water Level	Max- 400 m and Min-380m
Induction Motor (11KV)	10 No's (4200 KW) & 4 No's (2600 KW)
EOT Crane	1 No (65 Ton, Span-15m, Bay L-70 m)
Trash Rack Screen	14 Sets (4.75m X 28.7m with guide frame)
Power Requirement	40 MW
Switch Yard	1 No (132 KV) (Area 3200 sqm)
Transformers	2 Nos (50 MVA each)
Electrical Building	1 No's
VFD Panel & Soft Stater	11 No's VFD and 3 No's Soft Stater
Workshop Building	1 No (Area 450 sqm)
Air Handling Unit	1 No's
Fire Water PH & Tank	1 No + 1 No

Components of Project



KUNDALIA IRRIGATION PROJECT - LEFT BANK (DISTRIBUTION CHAMBERS)



Distribution Chamber-1A/1B		Distribution Chamber-2	Distribution Chamber-3
Dimension	Inner Dia 67.5m, Height 32.5m	Inner Dia 30m, Height 22.4m	Inner Dia 20m, Height 20 m
Storage Capacity	26,838 cum each	11,452 cum	5,390 cum
Discharge	14.3 Cum/s	6.36 Cum/s	2.9 Cum/s
Full Supply Level	+449.5 m	+469.7 m	+473 m

Components of Project



KUNDALIA IRRIGATION PROJECT – RIGHT BANK (DISTRIBUTION CHAMBERS)

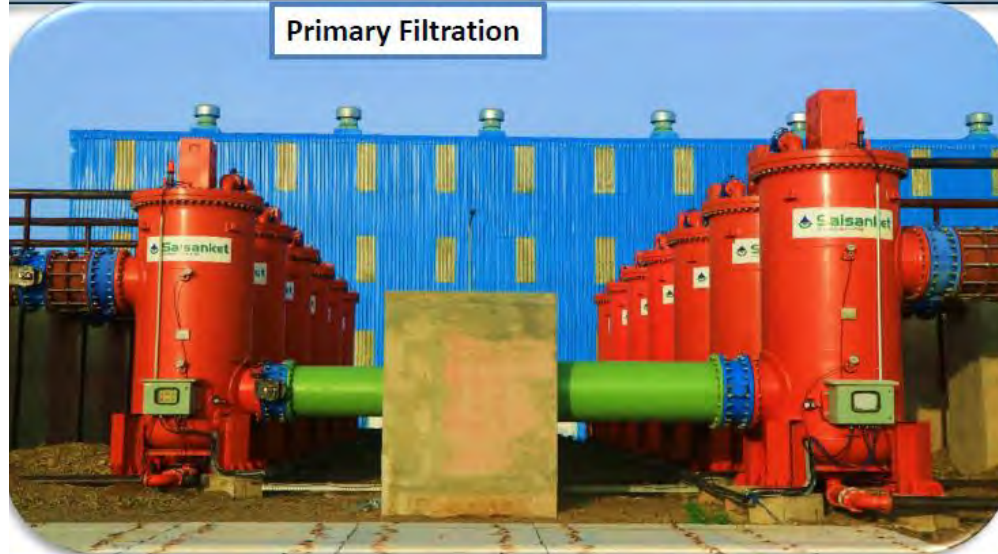


Distribution Chamber - 1		Distribution Chamber – 2A & 2B	
Dimension	Inner Dia 50m, Height 9.4m	Dimension	DC 2A (Inner Dia 37m, Height 21.75m from GL) DC-2B (Inner Dia 40m, Height 19.25m from GL)
Capacity	Capacity 14,253 cum	Capacity	Capacity 20,674 cum (for each)
Discharge	7.22 Cum/s	Discharge	11.49 Cum/s
Full Supply Level	+475 m	Full Supply Level	+504 m

Components of Project



KUNDALIA IRRIGATION PROJECT - PRIMARY FILTRATION & SURGE PROTECTION



Kundalia LB - Self Cleaning Primary Filtration

Primary Filtration	26 No's (RM 1A-13 no's, RM 1B -13nos)
Filtration Capacity	200 micron
Operation	Manual and Auto Mode through PLC
Status	Completed (100%)

Kundalia RB - Self Cleaning Primary Filtration

Primary Filtration	29 No's (RM 1-7 no's, RM 2B & 2B -22nos)
Filtration Capacity	200 micron
Operation	Manual and Auto Mode through PLC
Status	Completed (100%)

Kundalia LB - Surge Protection

Bladder Vessel	2 No's 20 Cum at PH-1 and 1 No's 5 Cum at PH-4
Status	Completed (100%)

Kundalia RB - Surge Protection

Bladder Vessel	1 No 15 Cum & 2 No's 40 Cum
Status	Completed (100%)

Components of Project



KUNDALIA IRRIGATION PROJECT - OUTLET MANAGEMENT SYSTEM



Outlet Management System (OMS) at every 30Ha

Dimensions(m) (LxBxH)	2.8 x 0.95 x 1.3	
Components	PFCMD (Pressure Flow Control and Monitoring device), Air Valve with Isolation Valve, Strainers, Controller with Pressure Transmitter, Solar Panel and Batteries, Enclosure Cabinets	
Pressure & Head at 30 Ha	25 m & 2.5 Kg/cm ²	
Pressure & Head at 1 Ha	20 m & 2.0 Kg/cm ²	
Discharge	0.45 LPS/Ha	
	Kundalia LB - OMS	Kundalia RB - OMS
Scope	2168 Nos	2224 Nos
Status	2129 Nos Completed (98%)	2180 Nos Completed (98%)

Components of Project



KUNDALIA IRRIGATION PROJECT - REMOTE MANAGEMENT SYSTEM



Remote Management System (RMS) at every 300Ha

Components	PFCMD (Pressure Flow Control and Monitoring device), Air Valve, Controller, Solar Panel and Batteries, Enclosure Cabinet	
RMS Size	200mm to 900mm	
Controlling Capacity (Area)	150 Ha to 300 Ha	
	Kundalia LB	Kundalia RB
Scope	239 Nos	244 Nos
Status	211 Nos Completed (88%)	225 Nos Completed (92%)

Components of Project



KUNDALIA IRRIGATION PROJECT - AIR MANAGEMENT SYSTEM



Kundalia LB - AMS

Components	Air Valve with Isolation Gate Valve, Pressure Transmitter, Controller, Solar Panel/Batteries, Enclosure Cabinet
Scope	669 Nos
AMS Size	50 mm to 200 mm
Status	560 Completed (84%)

Kundalia RB - AMS

Components	Air Valve with Isolation Gate Valve, Pressure Transmitter, Controller, Solar Panel/Batteries, Enclosure Cabinet
Scope	551 Nos
AMS Size	50 mm to 200 mm
Status	367 Completed (67%)

Components of Project



KUNDALIA IRRIGATION PROJECT – LORA TOWERS



Kundalia LB - Gateway Towers	
Scope	12 Nos
Mode of Communication	LoRA (Long Range communications)
Purpose	Communication between Main control room with Field Control Units
Status	9 Nos Completed (75%)

Kundalia RB - Gateway Towers	
Scope	11 Nos
Mode of Communication	LoRA (Long Range communications)
Purpose	Communication between Main control room with Field Control Units
Status	4 Nos Completed (33%)

Components of Project



KUNDALIA IRRIGATION PROJECT – IMPLEMENTATION SUPPORT



Description	Kundalia LB	Kundalia RB
Number of Villages	146 Nos	210 Nos
Farmer Support Center	4 Nos	4 Nos
Trainings of awareness about project (T1)	In 146 villages	In 210 villages
Importance of Micro Irrigation Scheme (T2)		
Training and Demo at Field (T3)		
Farmers Field School (FFS) of 30 Ha each	21 Nos	22 Nos
Formation of Water User Association	239 Nos (300 Ha each)	244 Nos (300 Ha each)

Components of Project



KUNDALIA IRRIGATION PROJECT - TESTING & FLUSHING



Kundalia LB (Testing & Flushing) in Ha				
Zones	Scope	Comp	Balance	%
Zone-1	22,926	1,959	20,967	9%
Zone-2	5,518	1,988	3,530	36%
Zone-3	6,598	5,840	758	89%
Zone-4	7,033	3,787	3,246	54%
Zone-5	13,927	3,508	10,419	25%
Zone-6	6,593	5,103	1,490	77%
Total →	62,595	22,185	40,410	35%

Kundalia RB (Testing & Flushing) in Ha				
Zones	Scope	Comp	Balance	%
Zone-1	15,377	15,377	-	100%
Zone-2	7,201	7,201	-	100%
Zone-3	44,513	7,872	36,641	18%
Total →	67,091	30,450	36,641	45%

Components of Project



LOCAL SCADA AT PUMP HOUSES



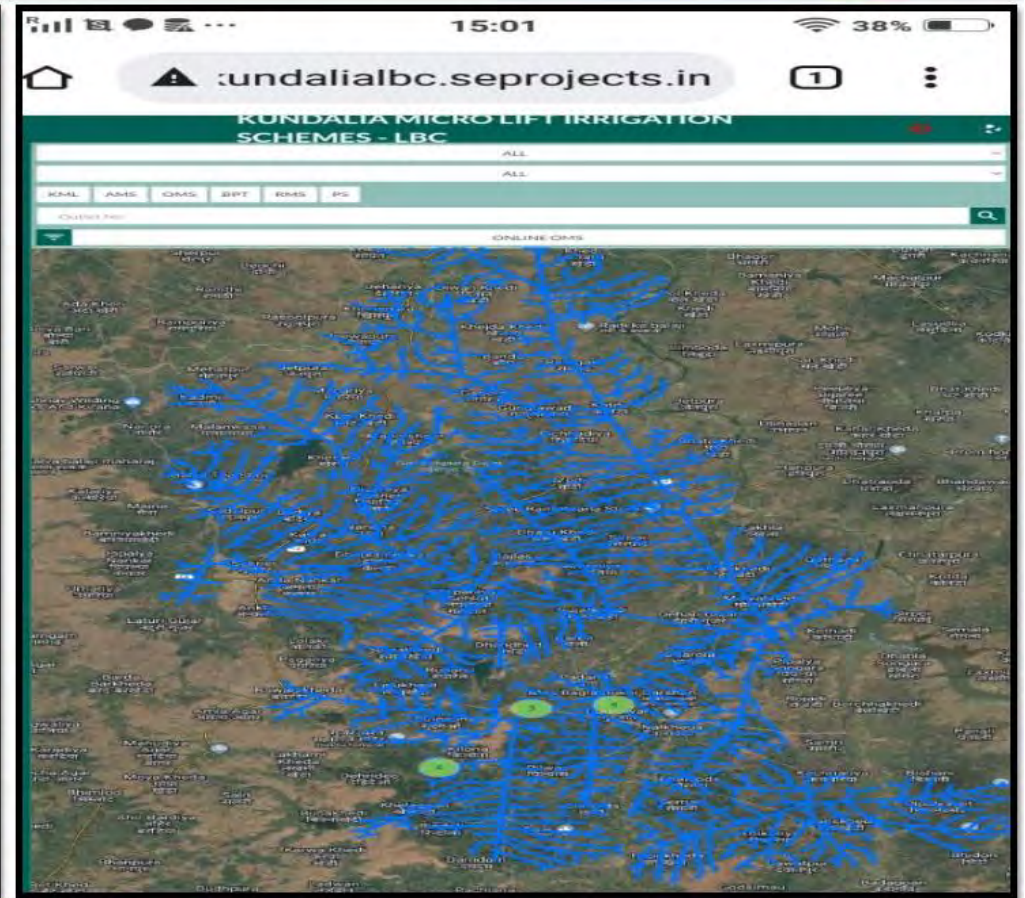
The screenshot displays three distinct SCADA control panels:

- Panel 1 (Left):** A schematic diagram of a pump house. It shows a network of pipes, valves, and pumps. A large blue tank is visible at the bottom. The interface includes various status indicators and control buttons for different components.
- Panel 2 (Middle):** Titled "VFD - 01". It features a "SYSTEM IN WEB SCADA" indicator. The "VFD" section contains "START" (green) and "STOP" (red) buttons. An "ALARMS" section has a yellow "ACK" button. The "VFD STATUS" section lists indicators for VFD RUN, VFD TRIP, READY FOR OPERATION, and SYNCHRONIZATION SUCCESSFUL. It also includes sections for "INPUT BREAKER", "OUTGOING BREAKER", and "BYPASS BREAKER", each with "ON FEEDBACK", "TRIP FEEDBACK", and "TRIP CIRCUIT HEALTHY" indicators. The "VFD PARAMETERS" section shows "SPEED REFERENCE" at 0.00 rpm, "SUMP LEVEL" at 0.00 m, and "SPEED SETPOINT" at 0.00 rpm.
- Panel 3 (Right):** Titled "MBFV - 04". It includes a "MANUAL" selector switch (M/A) and a "SYSTEM IN WEB SCADA" indicator. The control section has "OPEN" (green), "CLOSE" (red), and "STOP" (blue) buttons, along with a yellow "ACK" button. The status section lists indicators for 100% OPEN, 100% CLOSE, BFV MOTOR TRIP, OPEN FAULT, CLOSE FAULT, TS OPEN, TS CLOSE, BFV IN REMOTE MODE, READY, HEALTHY, and INTERLOCK OK. At the bottom, it shows "VALVE POSITION" at 0.00% and "SETPOINT" at 0.00%.

Components of Project



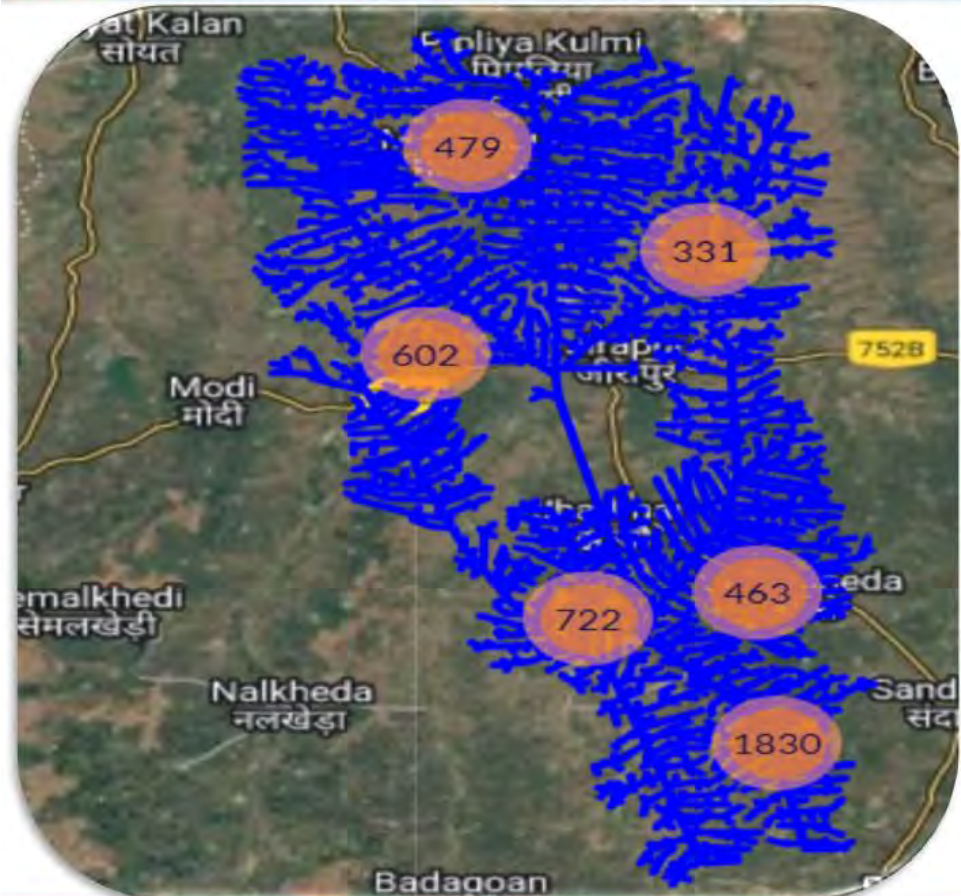
WEBCADA – PIPELINE DISTRIBUTION NETWORKS



Components of Project



KUNDALIA IRRIGATION PROJECT - WEBCADA SCREEN-OMS



06155-C6 (524658000001759)
10-Jan-2023 15:03

Area Name	Zone-1	Network Name	Balsheda
Design Pressure	42.72	Khasara Name	-
Chak Leader Name	ravi	Chak Leader Number	85856859588
Village Name	Balsheda	Chak Area (Ha)	29.33
Design Flow Rate (lps)	13.20	Dirty (lps per Ha)	0.45

ΔP: 8.67 m

P1: 30.80 m P2: 22.13 m

PFCMD1 PFCMD2 PFCMD3 PFCMD4 PFCMD5 PFCMD6

43.51°C

84% 21V

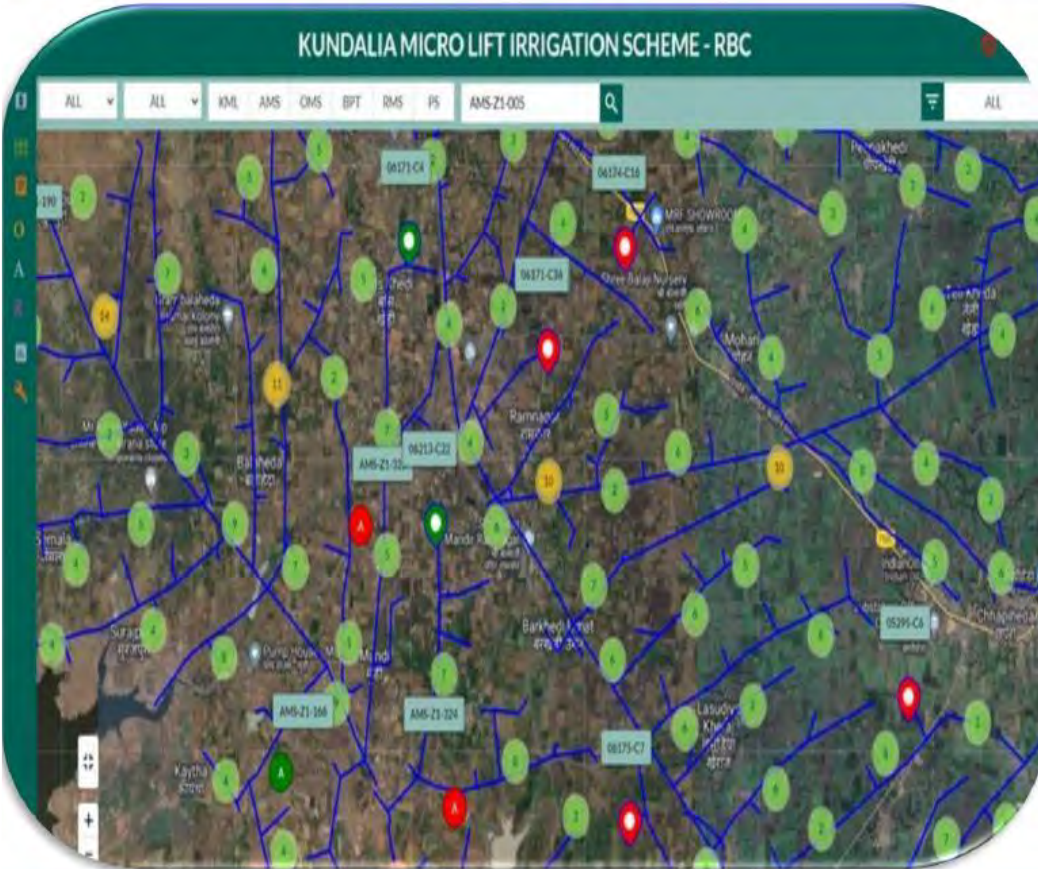
Interrogate
Refresh
Emergency Stop

Sub Chak Status	Sub Chak Design Info	Control Panel	Schedule			
Valve Details	PFCMD1	PFCMD2	PFCMD3	PFCMD4	PFCMD5	PFCMD6
Operation Type	Open/Close	Open/Close	Open/Close	Open/Close	Open/Close	Open/Close
Operation Mode	Auto	Auto	Auto	Auto	Auto	Auto
Valve Position (%)	100	63.47	0	0.17	0	0
Flow Rate (lps)	8.31	6.47	0.00	0.00	0.00	0.00
Today's Volume (m ³)	58.36	26.41	0.22	0.58	0	0.44
Pressure at Valve Discharge (m)	19.89	20.30	0.00	1.12	0.51	0.00

Components of Project



KUNDALIA IRRIGATION PROJECT - WEBCADA SCREEN-AMS



AMS-Z3-6 19-Nov-2022 10:26

Area Name	Zone-3
Network Name	DY1
Design Pressure	36
Type of Valve	AMS
Air Valve Size	150 mm
Chainage No.	3950 m
Actual Pressure	38.35 m

92% -V

Interrogate Refresh

Components of Project



KUNDALIA IRRIGATION PROJECT - DEMO FARMS





Thank you

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