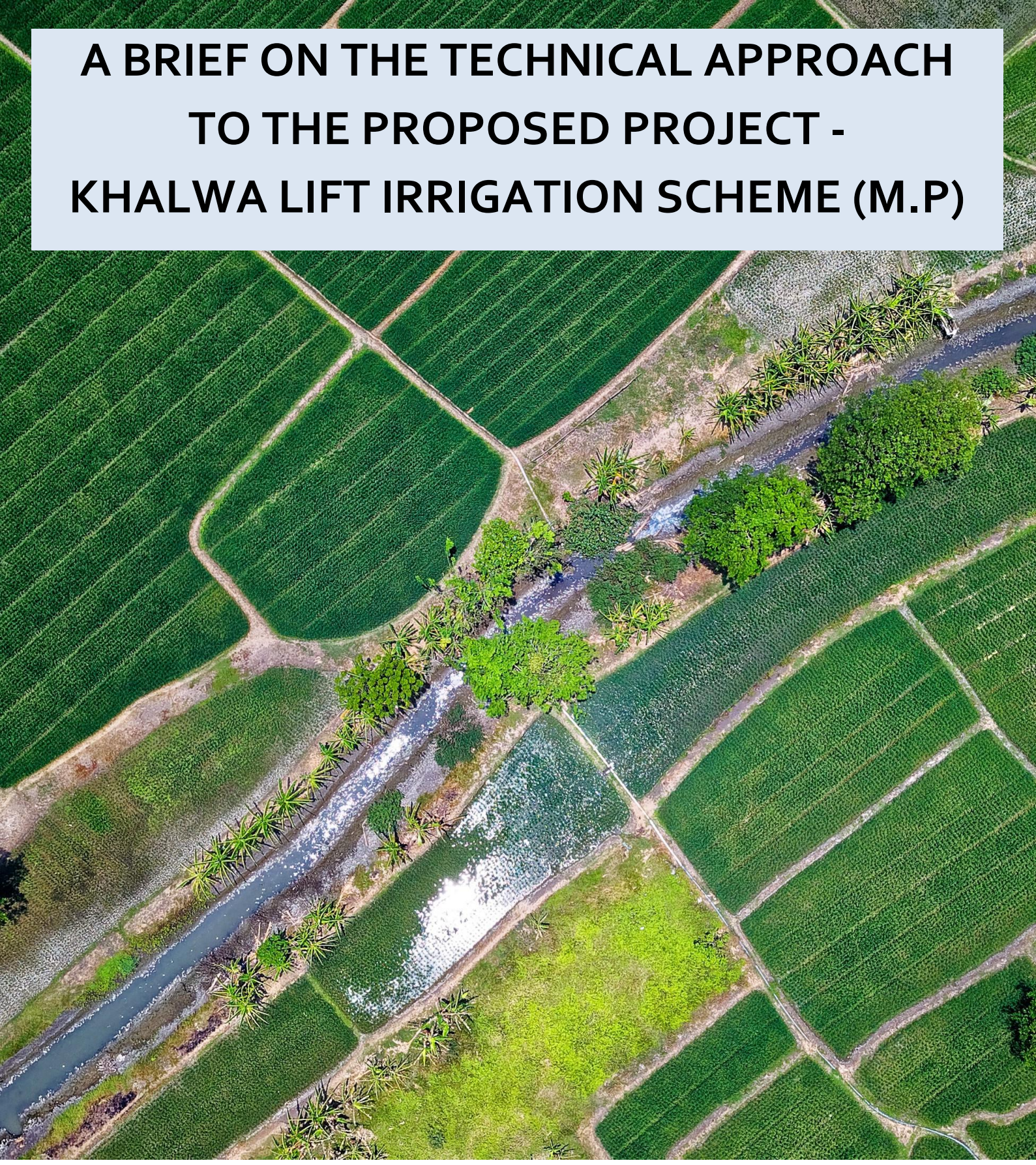
A BRIEF ON THE TECHNICAL APPROACH TO THE PROPOSED PROJECT - KHALWA LIFT IRRIGATION SCHEME (M.P)



PREPARED AND SUBMITTED BY

PHANS4 CONSULTING PVT. LTD.

PHANS 4 CONSULTING

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An overview

WHERE WE ARE NOW

About us: -

Phans4 is engaged in global consulting solutions, where we combine classic management consulting with outstanding technological expertise. For more than 9 years, we have been supporting companies around, through various consulting services to improve the sustainability of their competitiveness and performance capabilities along the entire value chain with the aid of innovative technologies.

Vision: -

Phans4 consulting private limited is a global diversified company with a network of workforce committed to the growth of your business through innovation which strikes for a sustainable development of your business.

Areas we do consulting: -

Phans4 consulting services are carried out in areas like water resources, irrigation schemes, micro irrigation, rural water supply and sanitation, effluent treatment plants, sewage & sewerage treatment, storm water drainage system, lake development.

KHALWA MICRO LIFT IRRIGATION SCHEME

(Technical Approach on Designs and Methodologies for The

Proposed Lift Irrigation Scheme and Scada)

NAME OF WORK

Execution of Khalwa Micro Lift Irrigation Scheme on "Turnkey" basis comprising of lifting of 11.22 cumecs water for irrigation in 35,000 hectares from Submergence of ISP reservoir for providing water with Micro-irrigation up to 2.5-hectare chak with residual head of 23 meters at 2.5-hectare chak.

PREPARED AND SUBMITTED BY

PHANS4 CONSULTING PRIVATE LIMITED

INTRODUCTION

Madhya Pradesh (MP) is the State of India having a geographical area of 30.8 million hectares. The state is predominantly agriculture-oriented as 80% of its population is dependent on agriculture. The net sown area of the state is 14.96 million hectares. In Narmada Valley 29 Major Projects are proposed for construction by the State with irrigation potential of 14.174 lacs hectares and installed capacity of 2434.50 MW for power generation, out of which potential of 5.74lacs hectares has already been created by completed 5 major projects,16 medium projects and 1000 minor projects. The Govt. of M.P. under Narmada Valley Development plans has emphasized on irrigated agriculture.

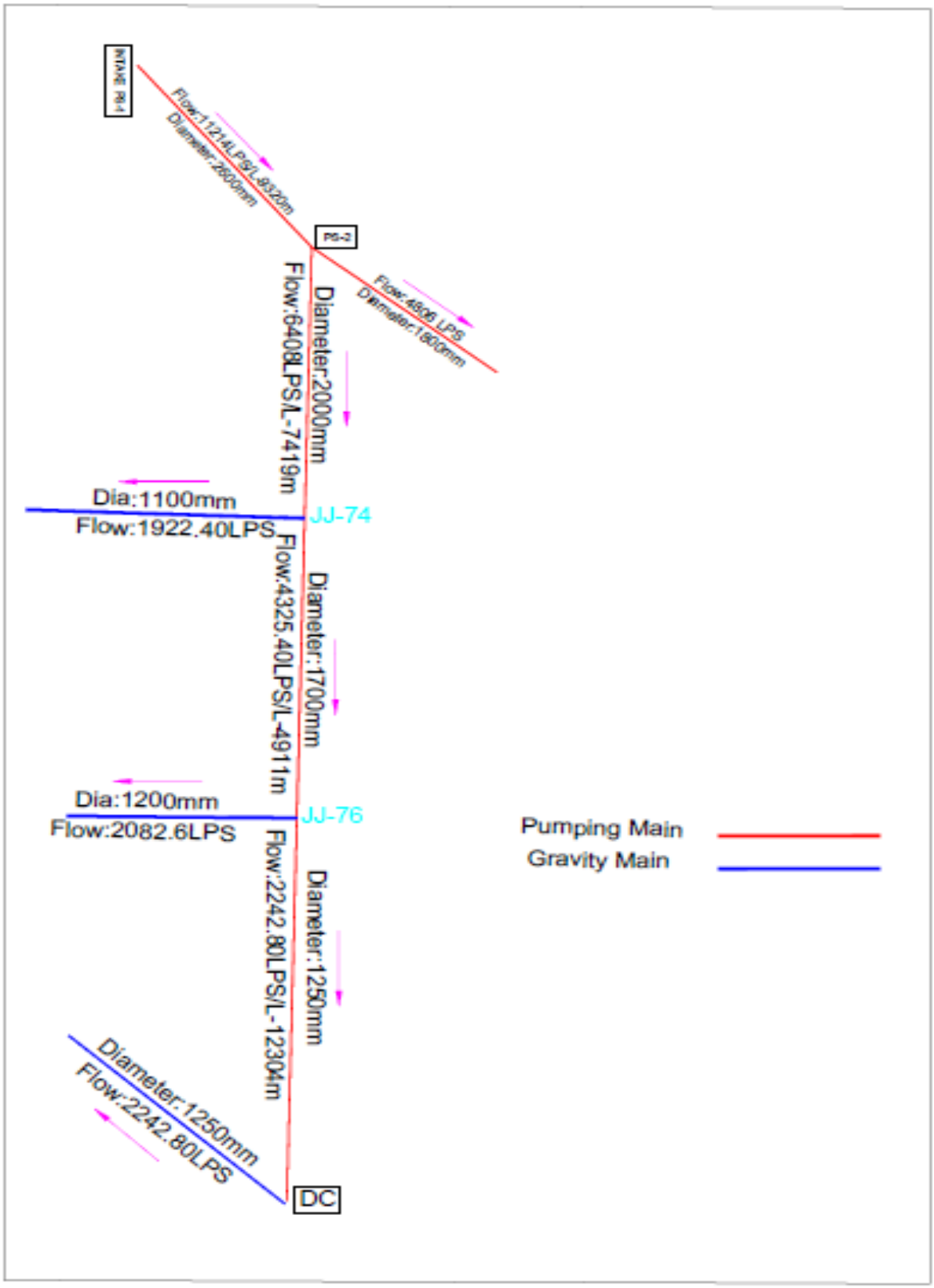
Execution of Khalwa Micro Lift Irrigation Scheme on "Turnkey" basis comprising of lifting of 11.22 cumecs water for irrigation in 35,000 hectares from Submergence of ISP reservoir for providing water with Micro-irrigation up to 2.5-hectare chak with residual head of 23 meters at 2.5-hectare chak. This includes work of survey, planning, design, drawing, estimation, Land acquisition/purchase, preparation and obtaining all statutory clearance, shifting and reinstallation of existing H.T. and L.T. electrical lines, Telephones lines, water supply lines etc. execution and installation of electric lines from M.P.P.K.V.V.C.L. substation to various pumping stations with all clearances from statutory authorities. Supply, installation and testing of suitable pumps and motor with related electrical components including regulation and control of complete system by SCADA, construction of pump houses, control rooms, rising mains, gravity mains, break pressure tanks and all inline structures including road crossing of highway and other roads, pipe line etc. with all clearances from the respective authorities, supplying and fixing of miscellaneous accessories of pump houses, rising mains etc. construction of underground piped main canal and distribution network up to 2.5 ha. chak for culturable command area, construction of residential and non-residential buildings with approach roads, internal roads at the pump house locations, preparation of all relevant documents for constitution of Water User Association of command area including establishment of Farm Services Centre, Farmer Field Schools and Demonstration sites and all other miscellaneous works related to entire system as directed by Engineer-In-charge during construction. Power consumption (including all types of power) in the whole system should not exceed 31.04 MW at the time of commissioning and 32 MW in 15 years lifetime, Commissioning of the entire system and operation and maintenance of complete commissioned system for 60 months.

AREA SELECTION

The Project Includes Total 35,000 Ha CCA for Irrigation. This area is sub divided in to Two Parts to cover the entire area as follow.

Area 1 covering about **20,000ha.** Area 2 covering about **15,000ha.**

MAIN LINE ALIGNMENT DRAWING OF THE PROPOSED PIPE NETWORK



PUMPING MAIN FROM INTAKE PS-1 TO PS-2

The total Required 11.22 cumecs of water will be lifted from Submergence of Indira Sagar Reservoir for a Level of 246m to the 311 m Level with around pumping head of 88m from intake PS to PS-2 of about 2600mm diameter.

PUMPING MAIN FROM PS-2 TO DC-

From PS-2 the right-side area about 20000ha CCA covered by lifting the water of about 6.408 cumecs from the level of 311m to 389m with around pumping head of 118m and diameter of varying from 2000mm -1250 mm.

In this pumping main the offtake point at node JJ-74 the water will go by gravity to cover 6000ha CCA and the Diameter varying from 1100mm to 350mm size and same as the offtake point at node JJ-76 the water will go by gravity to cover 6500ha CCA and the Diameter varying from 1200mm to 350mm size

Note: The Effective pump head is arrived to maintain sufficient residual heads at end points, the telescopic pipelines of their respective Rising main and disnet. It has been calculated head loss of their telescopic pipe line head loss in the RM cum disnet lines, and the residual head maintained based on the GL at each node point. Since. Sample calculations have been attached.

GRAVITY MAIN FROM DC-1

1. The water will go by gravity from the DC-1 at the level of 389m to cover around 5000Ha CCA, with sufficient heads of varying diameters from 1050 to 350mm size.
2. The water will go by gravity from the DC-1 at the level of 389m to cover around 200 Ha CCA, with sufficient heads of varying diameters from 700 to 350mm size.

PUMPING MAIN FROM PS-2

From PS-2 the left side area about 15000ha CCA covered by lifting the water of about 4.806 cumecs from the level of 311m to 325m with around pumping head of 105m and diameter of varying from 1900mm -350 mm size.

Note: The Effective pump head is arrived to maintain sufficient residual heads at end points, the telescopic pipelines of their respective Rising main and disnet. It has been calculated head loss of their telescopic pipe line head loss in the RM cum disnet lines, and the residual head maintained based on the GL at each node point. Since. Sample calculations have been attached.

COMPONENTS OF THE PROJECT

The various components to construct in this project are as follows,

- Intake well cum Pump house.
- Intermediate Pump houses.
- Delivery Chambers
- Rising main / Gravity main pipelines.
- Pipe line network 500ha to 20ha
- Distributary pipeline from 20ha up to 2.5 ha chak.
- Flow and pressure control device at 20 ha chak outlet and allied 8 nos. of on/off valves.
- Other Various civil structures.
- Valve chambers and maintenance manholes,
- Electro mechanical works.
- Electrical Transmission lines and Substation,
- SCADA.
- And Surge protection

INTAKE WELL

Intake well cum pump house is located near the of Indira Sagar Reservoir. The required discharge of water to supply 35,000 ha CCA from the intake well will be transferred to connecting suitable forebay/pipe size which is constructed near the ISP canal.

PUMP HOUSE

Tentatively, one pump house is proposed to control the two different segments. For segment one covers Area -1 command area about 20,000 ha. For segment two covers Area -2 command area about 15,000 ha and Electrical Panels, control room, crane facilities will be provided in the pump house. Also, SCADA control will be provided in this pump house.

RISING MAIN/GRAVITY MAIN

The Rising main /gravity pipeline serving command area will be designed based on 0.3204lps/ha to meet the irrigation water requirement. Hazen Williams Roughness of 140 is considered for head loss calculations and pipeline is designed in such a way maximum velocity limiting to 2.12 m/s. Also, suitably sized isolation valves, scour valves and Air valves at suitable locations ,manholes to scour the water at every 2km where ever is required all along the Rising main /Gravity main will be provided. Maintenance free Suitable type of surge protection system will also be provided to safeguard the rising main/gravity main from surge pressure. The material of pipe is Mild steel (M.S) or Ductile iron (DI) pipe will be considered for Rising main / Gravity mains.

DISTRIBUTION SYSTEM

Entire 35,000 ha area will be divided into size of 500 ha chaks, from 500ha to 20 ha sub chaks, and further area will be divided up to 2.5 ha chak as per tender requirement. water will be supplied up to 2.5 ha chak level at a discharge of 0.3204lps/ha. Also, minimum of 23m residual head will be maintained at 2.5 ha chak level with rotational method. M.S / DI/ HDPE pipe material will be considered in the distribution system.

DESIGN PARAMETERS

- Total command area 35,000 Ha Area (CCA)
- Duty is0.3204lps/ha.
- Chak formation will be done using collection of village maps and digitized and then will form 20 ha chaks. Actual area will be identified using ROR records collected from revenue department and as mentioned in the tender document.
- Approximately 1750 nos. of chaks for 20 ha size will be considered and the chak inlet will be provided to the center/highest elevation of the 20 ha.
- Pipeline distribution network designed up to 2.5 ha outlet provided for micro irrigation system such that Sprinkler/ Drip connections at the 2.5 ha chak can be provided to the farmers by connecting flexible pipe from the 2.5 ha outlet provided.
- Minimum of 23m residual heads will be maintained at 2.5 ha as per pipeline design and as mentioned in the tender condition.
- Minimum velocity in the pipeline is limited to 0.6 m/s (As per CPHEEO Manual) and Maximum velocity in the pipeline is limited to 2.12 m/s.
- Head loss calculations will be calculated with Roughness coefficient (C) value of 140 using Hazen Williams equation.
- Total Power (all types of Power) used for the entire system is limited to 32 MW only at the time of commissioning and 31.04 MW in 15 years life time with considering minimum pump efficiency of 88% and motor efficiency of 95%.
- Mild steel pipe thickness for Rising main and Gravity main is considered as per IS 5822 as mentioned in the Section II -Pre-Qualification criteria of Volume -I.
- Flow and Pressure control valves at 20 Ha chak level considered with remote wireless operated.
- ON/OFF valves provided at 2.5 Ha and it will be wirelessly operated.
- All the ON/OFF valves will be provided in the enclosure Box and one antenna will be provided for the wireless operation.
- Suitable surge protection will be provided to the rising main part of the pipeline and get vetted the designs as mentioned in the tender documents.
- valves (Air valves, Scour valves and isolation valves) will be located at suitable locations with suitable sizes as mentioned in the tender document.

- SCADA System is to control all pumping stations and all raising/gravity and distribution mains upto 2.5ha Chak
- Suitable size of HT/LT lines, Substations and required capacity of transformers is provided at suitable locations.
- Suitable Pump equipment is provided at pump houses with a minimum requirement of pump and motor efficiency.
- Provided Suitable size of Delivery chambers at suitable location.

CO-ORDINATES INTAKE WELL

INTAKE WELL /PUMP HOUSE LOCATIONS				
Intake well and Pump House Nos.	**Latitude**	**Longitude**	**Nearby Location**	**Elevation (m)**
1	21° 59.725'N	76° 38.136'E	Near BaidiyawRyt Village Indira sagar	248

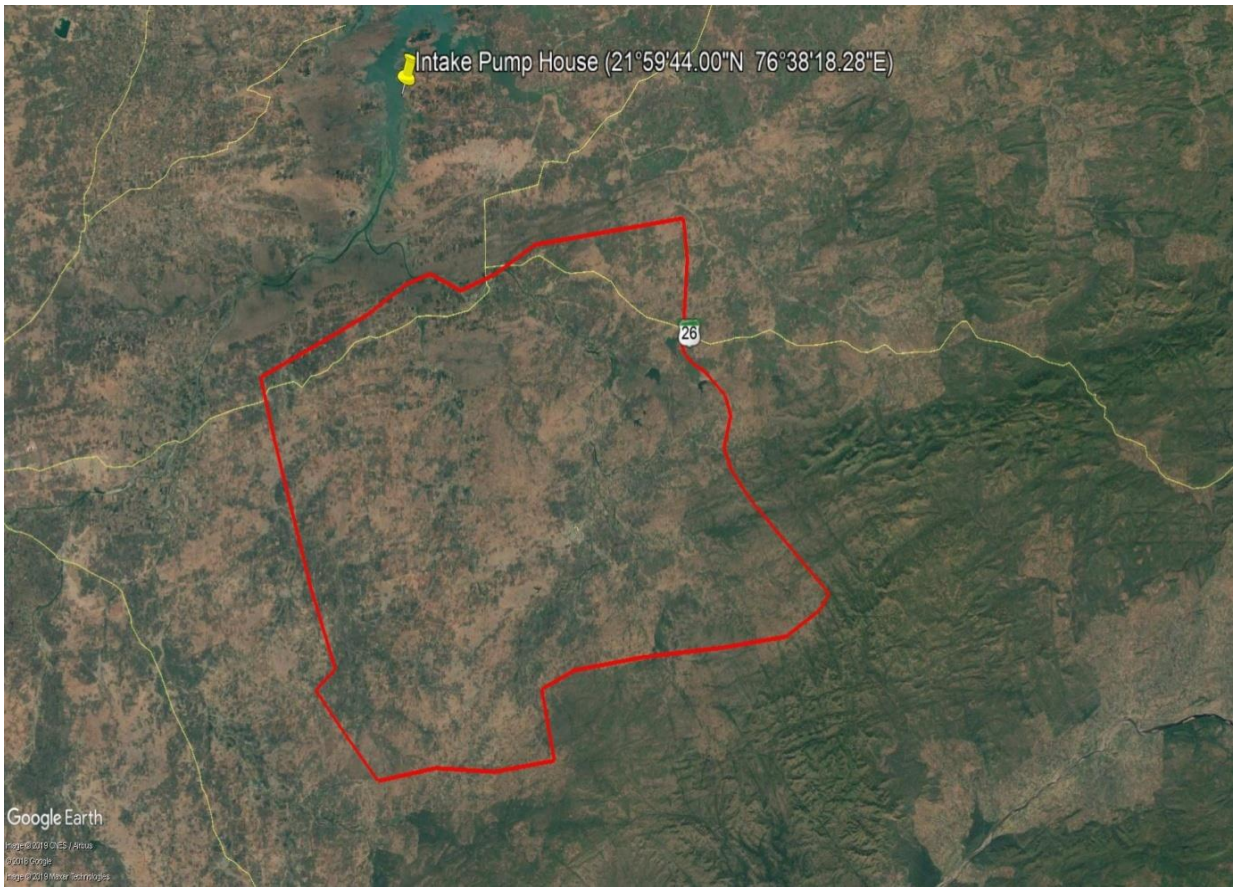
CO-ORDINATES OF PUMP HOUSE-2

Description	**PS-2**	
	Latitude	**Longitude**
PS-2	76° 41.377'E	76° 41.377'E

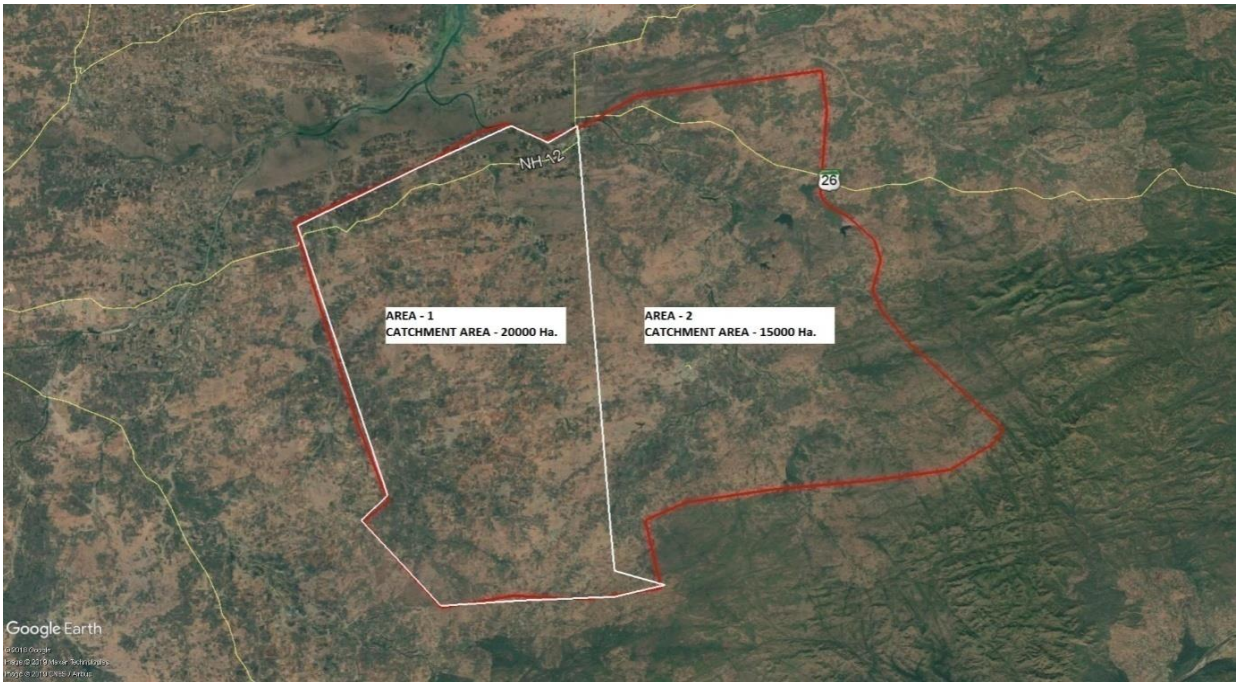
CO-ORDINATES OF DELIVERY CHAMBER(DC)

Description	**DC**	
	Latitude	**Longitude**
DC	21° 42.589'N	76° 42.396'E

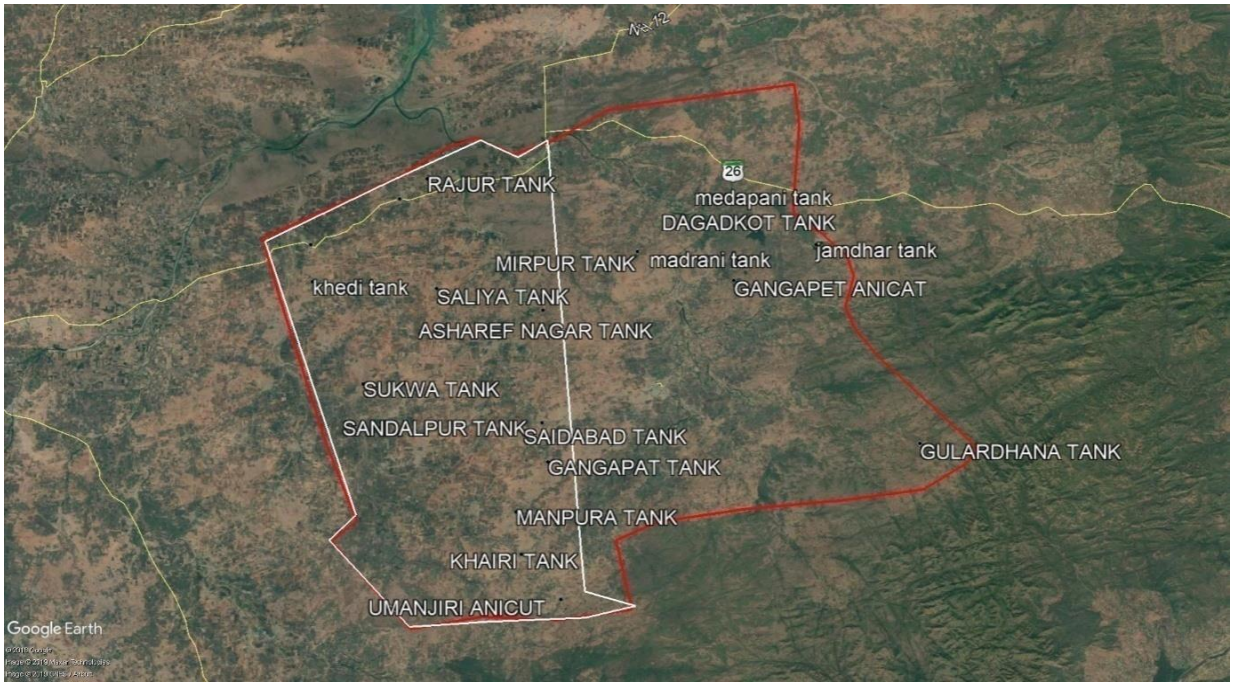
COMMAND AREA COMPLETE 35,000 HA BOUNDARY FROM GOOGLE EARTH



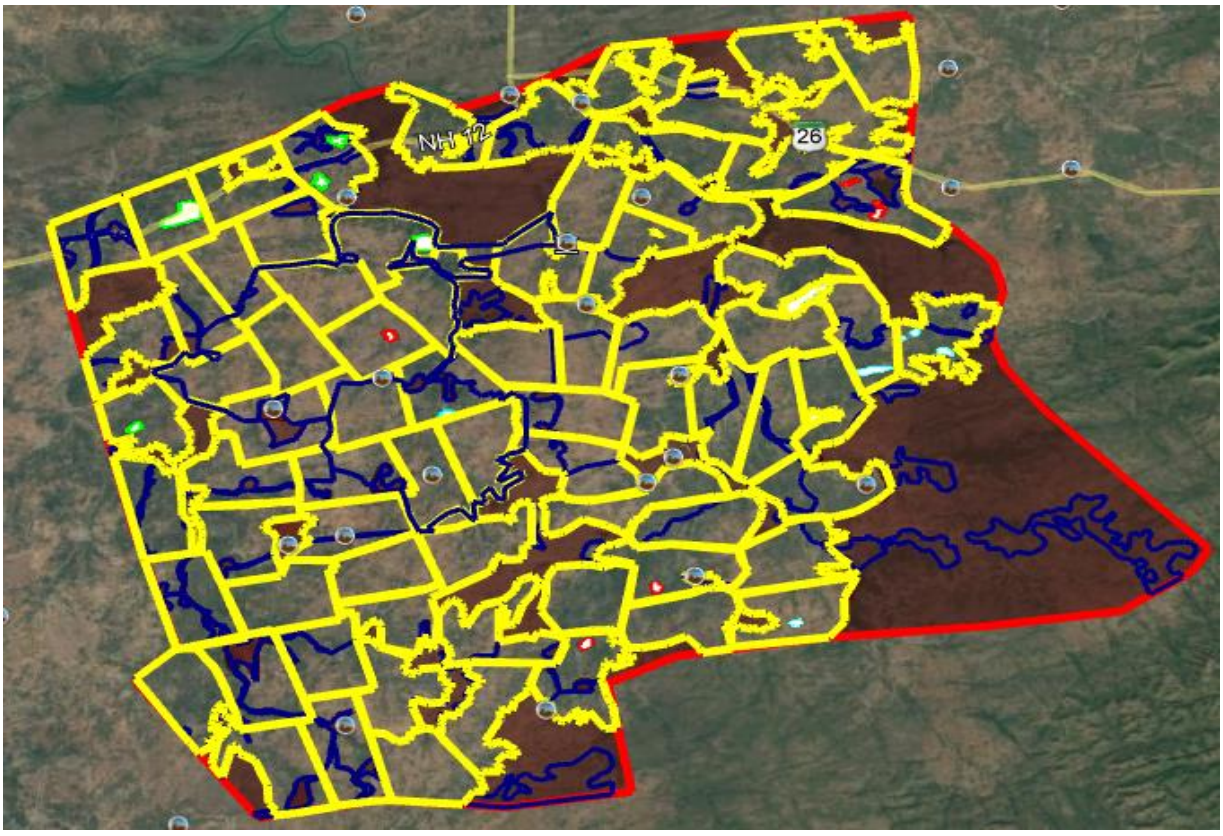
COMMAND AREA BOUNDARY FROM GOOGLE EARTH VIEW:



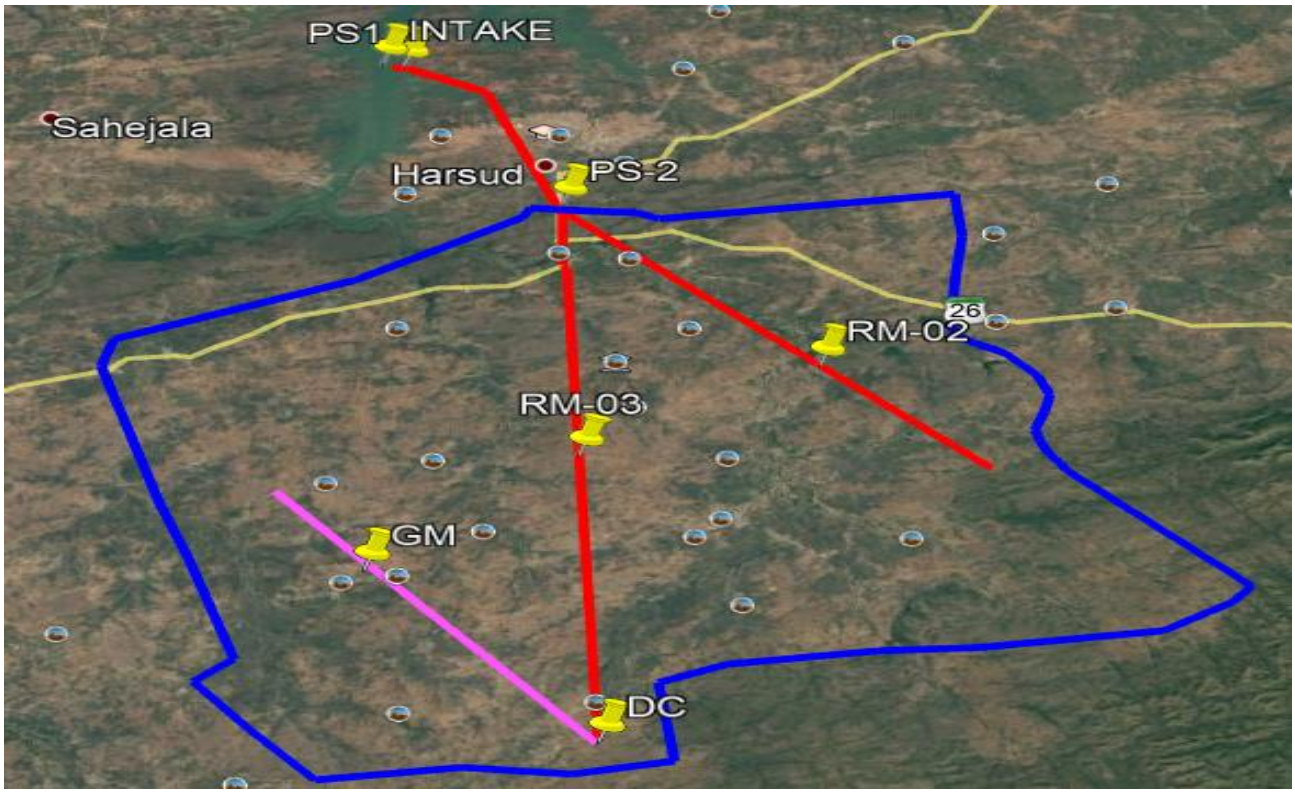
TANK LOCATIONS



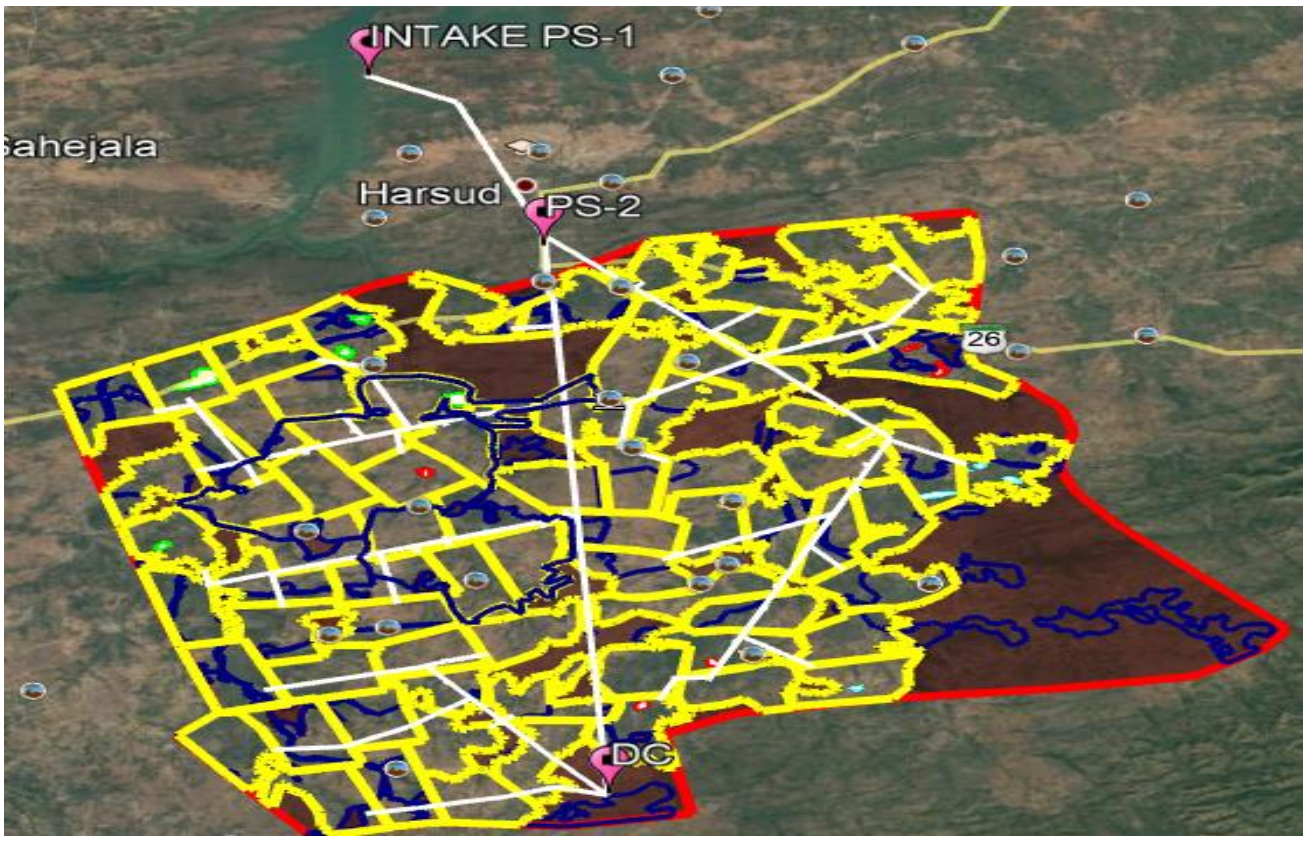
COMMAND AREA 500HA BOUNDARY FROM GOOGLE EARTH VIEW



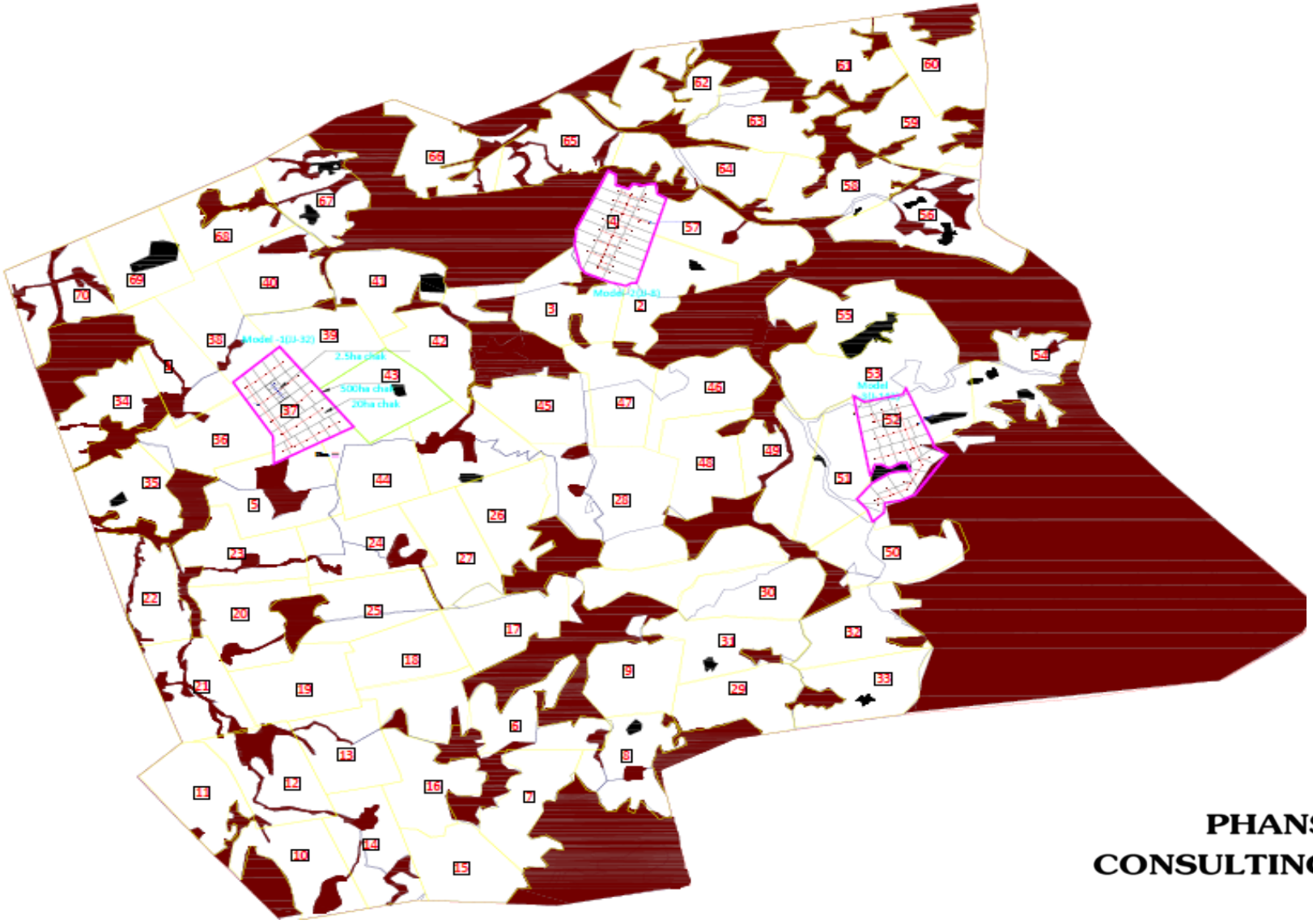
COMMAND AREA AND PUMPING AND GRAVITY MAINS FROM GOOGLE EARTH



TOTAL PIPELINE NETWORK FROM GOOGLE EARTH VIEW



THREE 500 HA SAMPLING TAKEN OUT FROM 35000 CCA VIEW



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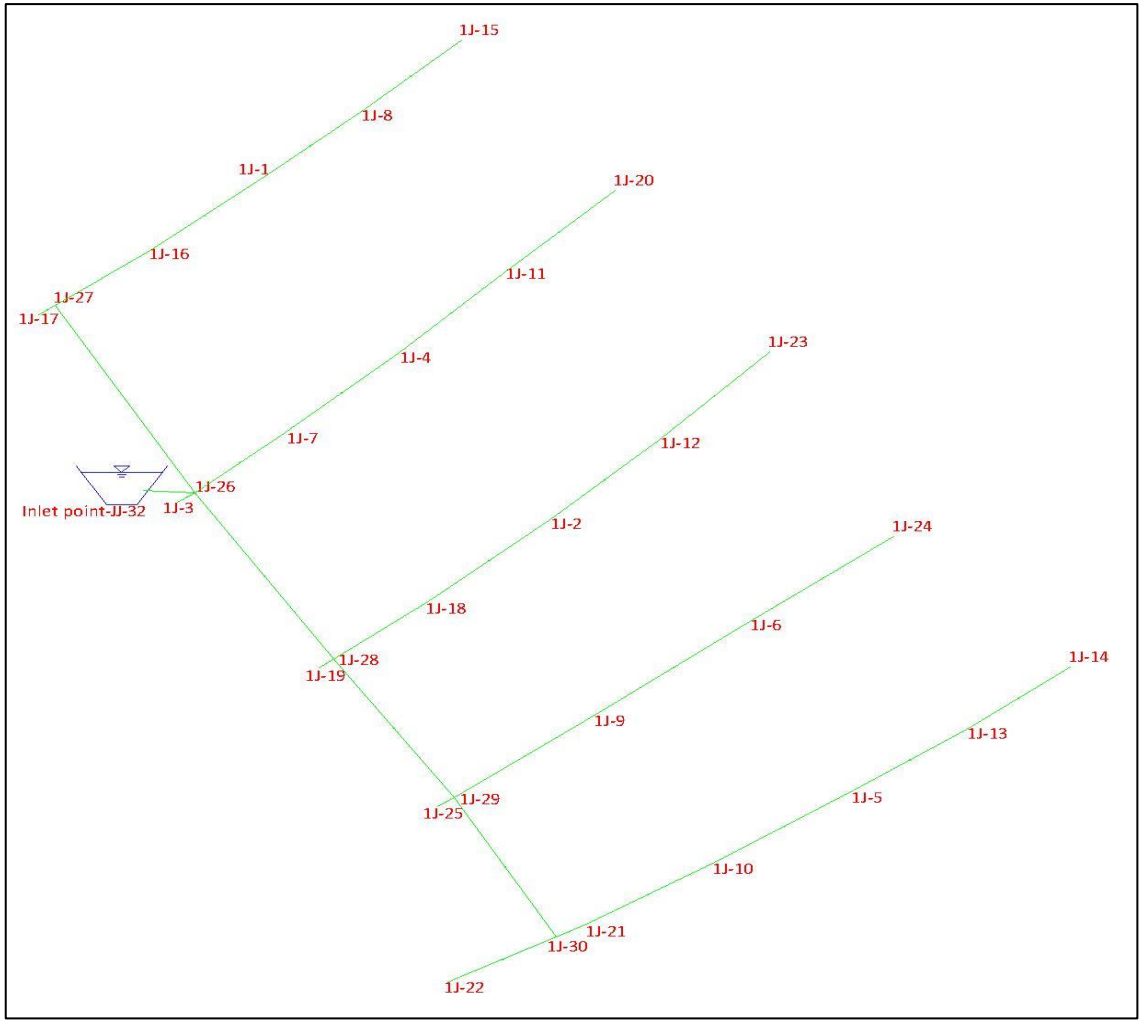
HYDRAULIC DATA

AFTER THIS, THE HYDRAULICS HAS TO BE EXECUTED TO ARRIVE THE PIPE DIA, PIPE MATERIAL, PIPE LENGTH AND DISCHARGE AND MORE.

SAMPLE -1 of 500 HA. CHAK at INLET CONNECTION (J-32)



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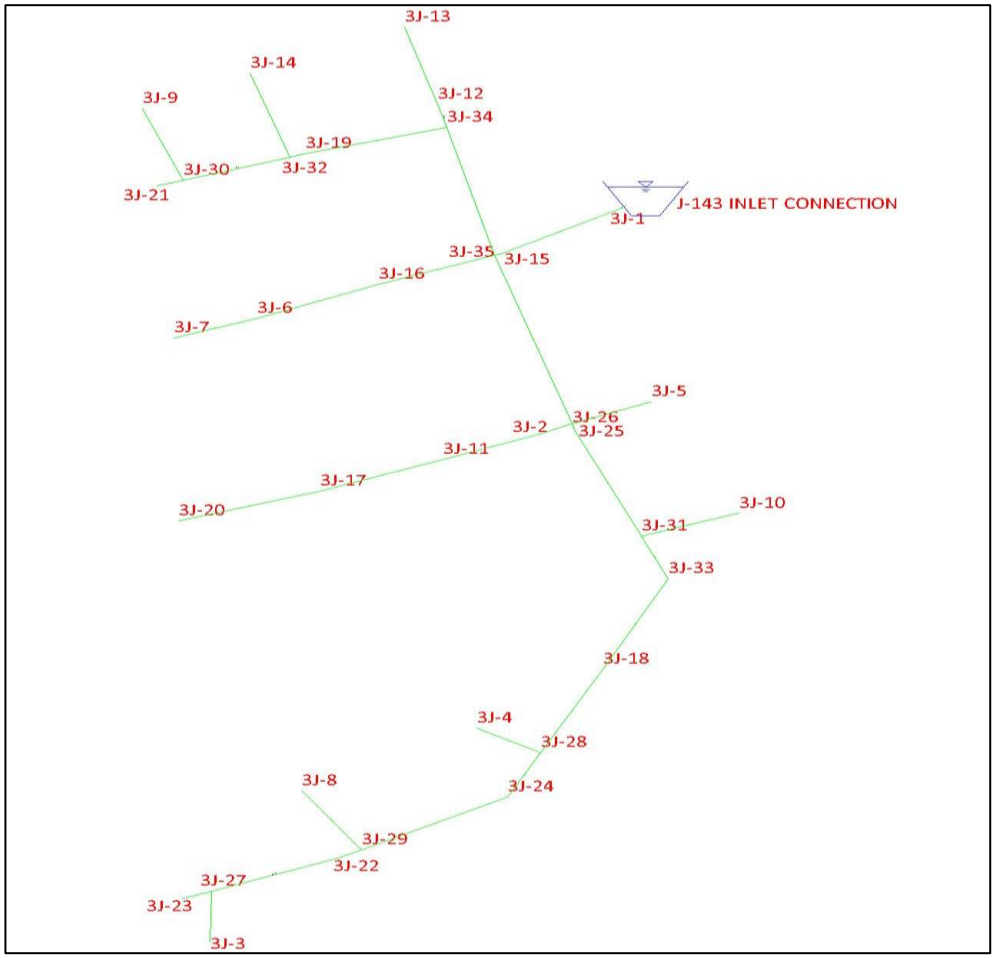
SAMPLE -2 OF 500 Ha. At INLET CONNECTION (J – 143)



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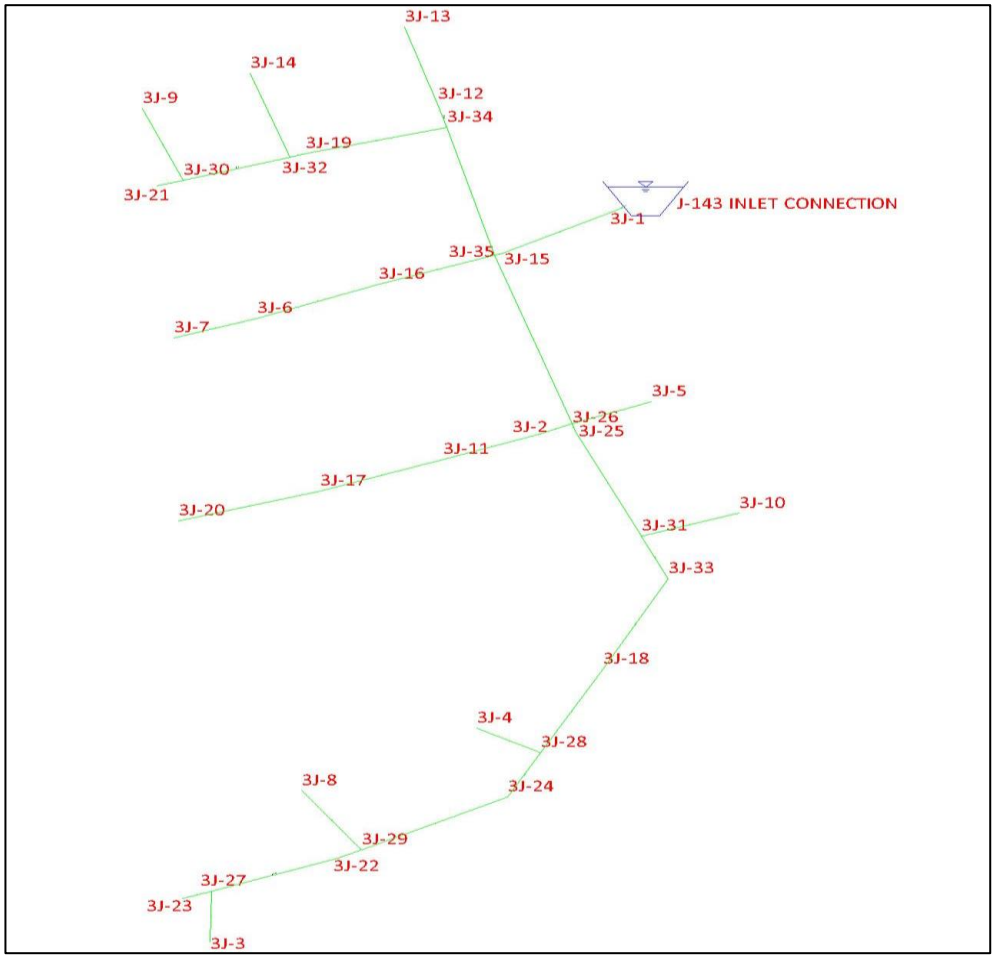
SAMPLE -3 OF 500 Ha. At INLET CONNECTION – (J – 143)



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SAMPLE HYDRAULIC CALCULATION FROM 20 HA TO 2.5 HA

1. Total Length of the pipeline with in one 20 ha chak = 1200m length
2. Piping from 20 ha to 2.5 ha =1200 m of 75mm diameter pipe (Approximately)
3. Residual head available at 20 ha = 27m (Approximately)

Head loss calculations:

4. Length from center of chak to one unit of 2.5 ha = 230m (approx.) For rotational
5. Method any 2 of 2.5ha chaks open at a time. That case critical length is about 600m

So, consider this length,

6. Diameter = 90mm nominal and 81.1mm internal (approx.)
7. Discharge = 0.801lps@ 2.5 ha chak level
8. For rotational method discharge at 2.5Ha chak level with 4-time duty @3.204lps

9. Hazen Williams Headloss formula (hf)= $10.75 \times L \times Q^{1.852} / D^{4.87} \times c^{1.852}$

where,
hf = headloss due to friction in pipe in m
L = Length of the pipe in m
Q = Discharge in the pipe in m^3/s
D = Internal Diameter of the pipe in m
C = Hazen William roughness coefficient (considered 140)

$(hf)= 10.75 \times L \times Q^{1.852} / D^{4.87} \times c^{1.852}$

$= 10.75 \times 600 \times 0.003204^{1.852} / 0.0811^{4.87} \times 140^{1.852}$

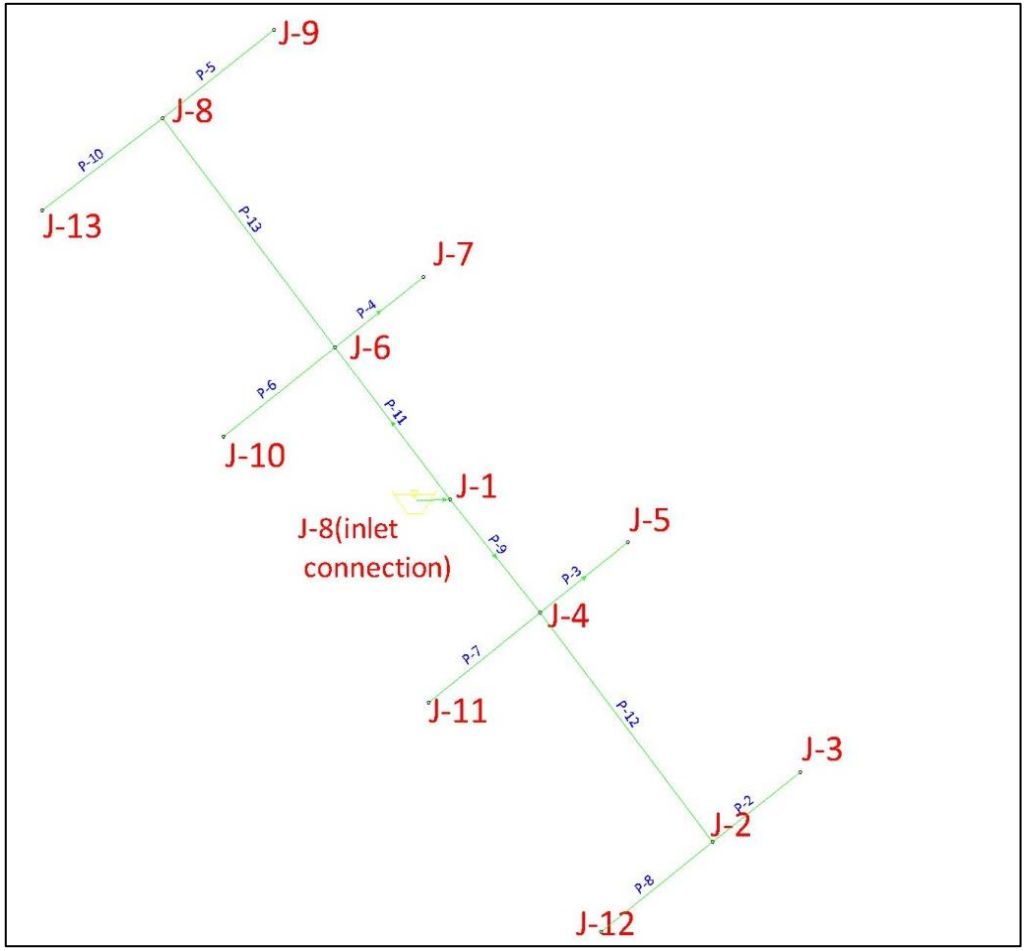
$hf = 3.05m$

- As per calculation head loss in the pipe will be 3.0m in rotation method of flow condition
- Minor loss in the pipe will be 0.305m (10 % over frictional loss)

Total head loss from 20 ha to 2.5 ha will be 3.05+0.305 = 3.36m.

So, with minimum 26.5m pressure maintaining at 20 ha chak level and further deducting loss of 3.36 the net residual head available at 2.5 ha will be 23.14m. Here as per the rotation method, from the network flow is to the 2 opposite dead end nodes given 4 times of the mentioned flow (i.e:0.3204lps/Ha) and to maintained sequentially for every 6 hrs., two 2.5 ha chaks are opened to substantiate the total inlet flow at 20ha chak.

SAMPLE LAYOUT OF THE DISTRIBUTION NETWORK FROM 20 HA TO 2.5 HA:



THICKNESS CALCULATIONS AS PER TENDER SPECIFIED METHODOLOGY

1) **Procedure for determining thickness for pipes as per IS 5822 code,**

The M.S PIPE thickness for the required diameter shall be considered as followed,

1) t1 = P x D / (2 a f e + P)

Where,

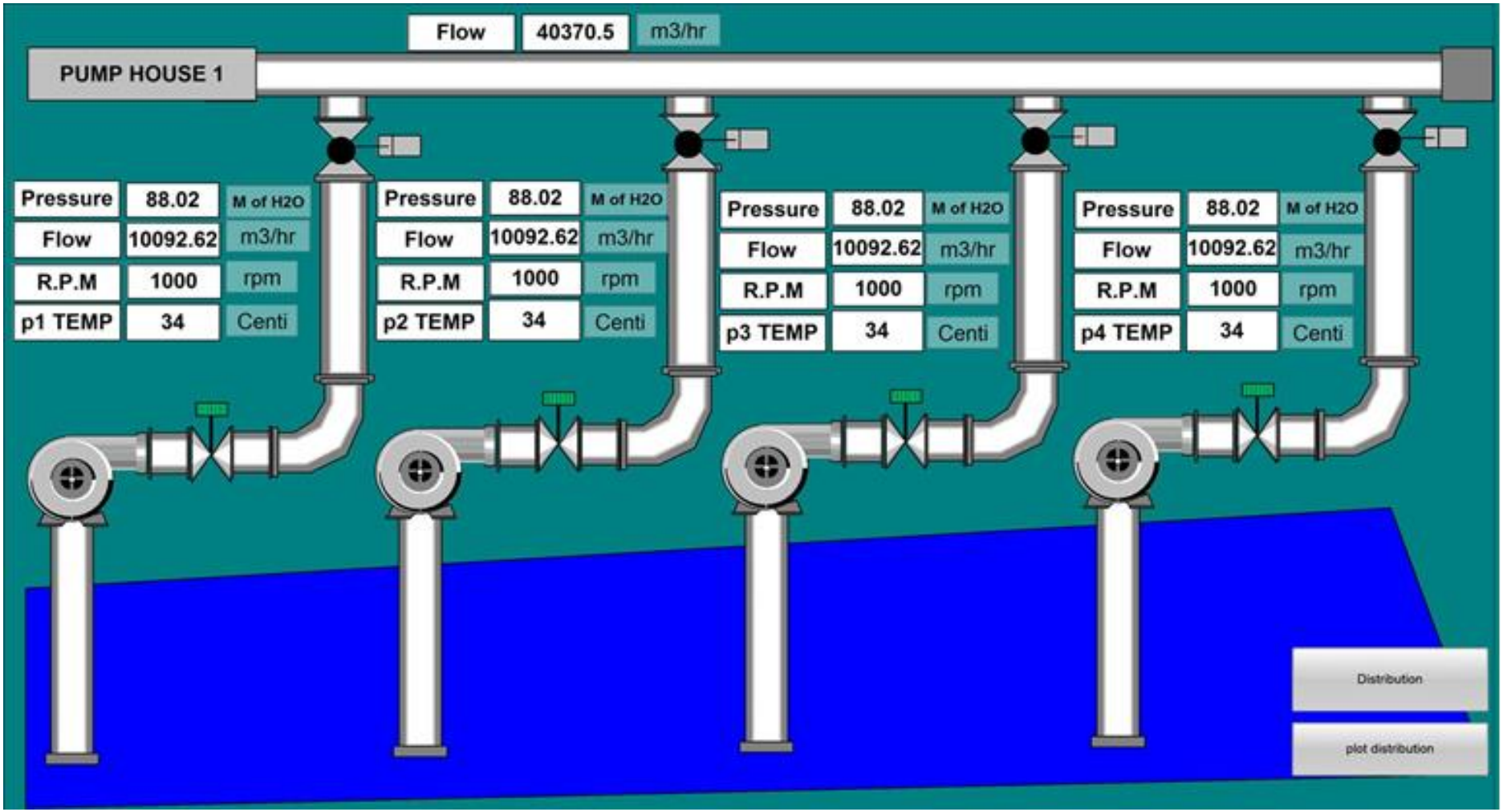
t1	=	Shell thickness in cm
P	=	Design internal pressure in kg/cm2
D	=	Outside diameter in cm
a	=	Design factor (0.6 for working pressure and 0.9 for test pressure inclusive of surge pressure)
f	=	Specified minimum yield stress 2500 kg/cm2
e	=	weld efficiency of the joint (0.9 for shop welding and 0.8 for field welding)

Note: The pipe thickness shall be finalized after surge analysis. Only upward revision will be considered. No downward revision of this thickness is allowed.

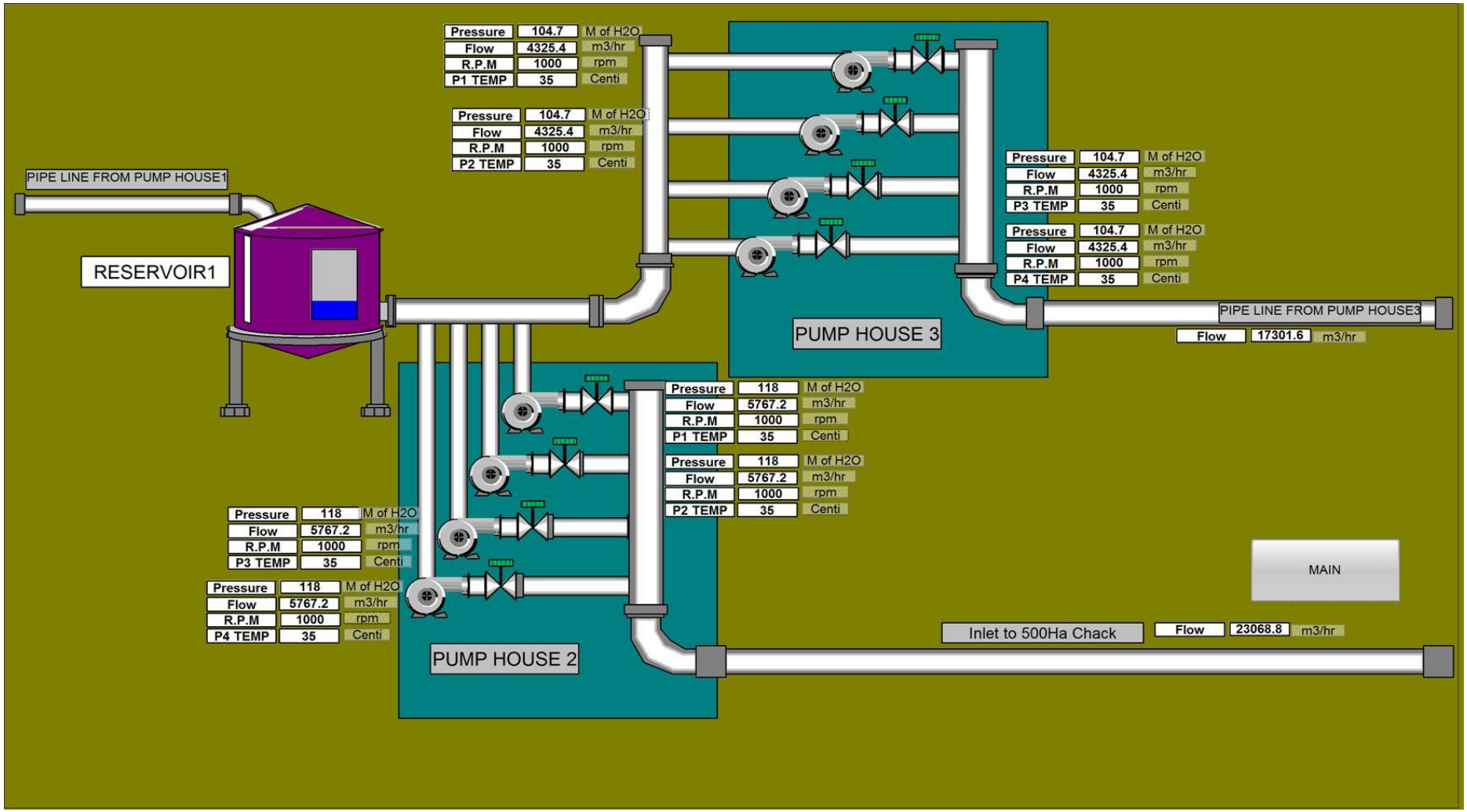
NOTE ON CONTROLS AND AUTOMATION SYSTEM FOR DISNET SYSTEM:

1. There are no Flow or Pressure controllers at of 500 ha chak.
2. One Flow and Pressure controller is provided at each 20 ha chak with remote wireless capacity to be switched on/off. This must be capable of delivering at least 6.408 liters per second for the 20 ha chak at the regulated residual pressure of 20m at controlled pressure and discharge with sufficient overload margin to carry out Osrabandi by chak rotation where some chaks may be operating for some time and other operate subsequently for proper operation of the irrigation rotation.
3. There are 8 On/Off solenoid valves also provided after the Flow and Pressure controller at each 20 ha chak. Each of these solenoid control valves can be wirelessly operated and each should be capable of delivering required water for the 2.5 ha chak with sufficient overload margin to carry out Osrabandi by chak rotation where some chaks may be operating for some time and other operate subsequently for proper operation of the irrigation rotation.
4. All the 8 nos. of ON/OFF solenoid valves and the flow and pressure controller valve are situated in center of the 20 ha chak location and in the enclosed box
5. One antenna is to be suitably mounted on the top of the RCC box for the wireless operation.
6. One Solid State Battery with solar panel charging and the wireless cards will also be housed in the RCC box.
7. Suitable adaptation should be possible for chak rotation (Osrabandi) where flow in each chak may be larger than that possible without chak rotation. All Pressure and flow controller and disnet pipes dia should be capable of taking this overload of extra water flow while maintaining same residual head of 20m.
8. During Chak rotation all the quantum of water available per second at the 20 ha chak inlet will be delivered to any 2 out of the 8 chaks of 2.5 ha area. The pipe sizes should be capable of delivering this complete water flow (water flow at the 20-ha inlet) to these two chaks without loss of residual head and flow.

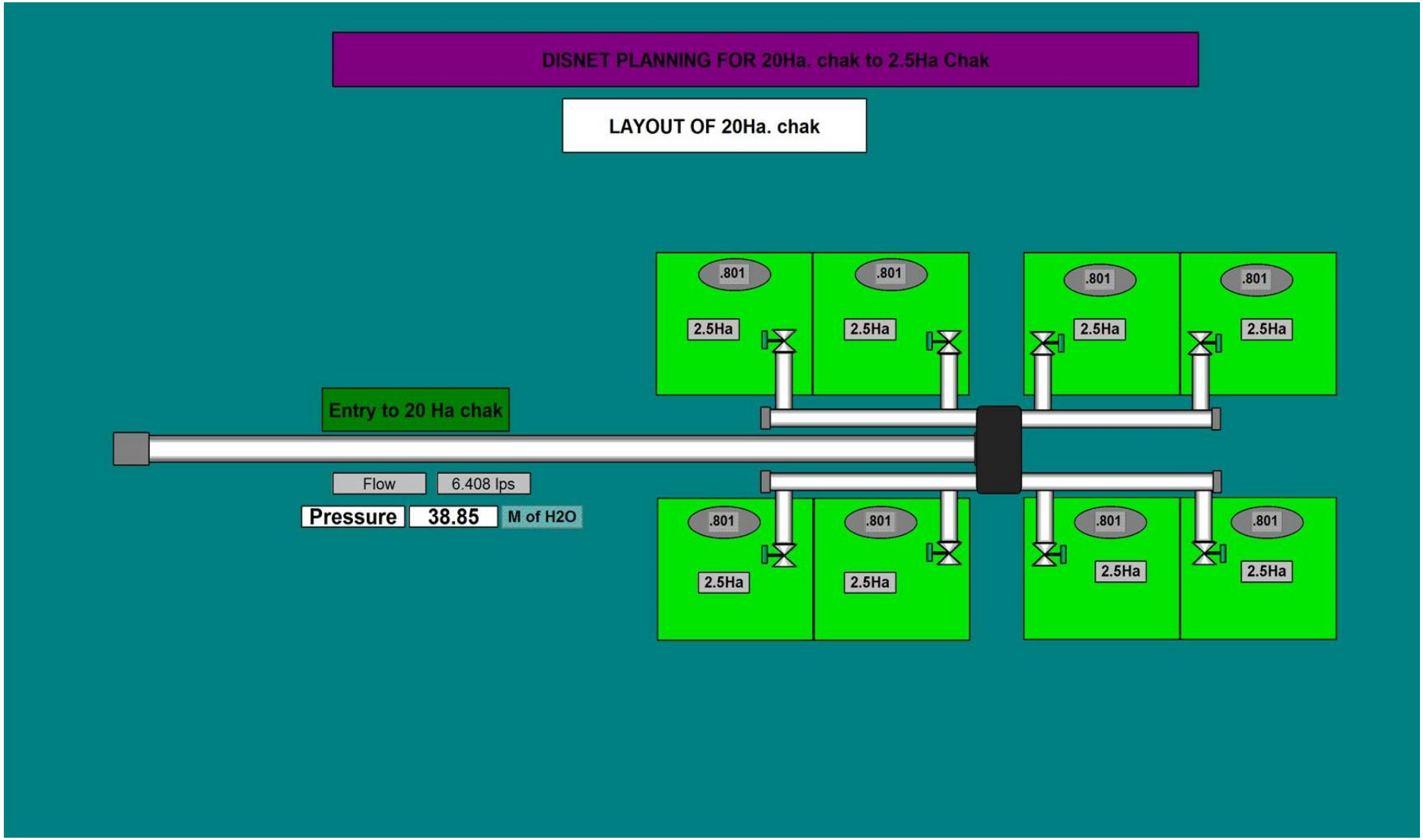
MODEL SCADA DRAWING AT INTAKE PS-1



MODEL SCADA DRAWING AT PS-2



MODEL SCADA DRAWING FOR 20HA CHAK TO 2.5HA CHAK



CONCLUSION:

1. The technical note is based on available data uploaded with the tender document and most initial and preliminary survey. However, after conducting detailed geographical field survey after award of work, comprehensive designs & drawings shall be prepared to fulfil the objective of the work.

2. It is also obvious from our submission that the hydraulic parameters (Pressures / velocities) in all types of pipes are under the prescribed limits and are in accordance with directions of CPHEEO manual. Thus, our Hydraulic and Hydro-mechanical designs are technically competent & responsive.

3. It is also worth here to mention that we are committed to complete the entire work in the given time frame with utmost quality adherence to ensure early benefits to the poor farmers of command area with longer life & durability of project.

4. Apart from above, in compliance to all Amendments, if we are declared as successful bidder, we may modify our design without deviating all tender conditions after conducting comprehensive detailed surveys and field investigations in order to ensure most efficient irrigation system for providing optimum benefits to the cultivators with in the command area.

THE END OF THE TECHNCIAL APPROACH TO THE PROJECT – THANK YOU

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WATER RESOURCE & IRRIGATION SECTOR BROCHURE

WATER RESOURCE & IRRIGATION

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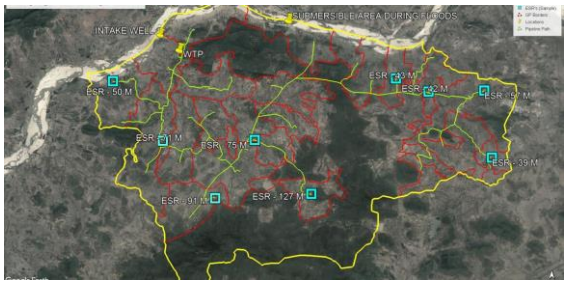
OUR SERVICES

1. RURAL WATER SUPPLY SCHEMES (RWSS)

Population growth in India is putting tremendous pressure on existing water systems to supply water to both urban and rural area in terms of quality and quantity requirement. **PHANS4 CONSULTING** has designed efficient rural piped water supply consulting solutions to meet the requirements of the country. Our experienced Engineers draws a lot of strategies and best technologies to the projects.

OUR SERVICES INCLUDE



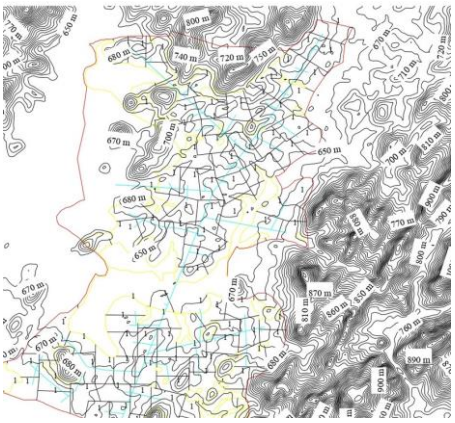
- Water demand studies,
- Site survey and investigations
- Reservoir studies,
- Raw water intake pump calculations,
- Master balancing reservoir (MBR),
- Water treatment plant design, Capacity calculations,
- Elevated service reservoirs,
- Distribution pipeline networks and hydraulics.
- Our expertise also includes smart water grid design with SCADA systems.

2. LIFT IRRIGATION SCHEME

Lift irrigation schemes are instrumental in stabilizing agricultural production in the years of drought and increase food production. For successful functioning the LIS requires appropriate techniques, planning, designing, execution under technical guidelines, understanding the importance **PHANS4 CONSULTING** has proven expertise in all types of lift irrigation consulting projects with integrated and customized service to clients in the field of irrigation.

OUR SERVICES INCLUDE

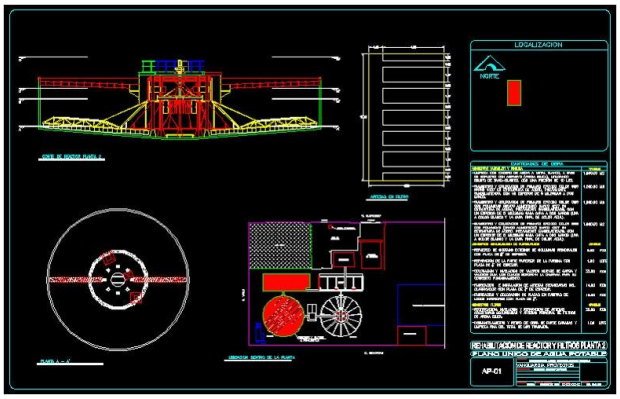
- Tender Support (Pre-bid Review, Meetings, Queries, Bid submissions) GIS
- Mapping
- Survey and Investigations Intake systems,
- Pump House design and selection,
- Rising Mains/Pressure Mains (DI, MS Pipes)
- Gravity mains (DI, MS pipes, HDPE),
- Delivery Chamber/BPT
- Distribution network planning,
- Control and Instrumentation design of entire scheme,
- Major and Minor outlets with Locations,
- Bill of Quantities,
- Project management consulting.



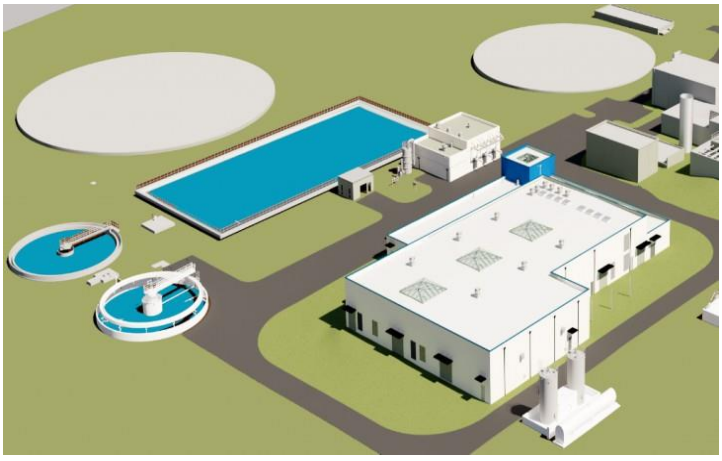
3. WATER AND EFFLUENT TREATMENT PLANT

PHANS4 CONSULTING engineers has proven experience and independent consultancy on water and waste water treatment in enhancing the efficiency of the plant while adding extra safety to the environment. **PHANS4 CONSULTING** has focused in improving operational flexibility and reliability mastered the design and development of efficient systems for industrial water treatment and effluent treatment plants.

OUR SERVICES INCLUDE



- Site Study & Design engineering,
- Technologies involved,
- Preparation of feasibility study (WTP, ETP),
- Detailed project reports (WTP, ETP),
- Transaction advisory services (WTP, ETP),
- Source,
- Water quality report (pH, TDS, TSS, Hardness, CI, SO4, Turbidity, COD)
- Design and Supply and Erection and Commissioning
- Operations and Maintenance (WTP, ETP).

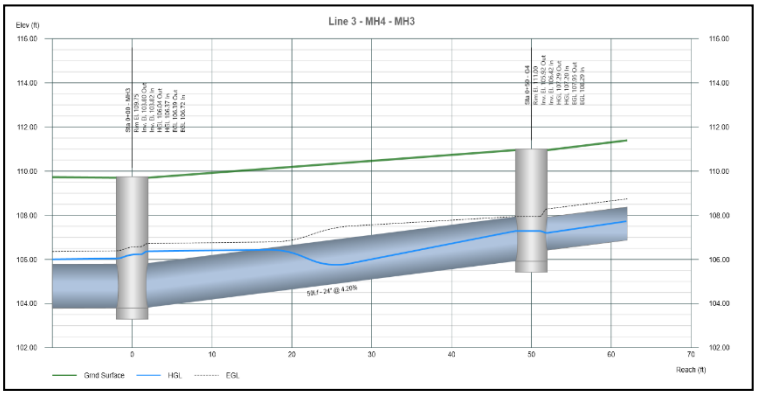


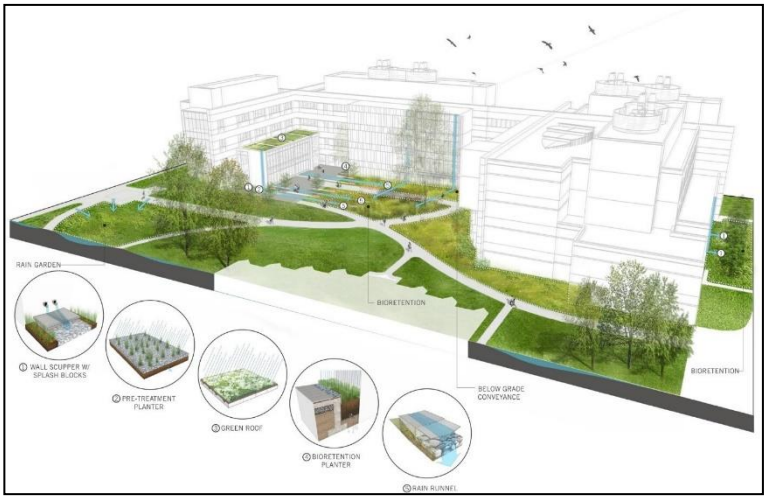
4. STORM WATER DRAINAGE SYSTEM

Storm water management is the effort to reduce the run off of rainwater and improvement of water quality. Together we provide a greater understanding of the characteristics of storm water run-off, sediment detention design, water quality impacts and management of non-storm water potential pollutant sources. Over the years **PHANS4 CONSULTING** has developed design models for efficient storm water drainage systems for various government bodies, SEZ's, Real-estate projects, ports across India.

OUR SERVICES INCLUDES

- Identifying the urban flooded areas using latest technologies,
- Data collections,
- Conducting surveys and investigations.
- Preparation of storm water drainage network,
- Hydraulic designs of storm water drainage locations like inlet locations, Manholes,
- Pumping of storm runoffs,
- Outfall structures and natural streams
- Conducting rainfall analysis,
- Design of rain water harvesting systems.

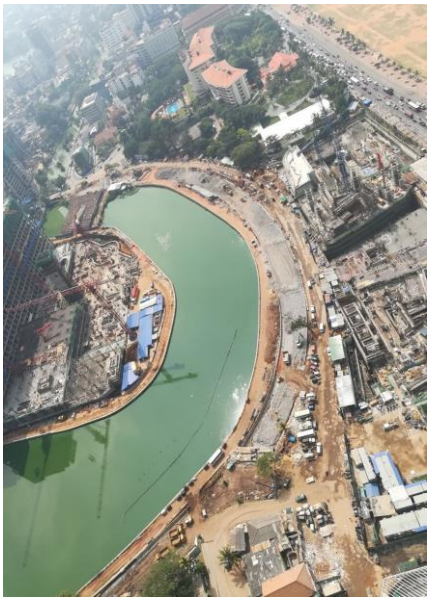




5. LAKE DEVELOPMENT

Lake development consulting is considered the one of the finest expertise for PHANS4 Consulting, as we have mastered the design, execution and operations and maintenance of lake development and lake rejuvenation.

OUR SERVICES INCLUDE



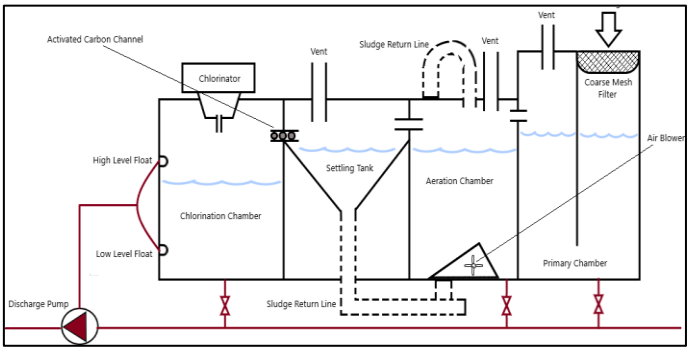
- Detailed project report for Strengthening and Beautification of Micro Irrigation and ZP Tanks,
- Bund improvements & Pitching work,
- Gravity main pipeline network,
- Topographical survey maps of the area Village map, tank details,
- Rainfall details,
- Reconnaissance survey for tank silt,
- Bund details & Waste weir details,
- Preparation of preliminary designs,
- Drawings & detail estimates required for the desilting,
- Improvements of tank, waste weir, etc., and structures detail design,
- Estimates and drawings,
- Detailed alignment survey,
- Detailed Engineering,
- Drawings for Gravity main pipe including structures coming across,
- Pipe diameter,
- Structures including hydraulic particular.

6. SEWAGE AND SEWERAGE TREATMENT

PHANS4 CONSULTING has immense experience in Sewage Treatment Plants consulting for cities and townships, municipal organizations and private sectors through the design, engineering, and commissioning of Sewage Treatment Plants Our treatment plants are developed on the basis of our client's requirement as Phans4 consulting has mastered the engineering design for sewerage treatment systems over the years.

OUR SERVICES INCULDE

- Develop forecasting models for estimation of sanitary sewage,
- Hydraulics of sewer,
- Design of sewer systems, Layouts,
- Components of the system, Sizing,
- Design and selection of sewer appurtenances,
- Suggesting the material for construction of sewers,
- Structural design of sewer.



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PHANS4 CONSULTING PVT. LTD.