PROPOSED TRANSMISSION SYSTEM OF THE CHAMBAL- BHILWARA PROJECT

The work of the transmission part was divided into five packages and break-up of above packages were got approved .Following are the break-up of the packages:-

Package No.	Particulars of the Package	Cost of the Package
Package-I	Work of construction of Intake PS at river Chambal near Bhaisrodgarh, intermediate pumping station at Bhunjar Kalla and Tisva and MS Raw Water Transmission Main from Intake to inlet of WTP at Rasadpura (Aroli) along with SCADA system and other required ancillary works under Chambal-Bhilwara Water Supply Project Phase-I with operation and maintenance for 10 years on Single Point Responsibility Turnkey Basis	223.00 Crores
Package-II	Work of Construction of 245 MLD capacity WTP at Rasadpura (Aroli) and MS clear water gravity main from WTP to Transfer Pumping Station at Bhilwara city along with SCADA system and other required ancillary works under CHAMBAL-BHILWARA WATER SUPPLY PROJECT PHASE-I with operation and maintenance for 10 years on Single Point Responsibility Turnkey basis	255.00 Crores
Package-III	Work of Construction of Pumping Station at Telekheda, Danta Pyara and Haripura Chauraha, MS/DI Clear Water Transmission main from Telekheda H/w to Haripura Chauraha, Master Control Center of SCADA at Telekheda, along with SCADA system and other required ancillary works under CHAMBAL-BHILWARA WATER SUPPLY PROJECT PHASE-I with operation and maintenance for 10 years on Single Point Responsibility Turnkey basis.	63.00 Crores
Package-IV	Augmentation of Water Supply Scheme of Bhilwara town	74.02 Crores
Package-V	Survey work of 1688 villages of Bhilwara district	1.25 Crores

Transmission system of Chambal- Bhilwara project was proposed for the intermediate demand for year 2030.But the Raw Water Transmission has been checked for the feasibility for the year 2045 and the size is found adequate. The site is very typical from Intake to WTP and secondly it will cross the sanctuary area so feasibility of raw water main for ultimate demand is essential.The present proposals are for catering to the demand of year 2030 with certain component like land acquisition, forest & wild life clearance, civil work of intake & other pump houses, internal distribution system of towns etc. for the year 2045. Sizing of different component of the project, proposed under transmission system is elaborated in detail in para 1.10. Index map of the Phase-I of the project is as under.

Off-takes at different locations would be left for the demand of other urban town & rural areas of the proposed integrated water supply project. Work beyond these off-takes for coverage of urban & rural areas, is proposed to be taken up under second phase of the project, in due course of time.

Construction & commissioning of the transmission system would take minimum of 30 months to 36 months & therefore construction of clusters & main pipeline up to other towns can be taken up with a gaping of 1 ½ to 2 years, when funding from World Bank or other financial institution is available

PROJECT LOCATION

Bhilwara is one of the important Districts of the state of Rajasthan, located its South- West side. There are, in all, 9 towns and 1688 villages in Bhilwara district. As per 2001 census, urban and rural population of Bhilwara district was 4,29,964 & 15,83,825 souls respectively. Present urban & rural population of Bhilwara district is 5,25,000 & 19,50,000 respectively. Bhilwara town is the district headquarters of Bhilwara District with its population as 280281 as per census 2001 and present population about 3,50,000. The Location of State of Rajasthan and Bhilwara District are depicted in maps below.

PRESENT PROBLEM

Bhilwara district is facing acute shortage of drinking water since last 10 years. Poor rainfall and over-extraction of groundwater have rendered all the 11 ground water blocks over exploited with stage of groundwater draft ranging from 113% to 155%. Various ground water sources developed in last few years have not been proved sustainable. Poor ground water quality, with 1086 habitations affected out of total 1688 habitations, made the drinking water situation worse in the district. There is no dependable surface source in Bhilwara. The only surface source for drinking water supply of Bhilwara town, Meja Dam, has not received sufficient water since last many years.

Urban Sector

All the 9 towns of Bhilwara district are facing acute shortage of drinking water since last ten years. Due to inadequate rainfall in Bhilwara district in previous years and over exploitation of ground water, water level in the district is going down year by year. Tube wells and open wells developed under various contingency works during last 7-8 years did not prove sustainable. In Bhilwara town, supply interval & service level, during summers, is 120 hr & 42 lpcd respectively. There are 8 other urban towns other then Bhilwara town in the district, out of which in Gangapur, Mandal & Gulabpura water is being supplied at interval of 96 hours, in Asind, Jahazpur, Mandalgarh and Shahpura at interval of 48 hours and only in Beejoliya at interval of 24 hours. Service level in these town varies from 19 lpcd in Mandal town to 54 lpcd in Bijoliya town. Present service level is based on production of water. Net availability of water is still lower after discounting the losses in the distribution system.

In Bhilwara town, apart from lower availability of water there is a substantial loss of water due to the leakages in the network. The distribution system, mainly consisting of AC pressure is having average age of 30 years. There are about 40000 water connections, drawing water mostly in the underground tanks. The supply pressure in different zones is very low & supply duration limited to 1 to 1 ½ hours in 120 hours. Distribution network needs replacement due to damage and around 25 % of them are required to be replaced to bigger sizes due to increased requirement. Similarly augmentation of storage capacity is also needed to improve the distribution system. Due to non availability of local ground water or surface source water, especially in summer, water transportation, by Rail Transportation from Kota, is required for Bhilwara town, every year.

Eight other urban town of Bhilwara district are also facing scarcity of drinking water due to almost similar reasons. There is also, a need of improvement in town distribution network & capacity of service reservoirs.

Rural Sector

All the 1688 villages of Bhilwara district are covered under different types of schemes. Normally, villages up to population of 1500 are benefitted by handpump schemes, up to 4000 population are provided with Pump & Tank scheme and balance by Piped schemes. Out of 1688 villages of Bhilwara district, only 103 villages are covered under Piped water supply scheme, where water is being supplied through house connections. In 402 villages, covered under Regional or other Schemes, water is being supplied through centrally located PSPs or GLRs. Remaining 1183 villages are being served through Hand Pump schemes.

Almost all the villages of Bhilwara district are facing scarcity of drinking water. Villages are having either quantity or quality problem and every year water is made available by road transportation, in summer season, especially in Asind, Raipur, Sahara, Bhilwara, Mandal, Banera, Hurda, Kotri and Shahpura tehsils. Transportation of water was being done in 868 villages in year 2009 summer which increases to 1220 villages in summer 2010. Number of tanker feed villages may also increase in coming summer. Quality of ground water in about 600 villages of Shahpura, Banera, Jahazpur, Hurda & Mandal block of Bhilwara district is not potable. There is excess quantity of Fluoride in ground water than prescribed standards. Concentration of Fluoride in ground water is increasing year by year due to depletion of water level and overexploitation.

Sewerage & Sanitation

There is no sewerage system in urban & rural areas of Bhilwara District. In rural areas and various towns of district, on-site sanitation is being practiced for disposal of wastewater and open defecation is common in smaller towns & rural habitations. Percentage of open defecation in Bhilwara town is about 5%, while in other towns it is up to 20%. The sewage is either draining in roadside open drains/ nallahs or people have made soak pit/ soakage well outside their houses, causing a lot of unhygienic conditions for the city dwellers.

There is no proper sewerage system in Bhilwara to collect sewage in the town. Bhilwara, in its old/inner localities, is very densely populated with narrow congested lanes. Presently, in Bhilwara, effluent from toilets as well as sludge water is flowing in open drains and being discharges at various places, creating unhygienic conditions. For maintaining healthy environment as well as aesthetics conditions, it is essential to collect and carry waste water away from the town and disposed it off after necessary treatment.

WATER RESOURCES IN THE DISTRICT

All the 1688 villages of Bhilwara district are facing acute shortage of drinking water since last ten years. Availability of ground water in the Bhilwara district is very low. All the blocks in Bhilwara district are overexploited and water level is going down year by year. Poor ground water quality, with 1086 habitations affected out of total 1688 habitations, made the drinking water situation worse in the district. There is no dependable surface source in Bhilwara. The only surface source for drinking water supply of Bhilwara town, Meja Dam, has not received sufficient water since last many years.

Water demand v/s availability of water in Bhilwara district is shown if following table;

(figure in TMC)

S.No.	Particulars	Demand	Supply	Gap
1	Agriculture Demand (Surface and Ground)	31.47	11.00	20.47
2	Drinking Water (Human + Livestock)	2.17	0.80	1.37
3	Industrial and Commercial	0.31	-	0.31
	TOTAL	**33.95**	**11.80**	**22.15**

PROPOSED SOLUTION

To solve the drinking water problem in Bhilwara district, water supply project for Bhilwara town, 8 other urban towns & 1688 villages of Bhilwara district has been proposed taking Chambal River as a sustainable source of water. Proposed location of source is near Bhainsroadgarh on upstream of Jawahar Sagar Dam. Proposed site of Intake well is about 122Km from Bhilwara town.

Since part of transmission main will pass through Bundi district, it is also proposed to cover 25 en-route villages of Bundi district by this project.

DESIGN SERVICE LEVEL

Urban & rural demand for the Chambal- Bhilwara water supply project has been calculated, taking per capita demand as per recommendations of CPHEEO water supply manual/ as agreed by GoR to design the project, for 55lpcd demand, for rural area, to be met from external surface source project . While calculating net water demand to be met from external surface sources, locally available ground water & harvested rain water has also been considered and project is designed for following per capita demand;

- ✓ For Bhilwara Town : 135 lpcd (Sewerage Contemplated)
- ✓ For other towns : 70 lpcd (Without sewerage system)
- ✓ For Villages : 55 lpcd

PROJECT SIZING

Ultimate design population & water demand for the project has been calculated for the intermediate design period of 15 years i.e year 2030 and ultimate design period of 30 years i.e. year 2045. In the present project, various components are proposed as under:

- ✓ Intake pumping station : Land acquisition, Civil work for 2045
  : EMI work for 2030
- ✓ Raw Water rising main : Pipe Line for 2045
- ✓ Water Treatment Plant : 245 MLD for demand of Year 2030, with provision of future extension for year 2045
- ✓ Raw Water Intermediate Pumping Station : Land acquisition, Civil work for 2045
  : EMI work for 2030
- ✓ Raw Water & Clear Water Reservoirs : 2 hour storage capacity for the demand of year 2030
- ✓ Clear Water Gravity mains : For the design demand of year 2030.
- ✓ Elevated service reservoirs : Service reservoirs for the demand of 2030.
- ✓ Clear Water Rising main to ESRs : DI pipe line for the demand of year 2030.
- ✓ Distribution net work in Bhilwara :90mm to 280mm HDPE PN-6 Pipe line for improvement in distribution network.
- ✓ Land acquisition, right of way permission, Road crossings, Railway line crossings, Forest Clearance : To be taken as per requirement for ultimate design period to accommodate future parallel line, Pump Houses, Reservoirs etc.
- ✓ Cross drainage works like High level bridges, Culverts etc. : For the requirement of ultimate design period. Shall be constructed in such a way to accommodate future parallel line.

MAIN COMPONENT OF PROJECT

Project components taken in the proposals are summarized as under:

- RCC Intake Pumping Station, near Bhainsrodgarh with installation of 6 working + 3 standby Pump Sets & EMI work.
- 15.72 km- 1800mm MS Raw Water Rising Main from Intake to Intermediate Pumping Station near Bhunjar Khurd
- Intermediate Pumping Station with installation of 6 working + 3 standby Pump Sets & EMI work at Bhunjar Khurd
- 16.80 km- 1800mm MS Raw Water Rising Main from Bhunjar Khurd IPS to Intermediate Pumping Station near Tilsva
- Intermediate Pumping Station with installation of 6 working + 3 standby Pump Sets & EMI work at Tilsva
- 16.75 km- 1800mm MS Raw Water Rising Main from Intermediate Pumping Station to WTP Head Works at Rasadpura (near Aroli)
- 245 MLD Capacity Water Treatment Plant at WTP Head Work
- Clear Water reservoir of Capacity 22.5 ML at WTP head work.
- 48.60 Km- 1400mm, 14.52 Km-1300 mm, 6.59 Km-1200 MS Clear water gravity line from WTP Head Work to Bhilwara junction point.
- 1200mm/900mm/700mm/500mm dia., MS/ DI gravity main from Bhilwara junction point to different head works in Bhilwara town.
- Clear Water Pumping Station with EMI work and 9.8 ML CWR at Bhilwara Jn.
- 21.23 Km- 1000 mm dia. MS Clear Water pipeline from Bhilwara Jn. To Danta Pyara PS.
- Clear Water Pumping Station with EMI work and 4.8 ML CWR at Danta Pyara PS.
- 4.8/ 12.9 Km-700/600 mm dia. DI pipeline from Danta Pyara to Mandal and Mandal to Haripura Chauraha.
- Clear Water Pumping Station with EMI work and 1.58 ML CWR at Haripura Chauraha PS.
- Clear water reservoirs, clear water pumping stations with EMI work at different head works in Bhilwara town
- Dedicated 33 KV power feeder at Intake, IPS & WTP and constriction of 33KV sub stations at all PS.
- Reorganization, rehabilitation & expansion of distribution system in Bhilwara including construction of, Elevated Service Reservoirs, laying of distribution network including GIS based water management system.
- PLC-SCADA & Voice Communication System
- Ancillary Civil work, land acquisition & crop compensation, National Highway, Railway Crossings etc.

Policy & Reforms

The importance of integrated management of water resources, providing topmost water allocation priority to human drinking water, for the state's economic development and poverty reduction has been recognized by the Government and is incorporated as a key issue in the State Water Policy' 2010. Government is attaching high priority to state wide reforms in water sector, in general and to the reforms in drinking water sector, in particular. It has been recognized that that mere investment on construction of new assets is not going to solve the problem on sustainable basis and therefore wide ranging reforms are being contemplated by the State Government, summarized below;

a. In February 2010, Government of Rajasthan (GoR) approved a new State Water Policy of which the main objectives, are i) to adopt an integrated and multi sectoral approach to the water resources planning, development & management on a sustainable basis taking river basin/sub basin as unit; ii) The water resources of the state shall be planned, developed and managed with a river basin/sub basin as a unit adopting multi sectoral approach and treating surface and sub surface water with unitary approach.

b. GoR has, recently taken up benchmarking studies for Urban & Rural water supply schemes in a bid to identify the bottlenecks, in proper performance of schemes, to plan interventions and to assess effectiveness of such interventions made. much greater emphasis is being given on bulk metering, consumer metering and water audit.

c. For ensuring greater local participation, proposals are being prepared to involve PRIs and ULBs in the management of intra village and intra town distribution systems of drinking water in rural and urban areas respectively. Efforts are afoot in creating awareness and capacity building of the rural and urban local bodies.

d. In rural areas, the entire surface source based multi village schemes, as a policy, the intra village system is necessarily to be maintained by the Village Water and Sanitation Committee (VWSC) and tariff is being imposed considering village as one unit. For this well designed IEC campaign is taken up through experienced NGOs before connecting the village with distribution network.

e. To offset financial & other constraints, GoR has identified number of water supply project proposed to be implemented on Public Private Partnership (PPP) model. For two of the projects, technical feasibility studies are under progress for identified projects of water supply for Ajmer & Udaipur City. Efforts are on for appointment of Transaction Advisor for these two projects under IIPDF.

   The proposals for taking up projects on PPP are published on department's website for its wide publicity and to get feedback from all stakeholders i.e. Citizens, consumers groups, potential bidders, NGOs, Employees etc.

f. GoR intends to adopt water pricing to reflect its scarcity value and to utilize it as an effective tool for water demand management to curb its profligate use. The Concept, which is being worked upon for water pricing, is based on following principle;

   i. Considering Water as a social good up to lifeline consumption and an economic good beyond it.

   ii. Defining lifeline consumption limit required to meet the water requirements for basic human needs. It would be taken as 50% of the normative demand (20-25 LPCD for rural area, 35 LPCD for small towns with 70 LPCD demand and 60 LPCD for town having 135 LPCD as normative demand)

   iii. Pricing water consumption up to this lifeline consumption on affordability basis

   iv. Full cost recovery for water consumption beyond lifeline consumption limit

   v. Transparent cross subsidies for excessive consumption with objectives to curb excessive use and to manage demand.

Rationale for Chambal Bhilwara WS Project

Where as, In most of the water stressed districts of the State, implementation of surface source based projects has been initiated, Bhilwara is the only district, facing acute drinking water crisis, not to have any major drinking water supply project from sustainable surface source. With no dependable local surface source and nearly exhausted ground water sources coupled with poor quality(High fluoride), the district is very much in need of a major drinking water supply project fed from a reliable source, on the highest priority.

The drinking water supply situation in urban &rural areas of Bhilwara District is very grim with per capita availability of drinking water from 19 to 54 LPCD and water supply interval from 2 to 5 days in urban areas and 600 villages out of 1688 villages having water quality problem. Water is regularly being transported to Bhilwara City and large number of villages to supply drinking water for meeting bare minimum needs. There are a number of factors which result in the economy being highly vulnerable and growth being constrained by inadequate drinking water supply. These factors are three-fold:- Non availability of dependable surface water source or a perennial river, over-exploitation of ground water sources rendering all the 11 ground water blocks in over exploited category. and historical underinvestment in drinking water infrastructure. The district's economy is severely affected by the high variability of the climate with frequent droughts which impacts the availability of water and drinking water supply services.

Water resources

The districts have number of rivers such as Banas, Bearach, Kothari, Unli, Mendi, Nakadi, Chandrabhaga and Khari River, but all these rivers are ephemeral. Bhilwara city has one of its drinking water source at Meja Dam, which has not received adequate inflows since long. Vagaries of climatic & rainfall variation have left these sources wanting of adequate flows to serve as dependable source for any drinking water supply arrangements.

Drinking Water Supply

The Status of drinking water supply in Urban towns of Bhilwara district is as below;

S.N.	Name of Town	Population		Total present demand MLD	Present Production MLD	Present Service Level LPCD *	Supply Interval In Hours
		2001	Present				
1	Bhilwara	280128	350000	35	15.0	42	72
2	Asind	14123	16157	1.13	0.510	33	48
3	Mandal	16842	19267	1.18	0.50	19	72
4	Gangapur	17073	19532	1.19	0.70	35	72
5	Mandalgarh	20169	23073	1.41	0.55	22	48
6	Bijoliya	12389	14173	0.99	0.80	54	24
7	Shahpura	27792	32572	3.18	1.35	41	48
8	Jahazpur	18815	22051	1.31	1.05	47	48
9	Gulabpura	24362	28552	1.71	0.78	26	48

Present service level is based on production of water. Net availability of water is still lower after discounting the losses in the distribution system

Villages of the district are having either quantity or quality problem and every year water is made available by road transportation in summer seasons specially in tehsils namely Asind, Raipur, Sahara, Bhilwara, Mandal, Banera, Hurda, Kotri and Shahpura. Quality of ground water in about 600 villages of Shahpura, Banera, Jahazpur, Hurda & Mandal block of Bhilwara district is not potable. Detail of quality effected villages & villages having transportation of water in summer 2011 of Bhilwara district is shown below;

S.N.	Tehsil	Total No of Villages	Detail of Quality Effected Villages					No. of TOW villages in Summer 2010	No of TOW villages in Summer 2011
			Fluoride	Iron	Salinity	Nitrate	Total		
1	ASIND	204	107	1	1	1	110	175	204
2	BANERA	82	49	0	1	4	54	69	69
3	BHILWARA	136	50	5	9	5	69	102	149
4	HURDA	70	35	0	0	0	35	60	75
5	JAHAZPUR	217	17	1	7	8	33	143	164
6	KOTRI	175	26	1	6	2	35	64	82
7	MANDAL	188	131	0	0	0	131	67	77
8	MANDALGARH	169	2	3	0	2	7	65	113
9	RAIPUR	89	50	0	0	0	50	51	126
10	SAHARA	101	22	0	0	0	22	72	133
11	SHAHPURA	130	54	0	0	0	54	0	36
	TOTAL	**1688**	**543**	**11**	**24**	**22**	**600**	**868**	**1226**

Specific Project Proposals for Integrated Water Supply & sanitation Project

The primary objective of the proposed project is to provide safe & potable drinking water to 9 towns and problematic villages of Bhilwara districts & en-route villages of Bundi district. The objectives of the project are as follows:

- Creation of sustainable infrastructure for drinking water supply in project area.
- Improvement in health and reduction in instances of water borne diseases.
- Improvement of quality of life and the standard of living among the residents especially for women & underprivileged section of society.
- Improved sanitation facilities in the project area.
- Setting up of appropriate institutional mechanism for sustainable operation and maintenance of the facilities for ensuring desired level of service delivery, in line with state water policy and state wide, sector wide reform agenda. In fact, implementation of the multi village multi town drinking water project for Bhilwara would help in fast tracing the reform presses not only in Bhilwara but also in the entire state.
- To solve the drinking water problem in project area, it has been proposed to bring water from Chambal River, as a sustainable source of water. Proposed location of source is near Bhainsroadgarh, on upstream of Jawahar Sagar Dam.

Project Location

The district has an area of 10,455 km², and a population of 2,009,516 (2001 census), which increased 26.14% from 1991 to 2001. The district is divided into 4 sub-divisions namely Bhilwara, Gulabpura, Mandalgarh and Shahpura and comprises of 12 tehsils & 11 blocks. Bhilwara is known for its textile Industries, It is bounded on the north by Ajmer District, on the east by Bundi District, on the south by Chittaurgarh District, and on the west by Rajsamand District. State Highway (Jaipur-Udaipur) passes through the district, as does a meter gauge railway line measuring 84 km and connecting Ajmer with Khandwa in Madhya Pradesh. The nearest airport is at Udaipur (171 km). The total length of the district from west to east is 144 while the breadth from North to south is 104 km approximately.

Need of the Project

The main sources of water for the city are Meja dam, tube wells in upstream side of the dam and tube wells in Kankroliya Ghati area. Although, the capacity of the dam is 3000 mcft but rarely sufficient water came in the dam in last 15 years. Therefore, city faced scarcity of drinking water . Even since year 1999 to 2004, water supply was at the interval of 96 hours and this year also the same situation has arises due to negligible inflow of water in the dam and water supply is only @ 42 lpcd at interval of 120 hours. Every year water transportation is required to provide drinking water in the town.

To mitigate the problem, alternative sources such as tube wells, open wells and surface water of Guwardi dam were developed in the vicinity of 20 kms from the city under various contingency works during last 7-8 years but same could note be proved sustainable.
Bhilwara city has been a good centre for industrial growth in 80s and early 90s but due to regular scarcity of water and excessive exploitation of ground water, not only existing industries are facing water crisis but further industrial growth has stopped for want of water in spite of other supporting factors for their development.

Other Urban Towns and Rural Area of District :

There are 8 other urban towns in the district out of which in Gangapur water is being supplied at interval of 72 to 120 hours, in Asind, Gulabpura, Mandal, Jahzjpur Mandalgarh and Shahpura at interval of 48 hours and in Bijoliya at interval of 24 hours. These all towns are not having sustainable sources and facing water crisis every year. Similarly, there are around 1688 villages in the district out of which most of the villages are either having quantity or quality problem and every year water is made available by road transportation in summer seasons specially in tehsils namely Asind, Raipur, Sahara, Bhilwara, Mandal, Banera, Hurda, Kotari and Shahpura.

Looking to the scarcity of water, Quality & Quantity problem in villages, transportation of water every year in Bhilwara town, 8 other Urban Towns & 1688 villages of Bhilwara District, water supply project from a sustainable source, i.e Chambal River, only perennial river in Rajasthan, has been proposed for the permanent solution of the problem.

Ultimate design population & water demand for the project has been calculated for the year 2045 i.e. for 30 year design period. Considering year December 2014 as commission period, project components for Intermediate demand of 15 years are proposed for year 2030 & that for 30 year are proposed for year 2045. Sizing of different components of the project has been taken as under :

✓ Intake pumping station	: Land acquisition, Civil work for 2045 : EMI work for 2030
✓ Raw Water rising main	: Pipe Line for 2045
✓ Water Treatment Plant	: 245 MLD for demand of Year 2030, with provision of future extension for year 2045
✓ Raw Water Intermediate Pumping Station	: Land acquisition, Civil work for 2045 : EMI work for 2030
✓ Raw Water & Clear Water Reservoirs	: 2 hour storage capacity for the demand of year 2030
✓ Clear Water Gravity mains	: For the design demand of year 2030.
✓ Elevated service reservoirs	: Service reservoirs for the demand of 2030.
✓ Clear Water Rising main to ESRs	: DI pipe line for the demand of year 2030.
✓ Distribution net work in Bhilwara	:90mm to 280mm HDPE PN-6 Pipe line for improvement in distribution network.
✓ Land acquisition, right of way permission, Road crossings, Railway line crossings, Forest Clearance	: To be taken as per requirement for ultimate design period to accommodate future parallel line, Pump Houses, Reservoirs etc.
✓ Cross drainage works like High level bridges, Culverts etc.	: For the requirement of ultimate design period. Shall be constructed in such a way to accommodate future parallel line.

Project Design Concept

Present proposals are framed for transmission system up to Bhilwara for demand of Bhilwara town, eight other urban town and 1688 villages of Bhilwara district & 25 en-route villages of Bundi district. In these proposals, project components, like Civil work for Intake Well, Land acquisition, right of way permission, Road crossings, Railway line crossings, Forest Clearance, Cross drainage works like High level bridges, Culverts etc has been proposed for ultimate design period of 30 year i.e. year 2045 for the demand of Integrated Chambal Bhilwara Water Supply & sanitation Project. All other components of the project including EMI work in intake pumping station, WTP, raw water main up to intermediate pumping station, raw water reservoir, intermediate pumping station, clear water gravity main up to Bhilwara are designed to meet out the intermediate demand of year 2030 for the integrated project. Clear water pump house, clear water rising main, storage system & distribution network etc. for the Bhilwara town are proposed for the intermediate design demand of year 2030 for the demand of Bhilwara town only. After 2030, parallel pipe lines would be laid, however certain civil works like cross drainage works, land acquisition, forest clearance,

right of way permission etc. are designed for ultimate demand of year 2045. The raw water transmission main has been checked for the ultimate demand of year 2045 and the required size is adequate for it.

Proposed Components for Main Transmission System

Intake Pumping Station

The proposed intake structure is planned on the downstream of the Rawatbhata Dam and upstream of Jawaharsagar dam, near Bhainsroadgarh village of Chittaurgarh district. From the proposed intake pumping station, raw water would be pumped to proposed IPS Bhunjar Khurd situated at about 17.13 km from the intake pumping station. The civil work of intake structure is proposed for ultimate design requirement. The pumps will be installed for 2030 demand of the project. It is proposed to install 6 working + 3 stand by Vertical Turbine pump sets for pumping of raw water, and accordingly electromechanical works in the Intake Pumping station are proposed. Duty condition of proposed pumps would be 1945 cum/hr 111m head. The river at the location flows in a broad valley about 300 m in width. Selected Site for intake lies about 100 m downstream of the Chambal road bridge. As the river is regulated at the Jawahar Sagar which is situated further downstream for hydro generation the maximum variation in river water levels at the site during fair weather is about 2.5 m, controlled FRL and MDDL at the dam are respectively 298.75 m and 296.25 m. Suitable surge protection devices shall also be provided near pumping stations

Raw Water Transmission Main

The proposed Water treatment Plant is planned to be located at about 48.18 km away from the Intake Pumping Station. Due the much length of pipe line and level difference of more than 250m, between Intake & proposed site of WTP, is proposed to construct an two intermediate raw water pumping station, one at 15.72 km away from Intake Pumping Station and other at 32.52 Km away from Intake PS. Raw water from the intake pumping station would be first collected in sump at IPS and then it would be pumped to second IPS and then WTP, about 16.75 km from IPS. The raw water transmission main is designed for 336 mld for which 1800 mm dia MS pipe line has been proposed. Raw water transmission main has been designed for intermediate demand of the project i.e. for year 2030 and checked for year 2045. Total length of proposed transmission main is 48180 m which will be of MS with internal cement mortar lining and external coating. MS pipe thickness has been designed inconsideration to working pressure & surge pressure in pipe line.

Intermediate Pumping Station

Due the much length of raw water main and level difference of more than 250m, between Intake & proposed site of WTP, it is proposed to construct two intermediate raw water pumping station, 15.72 km away from Intake Pumping Station at Bhunjar Khurd IPS-1 and 35.52 Km away at Tilsva IPS-2. From this IPS-2 raw water shall be pumped to WTP for the urban & rural demand. Civil work of pump house is proposed for 2030 & electro-mechanical works have been proposed for the requirement of year 2030. It is proposed to install 6 working + 3 standby pump set for pumping of Raw water to WTP (duty condition 1945 cum/hr/ 125 m head at IPS-1 and Q=1945 cum/hr, H=58 m at IPS-2). Accordingly, provision for electromechanical works in the IPS has been proposed. Suitable surge protection devices shall also be provided near pumping stations.

Water Treatment Plant

Water Treatment Plant of 245 MLD capacities is proposed. The capacity of WTP is taken as per Clear water demand of urban & rural of Bhilwara district. The plant will be of conventional type with rapid gravity sand filter. The plant will operate for 22 hours per day and will deliver required quality and quantity of treated water.. There is 30 MLD treatment plant is existing in Bhilwara town, which may be used to treat the locally available water.

Raw/ Clear Water Storage Reservoirs

The provision of raw water / clear water reservoirs have been taken at different head works. Storage capacities of clear reservoir is based on 2 hours storage capacity of daily demand for year 2030 while for sump 30 minutes capacity has been proposed. Proposed Capacity of storage reservoirs at different head works is mentioned below;

S.N.	Type Of Reservoir	Location	Capacity in ML
1	Raw Water Reservoir	IPS-1 and 2	5.9
2	Clear Water Reservoir	WTP Location	22.5
3	Clear Water Reservoir	Bhilwara	8.57

Clear Water Gravity/ Rising Main

WTP is proposed to be constructed at location having GL 540M, while GL at Bhilwara is 420 to 445M. Available head at WTP would be utilized and the water would flow under gravity up to Bhilwara. Main gravity line up to Bhilwara is proposed for the demand of year 2030. Clear water for Bhilwara town would be collected in the existing & proposed clear water reservoirs at four different head works in Bhilwara namely Vidhya Niketan, Kishnawato Ki Khedi, Telekheda & Main PHED HW. Clear water rising main from Bhilwara Jn. To Danta Pyara, Danta Pyara to Mandal and Mandal to Haripura Chauraha. Valves will be provided such as Sluice/Butterfly valves, double kinetic air valves, non return valves at required locations on the transmission main. Also anchor blocks, thrust blocks will be provided as required. Based on the design, provision of following pipe line is taken;

S.N`	Particular of Pipe Line	Length in Meters
	MS Pipe Line	
1	1400mm Dia	48600
2	1300mm Dia.	14520
3	1200mm Dia.	9590
4	1000mm Dia.	22150
	DI K-7 Pipe Line	
5	900 MM Dia Pipe Line	20490
6	700 MM Dia Pipe Line	1770
8	500 MM Dia Pipe Line	930

Clear Water Pumping Station

As the WTP is proposed at higher level, clear water from WTP to Bhilwara, would flow under gravity. To pump water from Telekheda PS To Danta Pyara and Danta Pyara to Haripura chaurha pumping station at Danta Pyara and haripura chauraha has been proposed. The provision of clear water pump house at these head works is taken. Area of pump house & electro-mechanical works have been proposed for the requirement of year 2030 with provision for future expansion for 2045 demand. 50% standby arrangement has been considered for pumps to facilitate the operation and maintenance. Suitable surge protection devices will be provided near pumping stations.

Dedicated Power Feeder

It has been proposed to lay about 33KV dedicated power feeder for Intake Pumping Station, Intermediate Pumping station, at WTP Head Works and at all PS from 132KV GSS. It is proposed to lay 33 KV feeders on lattice structure. Provision for construction of 33 KV GSS at these locations has also been taken.

Miscellaneous Provisions

In the project provision of following miscellaneous items has also been taken:

- ✓ Construction of office and officer qts. at Mandalgarh, Rawat Bhatta and Vidhya Niketan has been proposed.
- ✓ Construction of office building at WTP head Works with all fittings & furniture of about 250 sqm area.
- ✓ Campus development at WTP head works, IPS Head Works and CWPS head works at Bhilwara Jn., Danta Pyara and Haripura Chauraha including general grading of the campus, electrification, water supply, sanitation arrangement etc.
- ✓ Construction of Boundary wall, around Head work at WTP, IPS Head Works and CWPS head works at Bhilwara Jn., Danta Pyara and Haripura Chauraha
- ✓ Construction of RCC Approach road in WTP Campus, IPS Head Works and CWPS head works at Bhilwara Jn., Danta Pyara and Haripura Chauraha
- ✓ Land acquisition & forest clearance for construction of different head works, laying of Pipe line etc.
- ✓ Provision for detail survey, soil investigation,design & drawing,.
- ✓ Provision for National Highway Crossings, Road Crossings, Railway Line Crossings etc.
- ✓ PLS-SACDA & voice communication system.