



**GOVT. OF MADHYA PRADESH**

***NAGAR PALIKA PARISHAD***

***BHIND***



***Atal Mission for Rejuvenation  
and Urban Transformation***

***BHIND TOWN***

***DETAIL PROJECT REPORT***

***for***

***SEWERAGE PROJECT***



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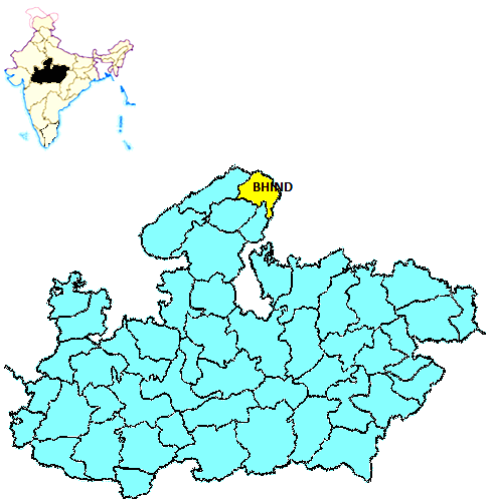
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# 1 Executive Summary

## 2.1 City Profile

Bhind District is a district of Madhya Pradesh situated in central India of Chambal division. The town of Bhind is the district headquarters. Bhind District is situated in Chambal region in the northwest of the state. This district of Madhya Pradesh is geographically known for its Ravines, Fertile land and dense Forests. Formerly there were 4 Tehsils viz; Bhind, Mehgoan, Gohad and Lahar but at Present there are 8 Tehsils viz; Bhind, Ater, Mehgaon, Gohad, Mihona, Lahar, Gormi and Raun. As per the History, the District is named after the Bhindi Rishi (Sage Bhindi). The entire District lies in the Chambal valley. It forms the south western part of Ganga Valley. The Hills are only a few, small and isolated, mostly in the south west. It is only in the Bhind Tehsil that the rivers flow towards east. The topology of Bhind is the topography of the valley plains. The plains at present are closely cultivated fields devoid of trees, stubbed with shrubby growth only along the moist hollows, and thickly populated. The only divisions of topography are offered by the network of rivers with deep channels and steep bank.



## **2.2 About the City**

The shape of the district is semi circular, bulging towards the north east. The District is bounded by Agra and Etawa districts of Uttar Pradesh in the north and Gwalior and Datia districts in the south. The eastern boundary is closed by the districts of Etawah, Auraiya and Jalaun of Uttar Pradesh in the east, where as the western and north western boundaries are common with Morena district. The north western boundary is marked by the Asan and the Kunwari rivers, the northern and eastern boundaries being traversed by the Chambal and the Pahuj.

The soil of Bhind is very fertile and is drained by the Chambal, Kali Sind, Kunwari or Kwari, Pahuj and Baisali rivers and by an extensive canal system. Formerly there were four tehsils, Bhind, Mehgaon, Gohad and Lahar, but at present there are seven tehsils: Bhind, Ater, Mehgaon, Gohad, Lahar, Mihona, and Raun. The district is part of the Chambal Division.

There are 39 Municipal wards in Bhind town. The municipal area of the Bhind town was 1878 Hectare (18.78 SqKm) and Proposed area in Phase-1st in 290 Hectare (2.90 SqKm).

Bhind Nagar Palika Parishad has taken up the work of providing sewerage network in the whole town, as all the area outside of ward boundary under sanitation facility. Presently effluents from toilets as well as sullage water is flowing through open drains and discharged at various places into low-lying areas, which is creating unsanitary conditions. Therefore for maintaining healthy environment as well as for aesthetics conditions, it is essential to collect and carry this wastewater away from the town and dispose it off after treatment.

The proposed project aims to provide a comprehensive wastewater collection, treatment & disposal system using laterals, branches and trunk mains including punping stations and sewage treatment plant for Bhind town.

## **A. Comprehensive DPR of Town:**

For Sewerage Project of Bhind Town, an Comprehensive DPR was prepared by Nagar Palika Parishad Bhind. The details are mentioned below:

- The town has been divided in 5 Zones.
- City Population:           As per Census (2011)       :       197785 Souls  
  Present Population (2018) :       227140 Souls  
  Intermediate Population (2033): 298780 Souls  
  Designed Population (2048) :     381740 Souls
- Area                        :       1878 Hectare (18.78 SqKm)
- Household                :       63624 Souls
- Comprehensive Project Cost       :       368.65 Cr. with 10 Year O&M

## **B. Phase-1st of BhindTown:**

The details are mentioned below:

- Covered Zones:           Zone-1 & Zone-5
- City Population:           As per Census (2011)       :       71792 Souls  
  Present Population (2018) :       81510 Souls  
  Intermediate Population (2033): 103730 Souls  
  Designed Population (2048) :     129021 Souls
- Area                        :       290 Hectare (2.90 SqKm)
- Household                :       13585 Souls
- Phase-1st Project Cost       :       70.80 Cr. without O&M

## ***2.3 Location and Regions Setting***

Bhind is the Northernmost District of Madhya Pradesh, north east of Gwalior, situated at 26°34'50" latitude and 78°48'05" longitude. The district lies in the valleys of Chambal and the Sind, between the Kunwari and the Pahuj rivers. The district spans from 25°54'5" North to 26°47'50" North and from 78°12'45" East to 79°8'30" 79°8'30" East.

## ***2.4 Linkage and Connectivity***

Bhind is well connected by Train as well as by Bus route. Road transport is the main mode of transportation in Bhind. Main link Road of Bhind is Etawah Gwalior State Highways which connects with MP and UP states.

The railway line connects Bhind with Gwalior. This line was constructed by the erstwhile Gwalior State and opened on 3rd December 1899. The Gwalior light Railway (later known as Scindhia State railway) was worked by the Great Indian Peninsula Railway Company upto 30th June 1913, after which was taken by the Gwalior Durbar. The line was Comprehensive into Central Railway on 5th November 1951.

## **2.5 Existing Sewerage System**

There is no proper wastewater related infrastructure for collection, treatment and disposal of sewage of the town. Raw sewage is mostly been disposed directly into the existing open municipal drains except a few thousand population which is covered by private septic tanks disposing off their effluent in the same existing open drains. Besides this, there are localities which have no drains at all and their Waste Water is being disposed in the adjoining open land or spreads all along the narrow lanes leading to unhygienic & sanitation conditions to the town population.

## **2.6 Field Investigations**

Before preparing these proposals, the following detailed survey work has been carried out;

### **Topographical surveys**

- Topographical survey of the town.
- Leveling with auto level survey instrument of complete Municipal boundary area of Bhind.
- Details of existing sewerage/drainage pattern
- Fixing of bench marks.
- Topographical Survey of STP Land.

### **Survey of Wards**

- Total no of Houses
- Ward wise population projections
- Area and Density of ward

## 2.7 Projected Population

The Zone wise projected population covered in Phase-1st of Bhind town is as below;

Zone No.	Area (SqKm)	Census Population of Year	Projected Population of Year	Projected Population of Year	Projected Population of Year	Sewer Length
		2011	2018	2033	2048	
Z-1	2.06	40062	45664	59660	79546	81789
Z-5	0.84	31730	35846	44070	49475	23863
<b>Total</b>	<b>2.90</b>	<b>71792</b>	<b>81510</b>	<b>103730</b>	<b>129021</b>	<b>105652</b>

The Zone wise projected population for Whole town is as below;

Zone No	Area in SqKm	Census Population of Year	Projected Population of Year	Projected Population of Year	Projected Population of Year	Length of Sewer (Mtr)
		2011	2018	2033	2048	
Z-1	6.46	83234	95600	129089	180671	121347
Z-2	2.06	26615	30251	38948	46804	45305
Z-3	3.61	20942	23790	30086	33643	49179
Z-4	1.73	13056	15394	21591	29193	31003
Z-5	4.92	53738	62105	79066	91429	63475
<b>Total</b>	<b>18.78</b>	<b>197585</b>	<b>227140</b>	<b>298780</b>	<b>381740</b>	<b>310309</b>

## 2.8 Proposed Sewerage Scheme of Bhind Town

There is no sewerage system or treatment and dispose of sewage in this part of town. Raw sewage is mostly been disposed directly into the existing open Municipal drains except a few houses which are covered by private septic tanks. Proposed project is designed to collect the sewage water from the houses and carry it to a suitable place for providing desired treatment before the waste water being finally being disposed off to low-lying area or reused for the purposes like irrigation, gardening, firefighting, Industrial & institutional supply or ground water recharge etc.



The proposed project aims to provide a comprehensive wastewater collection, treatment & disposal system using laterals, branches and trunk mains including sewage treatment plant for Bhind town. This project has been prepared for the design population of the town living in the area which is under Municipal Council jurisdiction for public amenities. The design population for this area has been projected as 381740 for design year.

Looking to the topography, construction scheduling and development trend the total area is divided in 5 zones. It is proposed to construct a comprehensive sewerage system for this area and also identify a proper site for STP and final disposal of the treated effluent which is proposed to be treated at STPs based on SBR Technology have been provided for treatment of sewage. The STP technology is being selected primarily taking into consideration less land requirement and to have effluent characteristics as per MOEF/ CPHEEO, so that treated water can be reuse or discharged into inland water ways which are being potential drinking water sources. The land available for STP is sufficient for ultimate design flow.

STP-1 of 12.0 MLD based on SBR technology has been proposed under Phase-1st Nearby Nallah on Chathar Road in Zone-5. To avoid deep excavation, one sewage pumping station of 7.0 MLD has been proposed under Phase-1st near Gauri Lake in Zone-1 of town.

As per the decentralised guidelines there are four STPs based on SBR technology have been proposed in town. STP-1 of 31.0 MLD has been proposed in Nearby Nallah on Chathar Road in Zone-5, STP-2 of 5.5 MLD has been proposed on Lahar road in Zone-2, STP-3 of 4.0 MLD has been proposed nearby nallah & MP forest planning & nursurey in Zone-3 and STP-4 of 3.5 MLD has been proposed on Bharoli road in Zone-4.

Under the proposed project laterals / Manhole for house connection have also been provided. The designs in this project report has been prepared as per relevant clauses of CPHEEO Manual on Sewerage and Sewage treatment. As far as possible the project has been prepared considering the existing scenario of sewerage system which is mainly through open drains. The data regarding possible sites of STP, Rate of water supply & flow of sewage has been collected from Municipal Council, Bhind.



The future population of town has been worked out as per methods given in CPHEEO Manual on sewerage and sewerage treatment. The probable population obtained by incremental increase method has been considered for the design purpose. Trunk Main & Outfall sewers shall only be provided for the roads having width more than 5 m. The Zones are proposed with combing wards as per topography of the surrounding area. The Municipal Council has prepared a Comprehensive DPR for sewerage project for Bhind town for 30 Years design period of amounting Rs 368.65 Crores including 10 year O&M. As per availability of fund under AMRUT scheme of Gol phasing has been done by Municipal Council and Phase-1st work has been taken under this contract of amounting Rs 70.80 Crores without O&M.

### **For Proposed Works under Phase-1st**

The following various components are included in the project:

- i. Providing, laying & jointing of RCC NP-4 & DWC-HDPE sewer pipeline for lateral, branch and trunk mains as per design.

Dia / Zone	Zone-1	Zone-5	TOTAL	Type of Pipe
170mm	73600	19252	92852	DWC-HDPE
250mm	4068	455	4523	DWC-HDPE
300mm	1317	71	1388	RCC NP-4
350mm	223		223	RCC NP-4
400mm	389	235	624	DWC-HDPE
450mm	538	727	1265	RCC NP-4
500mm		1028	1028	RCC NP-4
600mm	1279	1023	2302	RCC NP-4
700mm		434	434	RCC NP-4
800mm	355	317	672	RCC NP-4
900mm	20	321	341	RCC NP-4
Total	81789	23863	105652	

- ii. Construction of 4084 nos of circular manhole of various sizes on the sewer lines including ISI marked reinforced concrete heavy duty cover complete.
- iii. Construction of House hold connection with road gully chamber of brick masanory inside dimension 500 x 450 mm dia 60 cm deep for single pipe including providing and fixing of 135 / 160 mm DWC HDPE pipe with road

restoration as per unit estimate. Two house hold connection will be connected to one property connection chamber.

- iv. The Sewerage network propose to be created under this project shall be Comprehensive with 12.0 MLD STP nearby nallah on Chathar road based on SBR technology.

STP	Capacity in MLD (2033)	Capacity in MLD (2048)	Location of STP	Node & Zone No at STP	Incoming Sewer Dia at STP	IL at STP	GL at STP
STP-1	12.0	31.0	Nearby Nallah on Chathar Road	N-974, Zone-5	900 mm	143.06	149.40

- v. Construction of 1 no SPS (7.0 MLD) near Gauri Lake.

SPS	Capacity in MLD (2033)	Capacity in MLD (2048)	Location of SPS	Node & Zone No at SPS	Incoming Sewer Dia at SPS	IL at SPS	GL at SPS
SPS-1	6.5 MLD	21.0 MLD	Near Gauri Lake	N-77150, Zone-1	900 mm	143.37	149.81

- vi. Reuse of sewerage water : Construction of treated water over head reservoir, Chlorination cum treated water reservoir (UGR) along with providing and installation of pumps for pumping & Providing, Laying and Jointing of 110 mm diameter PVC pipes for treated sewage water to be reused in green space within Municipal Council.
- vii. Cutting & repairing of existing roads damaged during execution of sewer line work.
- viii. Provision for restoration of underground utilities i.e. Water supply pipe line and service connection etc.

## **For Proposed Works as per Comprehensive Sewerage Project**

The following various components are included in the project:

- i. Providing, laying & jointing of RCC NP-4 & DWC-HDPE sewer pipeline for lateral, branch and trunk mains as per design.

Dia / Zone	Zone-1	Zone-2	Zone-3	Zone-4	Zone-5	TOTAL	Type of Pipe
170mm	107974	40605	46134	28402	54909	278024	DWC-HDPE
250mm	6615	1067	1431	476	1795	11384	DWC-HDPE
300mm	2384	409	916	189	1184	5082	RCC NP-4
350mm	1089	310	221	359	706	2685	RCC NP-4
400mm	872	459		183	279	1793	DWC-HDPE
450mm	589		196	1394	1263	3442	RCC NP-4
500mm	170	819			1244	2233	RCC NP-4
600mm	1279	1636	281		1023	4219	RCC NP-4
700mm					434	434	RCC NP-4
800mm	355				317	672	RCC NP-4
900mm	20				321	341	RCC NP-4
Total	121347	45305	49179	31003	63475	310309	

- ii. Construction of 20329 nos of circular manhole of various sizes on the sewer lines including ISI marked reinforced concrete heavy duty cover complete.
- iii. Construction of House hold connection with road gully chamber of brick masonry inside dimension 500 x 450 mm dia 60 cm deep for single pipe including providing and fixing of 135 / 160 mm DWC HDPE pipe with road restoration as per unit estimate. Two house hold connection will be connected to one property connection chamber.

- iv. The Sewerage network propose to be created under this project shall be Comprehensive with cummulative capacity of 44.0 MLD STP based on SBR technology.

STP	Capacity in MLD (2033)	Capacity in MLD (2048)	Location of STP	Node & Zone No at STP	Incoming Sewer Dia at STP	IL at STP	GL at STP
STP-1	24.0	31.0	Near Krishi College on Chathar Road	N-974, Zone-5	900 mm	143.06	149.40
STP-2	4.50	5.5	on Lahar Road	N-9050, Zone-2	600 mm	142.50	151.96
STP-3	3.5	4.0	Nearby Nallah & MP Forest Planning & Nursery	N-2468, Zone-3	600 mm	144.42	149.90
STP-4	2.5	3.5	on Bharoli Road	N-1109, Zone-4	450 mm	142.79	150.06

- v. Construction of 1 no SPS has been proposed in Overall Bhind Town

SPS	Capacity in MLD (2033)	Capacity in MLD (2048)	Location of STP	Node & Zone No at STP	Incoming Sewer Dia at STP	IL at STP	GL at STP
SPS-1	15.0	21.0	Near Gauri Lake	N-77150, Zone-1	900 mm	143.37	149.81

- vi. Reuse of sewerage water : Construction of treated water over head reservoir, Chlorination cum trated water reservoir (UGR) along with providing and installation of pumps for pumping & Providing, Laying and Jointing of 110 mm diameter PVC pipes for treated sewage water to be reused in green space within Municipal Council.
- vii. Cutting & repairing of existing roads damaged during execution of sewer line work.
- viii. Provision for restoration of underground utilities i.e. Water supply pipe line and service connection etc.

## 2.9 Design Parameters for Proposed Sewer line works

Description	Design Parameter
The Design period	30 Years as per CPHEEO Manual
Sewage Contribution	80 % water supply including Kitchen waste 135 LPCD
Population Forecast	As per survey of proposed area & forecast proposed
Ground Water Infiltration	a minimum infiltration flow i.e. 5% of flow has been considered in the design
Hydraulic Formula	Manning's formula has been adopted in design. It is suggested by Manual & is best for gravity flow in channels/pipes
Peak Factor	PF as per manual is followed.
Depth of Flow in pipes	Not exceeding 0.8 full at ultimate peak flow
Self-Cleaning Velocity	Not less than 0.8 m/sec for peak flow but in initial stretches the minimum velocity cannot be achieved in design. Therefore flushing system as CPHEEO Manual has been proposed in initial reaches, where velocity is less than desired.
Maximum Scouring Velocity	Restricted to 3 meters per second
House Sewer Connections	Provision of house connection for collection of waste water has been proposed from property line to manhole by HDPF DWC pipe.
Design calculation	On Excel computer sheet as per CPHEEO manual procedure.
Selection of Sewer Slopes	Guide line of CPHEEO Manuals, has been followed
Manholes	The provisions of manholes has been proposed as per guide lines given in CPHEEO Manual

Description	Design Parameter
Drop Arrangement	Drop arrangement is proposed where the laterals join the manholes of main sewer and difference between invert levels of incoming and outgoing pipe is greater than 600 mm.
Manholes Construction	Brick masonry manholes shall be constructed in brick masonry in cm (1:4) and plastered from both sides in 1:3 CM.
Covers and Frames	The covers for circular manholes shall be with clear opening not less than 560mm. The manhole covers of pre-cast / Ferro-concrete are suitable to withstand heavy traffic loads as per IS standard.
Selection of Minimum Pipe Size	Sizes of the pipe are between 170mm to 900mm. Looking to the smaller size where in-lining is difficult and also corrosive nature of sewage the material of pipelines has been adopted DWC/HDPE SN 8.0 / RCC NP-4 class pipe and minimum pipe size considered is 170mm dia.
Pipe Material	DWC/HDPE / RCC NP-4 class pipes for sewer lines with granular bedding are proposed. From 170mm, 250mm & 400mm size, DWC/HDPE pipe has been proposed. For pipes 300mm, 350mm & above 450 mm dia of sewer line has been proposed with RCC NP-4 Class Pipes. 135/160mm diameter DWC/HDPE pipe has been proposed for property connection.
Structural Design of Sewers	<p>The structural design of sewers will be done in accordance with the guideline provided in the manual of sewerage and sewage treatment and in accordance with IS Code 4127-1967, 783-1959.</p> <p>The load over pipe will be calculated of refilling material both under trench and culvert condition. If the load calculated by use of trench formula is more than the load</p>

Description	Design Parameter
	calculated by the culvert formula, the latter will be taken as the load on the pipe in trench due to filling material. Load imposed where necessary, on the pipe due to surface load has been considered, depending upon the class of wheel load. Care will be taken to see that the field loads on the pipe leave a factor of safety of 1.5 over its corresponding supporting strength. If the worst combination of a field loading on the pipe is achieved, then it is assumed that the supporting strength of the pipe shall leave a factor of safety of 1.5. RCC pipes of class NP4 & DWC-HDPE will be selected as suggested in the above criteria.
Construction of sewer	Construction of sewer is proposed as per Manual.
Geology of the project area	The general water table is 20 - 25 mtr. Below the general ground level but at some locations near out fall, water table may be varied.
Maintenance of sewer network	The sewer network proposed to be laid shall be maintained by the contractor for 10 years and 1 year defect liability period.
Schedule of Rates	The rates for estimates in general are as per MP UADD ISSR in force from 10th May, 2012

## **2.10 Construction of STP**

### **Need of the Sewage Treatment Project**

Construction of STP at the end of collection and conveyance system is very essential. Large quantity of untreated sewage if discharged into surface water body, may grossly pollute it, endangering the health of downstream users. Wastewater after secondary treatment can be disposed of into surface water body and with proper precaution can be used in agriculture. As per the prevailing water polluting



laws also, discharge of wastewater not conforming to prescribed standards is not permissible.

Construction of treated water over head reservoir & Chlorination cum treated water reservoir (UGR) has been proposed to store the treated water for use of irrigation purpose in nearby agricultural land, through which effluent can be used for irrigation purpose. Reuse of effluent in irrigation will add in the revenue of the Bhind Municipal Council. During rainy season remaining effluent will be disposed off in nearby low lying area / nalla.

### Location of Treatment Plant

The Outfall sewer shall terminate at inlet chamber of STPs. Proposed STPs site area has been surveyed along with Municipal for assessing the availability of adequate area. This land is suitable for establishing the proposed STPs & future expansion. The area available shall be adequate for the proposed STP as well as for the expansions till design period.

STPs has been proposed for Comprehensive Sewerage Project:

STP	Capacity in MLD (2033)	Capacity in MLD (2048)	Location of STP	Node & Zone No at STP	Incoming Sewer Dia at STP	IL at STP	GL at STP
STP-1	24.0	31.0	Near Krishi College on Chathar Road	N-974, Z-5	900 mm	143.06	149.40
STP-2	4.50	5.5	on Lahar Road	N-9050, Z-2	600 mm	142.50	151.96
STP-3	3.5	4.0	Nearby Nallah & MP Forest Planning & Nursery	N-2468, Z-3	600 mm	144.42	149.90
STP-4	2.5	3.5	on Bharoli Road	N-1109, Z-4	450 mm	142.79	150.06

STP-1 has been proposed under Phase-1st:

STP	Capacity in MLD (2033)	Capacity in MLD (2048)	Location of STP	Node & Zone No at STP	Incoming Sewer Dia at STP	IL at STP	GL at STP
STP-1	12.0	31.0	Nearby Nallah on Chathar Road	N-974, Zone-5	900 mm	143.06	149.40

## Criteria for selection of the Process

The selection of process for STP has been done on the basis of following criteria.

1. Ease of construction
2. Ease of operation and maintenance
3. Simplicity of system (minimum equipment)
4. Trouble free service
5. Reliability of process
  - i. Well established design criteria
  - ii. Proven process worldwide
  - iii. Ability to absorb shock loads (Hydraulic / Organic)
6. Need for skilled / unskilled staff required for O&M
7. Presence / absence of nuisance potential from mosquito / fly / odour.
8. Ease of access to components of the system for repairs and maintenance.
9. Safety / Hazardous conditions at the plant.

As we understand that main component of operation & running cost of STP is power bill payment. During digestion of sludge in anaerobic digesters bio-gases are formed which can be used for power generation. This will make the STP self sustainable for O&M. As per present Indian practices, the STP having capacity more than 20 MLD, the power generation units are considered viable & are operationally feasible. Therefore, units for power generation in STP are not proposed.

Being Municipal waste, the indicative raw sewage characteristic has been considered in design is as below:-

Design parameter	Value for design purpose
5 days BOD at 20 degree C temp	300 mg/lit
COD	650 mg/lit
TSS	650 mg/lit
pH	6-9
TKN	55 mg/lit
TP	6 mg/lit
Flow	12.0 MLD average flow Peak Flow- 27.0 MLD

## Recommended Process

12.0 MLD STP-1 in Phase-1st having cumulative capacity 31.0 MLD STP-1 based on Sequential Batch Reactor technology (SBR) has been proposed. This process has been found suitable for Bhind town, but it is recommended to keep the technology open during bidding process and to be evaluated based on power consumption, O&M, reuse of effluent and solid liquid and gaseous product at intermediate/ end stage of treatment, land required and capital cost.

### 2.11 Re-use of treated sewage

Construction of treated water over head reservoir, Chlorination cum treated water reservoir (UGR) along with providing and installation of pumps for pumping & Providing, Laying and Jointing of 110 mm diameter PVC pipes for treated sewage water to be reused in green space within Municipal Council. The parameters of the treated water shall be as below,

Parameter	Maximum Allowed Concentration (MAC)
BOD	10 mg/l
COD	50 mg/l
TSS	10 mg/l
Fecal Coliform	230 MPN/100 ml
Total Nitrogen as N	10 mg/l
Ammonia Nitrogen as N	2 mg/l
Total Phosphorus as P	2 mg/l

The ULB shall explore the possible applications for the re-use treated sewage water other than drinking purposes. The re-use of treated water shall render,

- Optimum use of potable water.
- Maintaining the quality of treated water because the end user shall demand the desired parameters.
- The planned disposal shall ensure no water logging in the disposal channels.

Accordingly ULB can supply the treated water for following applications,

1. The treated water can be supplied to the industrial units for process management like boilers, tanning, bleaching, dyeing, washing etc. Here it is to be ensured that the end product should not be used for edible purposes. For supplying water for industrial purpose a firm policy at the level of State Government is required.
2. Treated water can be used for firefighting. For this stand-posts has to be provided at Sewage treatment plant. The fire tankers can take the water as and when required from these stand posts. As per the CPHEEO manual the fire fighting demand of the town is  $100\sqrt{p}$ .
3. The treated water can also be used for other community purposes like gardening of green spaces, gardens, plantation along the road side. In the recent AMRUT program of Government of India there is a special emphasis on the increasing of green cover in urban centers.
4. The treated water can be used for recharging of water bodies situated within Municipal Area. For this the water can be supplied to these water bodies which otherwise go dry after a certain period in a year.
5. The treated water can be supplied for the agricultural purposes and ground water recharging.

As per the above the treated water shall be reused resulting in optimum usage of treated water. Also this will strengthen the financial viability of the project by enabling additional revenue to Municipal Council, by sale of treated water. An assessment in this regard should be done and appended.

## 2.12 Design Parameters of STP

Description	Design Parameter																
Design period	The sewerage system is designed for a period of 30 years. Outfall sewer is proposed to meet the sewage flows expected in the year 2048. Hence the proposed treatment plant has also been designed to meet the requirements of year 2048.																
Quantity of sewage flow	Proposed 31.0 MLD STP-1, out of which 12.0 MLD STP-1 proposed in Phase-1st, 5.5 MLD STP-2 in Phase-2nd, 4.0 MLD STP-3 in Phase-2nd and 3.5 MLD STP-4 in Phase-2nd for design Year.																
Design base of STP	"MANUAL ON SEWERAGE AND SEWAGE TREATMENT Published by Central Public Health Engineering and Environment Organization, Ministry of Urban Development , New Delhi has been followed.																
Peak to average flow ratio	1:2.25, i.e. at peak flow the quantity arriving at STP-1 shall be 12.0 MLD (Phase-1st) average and 27.0 MLD peak flow.																
Average Flow	12000 M3/day in present Phase-1st																
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Process of Sewage Treatment Plant	Sequential Batch Reactor Process Technology. (Any other technology meeting the effluent criteria on enviro- techno																

Description	Design Parameter																
	economical feasibility basis).																
Line of Treatment	<p>Method of treatment of sewage is fairly standardized and the CPHEEO Manual describes various processes and their design criteria that may be adopted while designing a STP. Accordingly the treatment process may be divided in to three parts</p> <p><b>Primary Treatment</b></p> <p>Screens: – Coarse and fine screens, grit separator to remove suspended particulate matter. Primary settling Tanks to reduce the load on secondary treatment.</p> <p><b>Secondary Treatment</b></p> <p>Consisting of Sequential batch reactor (SBR).</p> <p><b>Sludge Treatment</b></p> <p>In SBR process the raw sewage is directly taken in SBR reactor for treatment. Provision of primary tanks has been taken to remove primary sludge. Digested sludge from primary settling tank and secondary sludge will be digested in digester and bio gas generated there will be used for running engine to generate power. Digested excess sludge will be dried /thickened on filter press. The dried/ thickened sludge may be utilized as manure otherwise may be disposed off in land fill site.</p>																
Treated Effluent Water Quality	<p>The treated effluent from the STP must conform to effluent quality standards as detailed below:</p> <table border="1" data-bbox="571 1552 1430 2027"> <thead> <tr> <th data-bbox="571 1552 943 1637"><i>Parameter</i></th> <th data-bbox="943 1552 1430 1637"><i>Maximum Allowed Concentration (MAC)</i></th> </tr> </thead> <tbody> <tr> <td data-bbox="571 1637 943 1693"><i>COD</i></td> <td data-bbox="943 1637 1430 1693"><i>50 mg/l</i></td> </tr> <tr> <td data-bbox="571 1693 943 1749"><i>BOD</i></td> <td data-bbox="943 1693 1430 1749"><i>10 mg/l</i></td> </tr> <tr> <td data-bbox="571 1749 943 1805"><i>TSS</i></td> <td data-bbox="943 1749 1430 1805"><i>10 mg/l</i></td> </tr> <tr> <td data-bbox="571 1805 943 1861"><i>Fecal Coliform</i></td> <td data-bbox="943 1805 1430 1861"><i>230 MPN/100 ml</i></td> </tr> <tr> <td data-bbox="571 1861 943 1917"><i>Total Nitrogen as N</i></td> <td data-bbox="943 1861 1430 1917"><i>10 mg/l</i></td> </tr> <tr> <td data-bbox="571 1917 943 1973"><i>Ammonia Nitrogen as N</i></td> <td data-bbox="943 1917 1430 1973"><i>2 mg/l</i></td> </tr> <tr> <td data-bbox="571 1973 943 2027"><i>Total Phosphorus as P</i></td> <td data-bbox="943 1973 1430 2027"><i>2 mg/l</i></td> </tr> </tbody> </table>	<i>Parameter</i>	<i>Maximum Allowed Concentration (MAC)</i>	<i>COD</i>	<i>50 mg/l</i>	<i>BOD</i>	<i>10 mg/l</i>	<i>TSS</i>	<i>10 mg/l</i>	<i>Fecal Coliform</i>	<i>230 MPN/100 ml</i>	<i>Total Nitrogen as N</i>	<i>10 mg/l</i>	<i>Ammonia Nitrogen as N</i>	<i>2 mg/l</i>	<i>Total Phosphorus as P</i>	<i>2 mg/l</i>
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Description	Design Parameter
Other Facilities to be provided at STP	<ul style="list-style-type: none"> <li>➤ Programmable Logical Controller (PLC)</li> <li>➤ Laboratory</li> <li>➤ Security room</li> <li>➤ PMCC room</li> <li>➤ Control room</li> <li>➤ Rest room</li> <li>➤ Workshop cum store</li> <li>➤ Open store yard</li> <li>➤ Covered vehicle park</li> <li>➤ Land- Scaping</li> <li>➤ Road network and street lighting</li> <li>➤ Electrical works</li> <li>➤ Pantry and facilities</li> <li>➤ Tube well for drinking water</li> </ul>
O&M	It has been proposed for 10 years of Operation and Maintenance to be included in the tender documents.
Completion period	24 months from the award of contract.



## 2 Price Break-Up Schedule (Phase-1st) Proposed under this contract.

S. No.	Name of the work Commissioning & Performance	Pro-rata Share %																																																				
1.0	<p>Work of Providing, Laying &amp; Jointing including Testing, Commissioning &amp; Trial run of 170 mm to 900 mm Diameter DWC HDPE/NP4 class pipe and as per IS 14333:1996 having total length <b>105652.00</b> m long with suitable joint including testing of joints, cost of pipes and jointing material complete with up to date amendments, Bedding, Barricading, Utility Shifting and Timbering Works.</p> <table border="1" style="width: 100%; margin: 10px auto; border-collapse: collapse;"> <thead> <tr> <th style="text-align: center;">Diameter (mm)</th> <th style="text-align: center;">Length (m)</th> <th style="text-align: center;">Cost / m</th> <th style="text-align: center;">Material</th> </tr> </thead> <tbody> <tr><td style="text-align: center;">170 mm</td><td style="text-align: right;">92852.00</td><td style="text-align: right;">298.00</td><td style="text-align: center;">DWC HDPE</td></tr> <tr><td style="text-align: center;">250 mm</td><td style="text-align: right;">4523.00</td><td style="text-align: right;">767.00</td><td style="text-align: center;">DWC HDPE</td></tr> <tr><td style="text-align: center;">300 mm</td><td style="text-align: right;">1388.00</td><td style="text-align: right;">958.00</td><td style="text-align: center;">RCC NP-4</td></tr> <tr><td style="text-align: center;">350 mm</td><td style="text-align: right;">223.00</td><td style="text-align: right;">1717.00</td><td style="text-align: center;">RCC NP-4</td></tr> <tr><td style="text-align: center;">400 mm</td><td style="text-align: right;">624.00</td><td style="text-align: right;">1524.00</td><td style="text-align: center;">DWC HDPE</td></tr> <tr><td style="text-align: center;">450 mm</td><td style="text-align: right;">1265.00</td><td style="text-align: right;">2248.00</td><td style="text-align: center;">RCC NP-4</td></tr> <tr><td style="text-align: center;">500 mm</td><td style="text-align: right;">1028.00</td><td style="text-align: right;">2494.00</td><td style="text-align: center;">RCC NP-4</td></tr> <tr><td style="text-align: center;">600 mm</td><td style="text-align: right;">2302.00</td><td style="text-align: right;">3512.00</td><td style="text-align: center;">RCC NP-4</td></tr> <tr><td style="text-align: center;">700 mm</td><td style="text-align: right;">434.00</td><td style="text-align: right;">4227.00</td><td style="text-align: center;">RCC NP-4</td></tr> <tr><td style="text-align: center;">800 mm</td><td style="text-align: right;">672.00</td><td style="text-align: right;">5440.00</td><td style="text-align: center;">RCC NP-4</td></tr> <tr><td style="text-align: center;">900 mm</td><td style="text-align: right;">341.00</td><td style="text-align: right;">6633.00</td><td style="text-align: center;">RCC NP-4</td></tr> <tr> <td style="text-align: center;"><b>Total</b></td> <td style="text-align: right;"><b>105652.00</b></td> <td></td> <td></td> </tr> </tbody> </table>	Diameter (mm)	Length (m)	Cost / m	Material	170 mm	92852.00	298.00	DWC HDPE	250 mm	4523.00	767.00	DWC HDPE	300 mm	1388.00	958.00	RCC NP-4	350 mm	223.00	1717.00	RCC NP-4	400 mm	624.00	1524.00	DWC HDPE	450 mm	1265.00	2248.00	RCC NP-4	500 mm	1028.00	2494.00	RCC NP-4	600 mm	2302.00	3512.00	RCC NP-4	700 mm	434.00	4227.00	RCC NP-4	800 mm	672.00	5440.00	RCC NP-4	900 mm	341.00	6633.00	RCC NP-4	<b>Total</b>	<b>105652.00</b>			20.70
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2.0	Construction 4084 nos. of circular type manholes (including cost of sewer appurtenances).	11.67																																																				
3.0	Construction of 1 nos. Sewerage treatment Plant each of 12.0 MLD based on suitable technology. The plant shall have SCADA-PLC for controlling and monitoring of process treatment.	16.95																																																				
4.0	<p>For laying the pipeline existing surface/roads structure shall be dismantled in appropriate width. The dismantling of various layers of roads shall be carried out as per requirement but within the particular item given in Schedule of rates. The pipe shall be laid over the approved bedding and in true levels as per specifications.</p> <p>After laying of pipes the back filling with appropriate material shall be carried out in as such a way that the compaction is achieved to 100% of MDD. For reconstruction of roads, the sub grade, the sub base, the base course and the surface layers shall be constructed as per specifications. The surface and composition of pavement of road being reconstructed over the laid pipe shall be same as the road which was existing before the laying of pipes</p> <table border="1" style="width: 100%; margin: 10px auto; border-collapse: collapse;"> <thead> <tr> <th style="text-align: center;">S. No.</th> <th style="text-align: center;">Particular</th> <th style="text-align: center;">Quantity</th> <th style="text-align: center;">Unit</th> <th style="text-align: center;">Cost</th> </tr> </thead> <tbody> <tr> <td style="text-align: center;">1</td> <td>Earth work in excavation for trenches in all kind of soil including dressing, watering and ramming and disposal of excavated earth lead up to 50 M. and lift up to 1.5 m, disposal earth to be neatly</td> <td></td> <td></td> <td></td> </tr> </tbody> </table>	S. No.	Particular	Quantity	Unit	Cost	1	Earth work in excavation for trenches in all kind of soil including dressing, watering and ramming and disposal of excavated earth lead up to 50 M. and lift up to 1.5 m, disposal earth to be neatly				23.68																																										
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S. No.	Name of the work Commissioning & Performance				Pro-rata Share %
		leveled.			
	i	up to 1.5 m deep	149001.00	Cum	129.10
	ii	>1.5m and upto3.0m deep	77748.00	Cum	134.10
	iii	>3.0m and up to 4.5m deep	31794.00	Cum	139.10
	iv	>4.5m and upto6.0m deep	10265.00	Cum	144.10
	v	>6.0m and up to 7.5m deep	1344.00	Cum	149.10
	2	Add extra if work is to be executed under water and / or liquid mud, including pumping out water as required.	27015.00	Cum	25.90
	3	Filling by available excavated earth (excluding rock) in trenches, plinth, sides of foundation etc. in the layers not exceeding 20 cm in depth, consolidating each deposited layer ramming and watering, lead up to 50m and lift up to 1.5 m.	270152.00	Cum	29.00
	4	Dismantling of flexible pavements and disposal of dismantled materials up to a lead of 1000 meters, stacking serviceable and unserviceable materials separately as per relevant clauses of Section-200.			
	i	Bituminous courses	998.00	Cum	358.00
	ii	Granular courses	1995.00	Cum	247.00
	5	Dismantling of existing structures like culverts, bridges, retaining walls and other structure comprising of masonry, cement concrete, wood work, steel work, including T&P and scaffolding wherever necessary, sorting the dismantled material, disposal of unserviceable material and stacking the serviceable material with all lifts and lead of 1000 meters.			
	i	Cement Concrete Grade M-15 & M-20	175.00	Cum	234.00
	ii	Rubble stone masonry in cement mortar.	370.00	Cum	150.00
	iii	Dismantling Brick / Tile work in cement mortar	100.00	Cum	150.00
	6	Dismantling of cement concrete pavement i/c breaking or pieces not exceeding 0.2 cum in volume and stock piling at designated locations and disposal of dismantled materials up to a lead of 1000 meters, stacking serviceable and unserviceable materials separately as per relevant clauses of Section-200.	15964.00	Cum	716.00
	7	Loading & unloading of stone boulders/ stone aggregates/ sand / kankar/moorum. (Placing tipper at loading point, dumping with front end loader, dumping, turning for return trip,	16609.00	Cum	102.00

S. No.	Name of the work Commissioning & Performance					Pro-rata Share %
		excluding time for haulage and return trip) : For a lead up to 5 km.				
8		Carriage of Material by Mechanical transport including loading unloading & stacking etc. : Earth up to 1 km distance.	63901.00	Cum	61.01	
9		Construction of granular sub-base by providing close graded material, spreading in uniform layers with on prepared surface, mixing by mix in place method at OMC, and compacting with vibratory roller to achieve the desired density, complete in all respects as per relevant clauses of Section-400. Grading - I Material	1842.00	Cum	604.00	
10		Construction of dry lean cement concrete sub base over a prepared sub grade with coarse and fine aggregate not exceeding 25 mm, aggregate cement ratio not exceeding 15:1, aggregate gradation after blending to be as per table of MORTH Specifications 600-1 , cement content not to be less then 200 kg/ cum, optimum moisture content to be determined during trial length construction, concrete strength not o be less then 10 Mpa at 7 days mixed in a batching plant, transported to site laid with paver with electronic sensor/mechanical paver, compacting with 8-10 tons vibratory roller, finishing and curing as per relevant clauses of section 600.	7371.00	Cum	2715.00	
11		Construction of Dowel jointed plain cement concrete pavement in M-30 grade concrete over a prepared sub base with 43 grade cement maximum size of coarse aggregate not exceeding 25 mm mixed in a batching and mixing plant as per approved mix design, transported to site, laid with a fixed form or slip form paver with spreading concrete by shovels, rakes compacted using needle, screed and plate vibrator and finished in a continuous operation including provision of contraction, expansion, and longitudinal joints, joint filler, separation membrane, sealant primer, joint sealant, debonding strip, placing of dowel bar, tie rod admixture as approved, curing compound, finishing to lines and grades as per approved	14742.00	Cum	4698.00	

S. No.	Name of the work Commissioning & Performance					Pro-rata Share %
		drawings as per IRC 15/2002 and relevant clauses of section 602 of specifications complete but excluding cost for steel in dowel bar and tie rod etc.				
	12	Providing laying, spreading and compacting stone aggregates of specific sizes as per to Water Bound Macadam specification including spreading in uniform thickness; hand packing, rolling with power roller 8-10 tonnes, in stages to proper grade and camber, applying and brooming requisite type of screening (Table 400-8) binding materials to fill up the interstices of coarse aggregates, watering (with water browser) and compacting to required density, making necessary earthen bund to protect edges as per clause 404 of MoRT&H specification including all material, labour, machinery, lighting, guarding and maintenance of diversion complete				
	i	Grading (i) (b) Using Screening Non- Crushable type	922.00	Cum	1035.00	
	ii	Grading (ii) (b) Using Screening Non- Crushable type	691.00	Cum	913.00	
	iii	Grading (iii) (b) Using Screening Non- Crushable type	691.00	Cum	931.00	
	13	Providing and applying primer coat with bitumen emulsion over prepared surface of granular bases including clearing of road surface and spraying primer @ 0.75 kg per sq.mtr using mechanical / manual means and as per relevant clauses of section 502	9213.00	Sqm	26.00	
	14	Providing and applying tack coat with bitumen emulsion using emulsion pressure distributor on the prepared bituminous/ granular surface cleaned with mechanical broom and as per relevant clauses of section-503. @ 0.40 kg per Sqm (Non bituminous surfaces) granular base not primed.	9213.00	Sqm	14.00	
	15	Providing and laying bituminous macadam with hot mix plant using crushed aggregates of specified grading premixed with bituminous binder, transported to site, laid over a previously prepared surface with mechanical paver finisher	922.00	Cum	5565.00	

S. No.	Name of the work Commissioning & Performance					Pro-rata Share %
	to the required grade, level and alignment and rolled as per clauses 501.6 and 501.7 to achieve the desired compaction complete in all respects and as per relevant clauses of section 504 for Grading I bitumen content 3.25%					
16	Providing, laying and rolling of close-graded premix surfacing/ mixed seal surfacing material of 20 mm thickness composed of 11.2 mm to 0.09 mm (Type- A) or 13.2 mm to 0.09 mm (Type-B) aggregates using penetration grade bitumen to the required line, grade and level to serve as wearing course on a previously prepared base, including mixing in a suitable plant, laying and rolling with a Smooth wheeled roller 8-10 tonne capacity, and finishing to required level and grade and as per relevant clauses of section-512. Type A or B aggregate with 60/70 bitumen					9213.00 Sqm 150.00
17	Providing and laying seal coat sealing the voids in a bituminous surface laid to the specified levels, grade and cross fall using Type-B (without hot mix plant / paver finisher) seal coats and as per relevant clauses of section-513 with bitumen. (This item can be executed only with prior approval of the chief engineer UADD).					9213.00 Sqm 29.00
18	Cement concrete grade M-15 (Nominal Mix) with 20 mm maximum size of stone aggregate (For providing CC encasing of the pipes as per specifications and as directed by Engineer.)					537.00 Cum 4154.00
19	Providing and laying in position specified grade of reinforced cement concrete excluding the cost of centering, shuttering, finishing and reinforcement - All work up to plinth level : Cement concrete grade M-20 (Nominal Mix) with 20 mm maximum size of stone aggregate.					75.00 Cum 4728.00
20	Centering and shuttering including strutting, propping etc. and removal of form for :					
i	Foundations, footings, bases of columns, etc. for mass concrete.					150.00 Sqm 138.00
ii	Columns, Pillars, Piers, Abutments, Posts and Struts.					130.00 Sqm 282.00
21	Reinforcement for RCC work including straightening, cutting, bending, placing in					4710.00 Kg 60.00

S. No.	Name of the work Commissioning & Performance					Pro-rata Share %
		position and binding including cost of binding wire up to floor two level including all wastage etc. complete: TMT bars				
	22	Random rubble masonry with hard stone in foundation and plinth including leveling up with cement concrete 1:6:12 (1 cement : 6 coarse sand : 12 graded stone aggregate 20mm nominal size) at plinth level with : Cement mortar 1:6 (1 cement : 6 sand)	225.00	Cum	2671.00	
	23	12 mm cement plaster of mix :Cement mortar 1:4 (1 cement : 4 fine sand)	1830.00	Sqm	108.00	
	24	Providing 63 KVA Generator set with 2 to 4 nos. of 2000-4250 lpm Capacity (Minimum Total combined capacity 8250lpm) 12 meter head non-clog Sewage pumps with panel board, Submersible Cable, 150mm dia PVC Suction and delivery Hose in 15mtr length with a set of quick connect nose coupling for total piping length 180mts. With manpower, consumables, diesel-oil, including operation and maintenance during contract period (for Day-night working)	3240.00	Hour	575.00	
5.0	Construction of Sewage Pumping Station with Pump house including Rising mains, Boundary, Approach road, Gate, Site development & all necessary electrical and mechanical accessories. Job includes pumps. Job includes construction of necessary substation and required associated works to complete the job in all respect. Pumps (100 % stand by) a) 41 lps, 8m, 14.00 kw (2 pumpsets) 81 lps, 8m, 25.00 kw (1 pumpsets) 162 lps, 8m, 40.00 kw (1 pumpsets)					5.09
6.0	Construction of House hold connection with road gully chamber of brick masonry inside dimension 500 x 450 mm dia. 60 cm deep for single pipe including providing and fixing of 135 / 160 mm DWC HDPE pipe with road restoration as per unit estimate. Two house hold connection will be connected to one property connection chamber.					12.47
7.0	Providing HT Feeder connection up to Sewerage treatment plant.					0.86
8.0	Providing House Sewerage connection for 13585 households					5.82
9.0	Construction of treated water over head reservoir with 22 meter staging of capacity 1700 KL, Chlorination cum treated water reservoir (UGR) of capacity 5000 KL along with providing and installation of pumps for pumping & Providing Laying and Jointing of 110 mm diameter PVC pipes for treated sewage water to be reused in green space within Municipal Council.					2.77
	<b>Total</b>					100.00