ENVIRONMENTAL AND SOCIAL IMPACT ASSESSMENT FOR CONSTRUCTION OF NEW 375 MLD STP AND UPGRADATION OF THE ASSOCIATED INFRASTRUCTURE INCLUDING EXISTING THREE TERMINAL SEWAGE PUMP STATION/S AT VASNA, AHMEDABAD

(Revised-Draft)

# GUJARAT RESILIENT CITIES PARTNERSHIP:

# AHMEDABAD CITY RESILIENCE PROJECT (G-ACRP)

October 2023

# Prepared by TATA CONSULTING ENGINEERS LTD. For AHMEDABAD MUNICIPAL CORPORATION

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# Note:

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# Abbreviations

Abbreviation	Expansion
ACRP	Ahmedabad City Resilience Project
AMASR	Ancient Monuments and
	Archaeological Sites and Remains
	Act
AMC	Ahmedabad Municipal Corporation
AMSL	Above Mean Sea Level
AUDA	Ahmedabad Urban Development
	Authority
APD	Assistant Project Director
ASI	Archeological Survey of India
ASP	Activated Sludge Process
BDW	Biodegradable Wastes
BIS	Bureau of Indian Standards
BMC	Biodiversity Management
	Committee
BMW	Bio Medical Waste
BNR	Biological Nutrient Removal
BOD	Biochemical Oxygen Demand
BOQ	Bill of Quantities
BP	Bank Procedures
BPL	Below Poverty Line
C&D	Construction and Demolition
CBD	Convention on Biological Diversity
CBMWTF	Common Biomedical Waste
	Ireatment Facility
CBO	Community-Based Organization
	Climate Change
	Conservation of Migratory Species
	Critically Polluted Area
	Central Pollution Control Board
	Central Public Health &
CFILLO	Environmental Engineering
	Organization
CRZ	Coastal Regulation Zone
CHS	Community Health Safety
СТЕ	Consent to Establish
СТО	Consent to Operate
CVCA	Critically Vulnerable Coastal Areas
DG	Diesel Generator
DBOT	Design Build Operate Transfer
DMP	Disaster Management Plan
DPR	Detailed Project Report
DTP	Directorate of Town Planning
DWMP	Disaster Waste Management Plan
EA	Environmental Assessment
EAP	Externally Aided Project
ECoP	Environmental Codes of Practice
EC	Environmental Clearance
EE	Environmental Engineer
EHS	Environmental Health and Safety

Abbreviation	Expansion
ESCP	Environment and Social
	Commitment Plan
ESIA	Environmental and Social Impact
	Assessment
ESMF	Environmental and Social
	Management Framework
ESMP	Environmental and Social
	Management Plan
EPR	Extended Producer Responsibility
ERT	Emergency Response Team
ESA	Environmentally Sensitive Areas
ESS	Environmental and Social Standards
FR	Feasibility Report
SDU	Sustainable Development Unit
ESF	Environmental and Social
	Framework
ESHS	Environmental and Social Health &
	Safety
ESZ	Eco-sensitive Zone
ETP	Effluent Treatment Plant
FHTC	Functional Household Tap
	Connection
FI	Financial Intermediary
FGD	Focus Group Discussions
GDP	Gross Domestic Product
GHG	Greenhouse Gas
GIIP	Good International Industry
	Practice
GIS	Geographic Information System
GOI	Government of India
GOG	Government of Gujarat
GPS	Global Positioning System
GRC	Grievance Redressal Committee
GRCP	Gujarat Resilient Cities Partnership
GPCB	Gujarat Pollution Control Board
GUDIM	Gujarat Urban Development
CMU	Wilssion
GWIL	Limited
GWSSR	Guiarat Water Supply & Sewerage
344555	Board
На	Hectares
нн	Households
HR	Human Besources
HFL	Highest Flood Level
ICB	International Competitive Bidding
IDU	Internal Documents Unit (The
	World Bank)
IEC	Information Education
	Communication
IEE	Initial Environmental Examination
L	



Abbreviation	Expansion
IESSR	Initial Environmental and Social
	Screening Report
IFC	International Finance Corporation
INR	Indian Rupee
IPF	Investment Project financing
IUCN	International Union for
	Conservation of Nature
JJM	Jal Jeevan Mission
IS	Indian Standards
KGP	Knowledge, Governance and Policy
LB	Local Body (Urban or Rural)
LDPE	Low-Density Polyethylene
LMP	Labor, Machinery and Plant
LU	Land Use
LULC	Land use and Land Classification
LPCD	Liters per Capita per Day
LFPR	Labour Force Participation Rate
MAM	Majur Adhikar Manch
M&E	Monitoring and Evaluation
MoEFCC	Ministry of Environment, Forests
	and Climate Change
MLD	Millions of litres Per Day
MBR	Membrane Bioreactor
MPN	Most Probable Number
Ν	Nitrogen
NCB	National Competitive Bidding
NDZ	No Development Zone
NEP	National Environmental Policy
NH	National Highway
NGO	Non-Governmental Organization
NGT	National Green Tribunal
NMA	National Monuments Authority
NOC	No Objection Certificate
NPDM	National Policy on Disaster
	Management
NTDNT	Nomadic Tribes and De-Notified
	Tribes
0&M	Operations and Maintenance

Abbreviation	Expansion
OD	Operational Directives
OHS	Occupational Health and Safety
ОР	Operational Policies
Р	Phosphorus
PAF	Project Affected Family
PAP	Project Affected Person
PD	Project Director
PDO	Project Development Outcome
PIU	Project Implementation Agency
РМ	Particulate Matter
РМС	Project Management Consultant
PPE	Personal Protective Equipment
SCADA	Supervisory Control and Data
	Acquisition
SC/ST	Scheduled Caste/Scheduled Tribe
SEP	Supplemental Environmental
	Project
SOP	Standard Operating Procedure
STP	Sewage Treatment Plant
SIRT	Systematic Incident Reporting Tool
SBR	Sequential Batch Reactor
SPS	Sewage Pumping Station
SPM	Suspended Particulate Matter
SPCB	State Pollution Control Board
SUDU	Sustainable Urban Development
	Unit
TSS	Total Suspended Solids
TDS	Total Dissolved Solids
WASMO	Water and Sanitation Management
	Organization
WB	World Bank
WRIS	Water Resources Information
	System
UASB	Up flow Anerobic Sludge Blanket
UT	Union Territory
ULB	Urban Local Bodies
USD	United States dollar
VFD	Variable Frequency Drive
VEC	Valued Environmental Components



#### **SUMMARY**

#### 1. **Project Description**

The Government of Gujarat (GoG) intends to utilize financial support from the World Bank for Gujarat Resilient Cities Partnership : Ahmedabad City Resilience Project (G- ACRP) which aims to strengthen the institutional and service delivery systems for Urban Service Delivery (mainly, Sewerage and Drainage) and financial systems in the Municipal Corporation of Ahmedabad and to strengthen the State's institutional capacity and infrastructure for management of services in urban areas. G-ACRP project consists of three major components which will strengthen AMC's institutional and financial systems and revenue performance; Improving wastewater management services; and develop state level institutional systems and capacities. ESMF and has been prepared for the ACRP project and disclosed on the AMC website<sup>12</sup>.

One of the sub projects to be undertaken under the ACRP project, is the existing 126 MLD STP at Vasna which has been identified for capacity augmentation and rehabilitation. The capacity of the STP is proposed to be augmented to 375 MLD based on the estimated population for succeeding three decades and technology upgradation for meeting the NGT standards for meeting discharge standards for the treated sewage.

#### 2. Status of the subproject development at the time of ESIA

The sub-project is under feasibility study/ detailed project report. The subproject will be bid out for implementation on a Design – Build – Operate – Transfer (DBOT) mechanism, also including the ESMP prepared through this ESIA, so that the contractor can plan and arrange the required resources for implementing and managing the E&S aspects.

#### 3. Sub-project Description

The existing Sewage Treatment Plant (STP) of 126 MLD capacity at Vasna is proposed for upgradation under the G-ACRP project. This STP was built in the year 2004 and over the years, its functioning is deteriorated as evident from the quality of treated sewage, and many of the infrastructure is dilapidated. The process used in the existing STP is Up flow Anaerobic Sludge Blanket (UASB) AMC proposes to (i) change the treatment process to enable it to accept and treat the sewage generated by all occupants in its catchment optimally with increased capacity, (ii) ensure higher efficiency and achieve service level benchmark set by National agencies and regulators, (iii) achieve better quality of treated sewage as suggested by the National Green Tribunal (NGT). This will ensure better sewage management in its catchment and area of influence, by reducing discharge and bypass of untreated or suboptimal treated sewage in waterbodies and land (reused for irrigation), and thereby reducing the contamination of surface and ground water sources and supporting overall improvement in health of the environment and the society. For this, the construction of STP is proposed in two sections under which Section I of STP with minimum capacity of 120 MLD shall be constructed in the available 10 ha land parcel before demolition of the existing STP. After commissioning of Section I STP, the remaining land area will be utilized to construct the remaining 255 MLD capacity of STP. It is also proposed to improve the upstream infrastructure including repair and electro-mechanical works at the 3 Terminal Sewage Pumping Stations (TSPS) and laying of a new rising main to the new STP. The construction work will be carried out in phases to reduce the E&S impacts and address issues related to diversion of sewage flow during construction. DBOT contractor shall prepare and submit schedule for diversion of sewage for treatment during construction & commissioning of new STP and demolition of existing STP. The work shall be carried out phase wise to ensure diversion and treatment of sewage.

<sup>&</sup>lt;sup>1</sup><u>https://ahmedabadcity.gov.in/portal/web?requestType=ApplicationRH&actionVal=viewAttachment&queryType=Select&screenId=2900003&AttachmentFileName=ESMF.pdf</u>

 $<sup>\</sup>label{eq:linear} ^{2} https://ahmedabadcity.gov.in/portal/web?requestType=ApplicationRH\&actionVal=viewAttachment&queryType=Select &screenId=2900003&AttachmentFileName=ESIA-126-MLD-STP.pdf$ 



#### 4. Analysis of Alternatives

The Analysis of Alternatives is structured to follow a 'narrowing approach' involving a series of logical steps, starting with the high-level strategy alternatives followed by description of more detailed technology alternatives considered. Using this commonly adopted narrowing approach, the Analysis of Alternatives considers alternatives in the following sequence:

- Strategy Alternative: Abandoning the Existing Centralised Treatment to follow decentralised treatment 'on site'. Here, a scenario where existing STP would be abandoned, and residents will be using onsite decentralised treatment in septic tanks is considered against the proposed subproject
- 'Zero' or 'No Project' alternative: Here, without project scenario i.e., continuing the existing situation compared with the scenario where the proposed project rehabilitation is implemented
- Complete reconstruction of Existing Plant: Demolition of existing plant to reconstruct a new STP in its place
- Design/Technology Alternatives: Technologies to achieve the stringent discharge standards suggested by NGT are compared with the current one. During Detailed design, this will be subject to further scrutiny and the best environmentally suitable alternative will be adopted.
- Capacity Alternative: Capacity alternative of two separate STPs (160 MLD near existing 48 MLD STP and 215 MLD at the location of current 126 MLD STP) and one single STP were assessed (375 MLD STP at the location of current 126 MLD STP).



This ESIA is for the proposed alternative namely, construction of new 375 MLD STP of advanced treatment technology such as Sequential Batch Reactor (SBR) to ensure treatment to meet the stringent discharge limits suggested by the National Green Tribunal. This will ensure full treatment of the sewage reaching the TSPS, without letting bypass of untreated sewage from the Western Zone 1



of the city of Ahmedabad (which is served by the existing 126 MLD STP) into the river Sabarmati. For this selected option, expected environmental and social risks and impacts are lower when compared to other options considered. This will on the whole ensure better environment and health in the city and the region by ensuring full treatment of sewage from the its generator catchment, improve quality of water in the river Sabarmati to which the treated sewage is discharged, and improve the reusability of treated sewage. The construction of STP is proposed in two sections. Initially Section I of STP with minimum capacity of 120 MLD shall be constructed in the available 10 ha land parcel. After commissioning of Section I STP, the remaining land area will be utilized to construct the remaining capacity of STP.

#### 5. Applicable Regulatory and Guidance Framework

The applicable regulatory framework for the ESIA comprised of the following:

- Applicable international, national, state and city level environmental and social policies, regulations and guidance's (including environmental policy and acts, water and air acts, noise rules, regulations on various type of wastes, wetlands and Eco sensitive areas, tree cutting, biodiversity, Dam Safety, The Right to Fair Compensation and Transparency in Land Acquisition, Rehabilitation and Resettlement Act, Scheduled Castes and Scheduled Tribes (Prevention of Atrocities) Act, The Sexual Harassment of Women at Workplace Act and others)
- Indian labour and related laws (including The Building and other Construction Workers (Regulation of Employment and Conditions of Service) Act, The Factories Act, Child Labour (Prohibition and Regulation) Act, Minimum Wages Act, Workmen's Compensation Act & Rules, The Street Vendors Act
- World Bank Environmental and Social Framework (ESF) and the Environmental and Social Standards (ESSs): Apart from ESS 7 & ESS9 all other ESSs are relevant for this project. ESS5 stipulates that project-related land acquisition and land-use restrictions impacts (physical displacement, economic displacement, or both on communities and persons) be addressed. However, as no land acquisition and resettlement will be required in this sub-project and as there is no expected livelihood impacts due to economic displacement, ESS 5 is not relevant for this specific sub-project. The adverse social impacts on adjacent communities include pollution and health effects due to discharge from STP, especially during construction phase and; increased insecurity and risk of gender-based violence faced by women and girls due to labor influx. These will be addressed through provisions following ESS1 and ESS4. World bank Group ESHGs and other Guidance's

The ESIA is prepared as guided by the Environmental and Social Management Framework for G- ACRP based on the regulatory and guidance framework above. The proposed project will comply with national and state regulations, as well as the WB ESF and WBG EHS guidelines and for specific standards the most stringent among these will be complied with.

#### 6. Baseline environmental and social conditions

Baseline environmental and aspects are presented in the following tabulated summary

Aspects	Existing Vasna 126 MLD
Location	
Co-ordinates	Latitude: 22°58'44""N'; Longitude: 72°31'22""E"
Details of	Ward No 52, Sarkhej, Ahmedabad, Gujarat, West side of Sabarmati River,
Administrative /	downstream of Vasna Barrage
Physical occurrence	



Aspects	Existing Vasna 126 MLD
Location Map	
Physiography, Microcl	imate and Surrounding landuse
Topography, Slope	Ahmedabad city area is monotonously flat except small patches. Land
and Soil	surface elevation is from 40 m to 60 m AMSL with master slope towards
	south. Site is flat, sloping from 42 – 46m. HFL is 41.7m.
Micro-climate	Hottest month- May (Maximum Temperature 41.6°C)
	Coldest Month- January (Minimum Temperature 27°C)
Surrounding landuse	East: 240 MLD STP at distance of 20 m
and activities	West: Residential area adjacent to STP
	North: Canal and Road at around 50 m and 70 m respectively.
	South: Sabarmati River at around 240 m
Any landuse or	Vasna Barrage located 3 km upstream, two parallel bridges across Sabarmati
structure of	downstream of the Barrage which is 1 km upstream of the site
importance	
Site Details	
Sile Plui	The second secon
Approach to site	Approach to the site is through the canal side road connected through an unpaved ( <i>Kuccha</i> ) road.
Approach to site Description of main	Approach to the site is through the canal side road connected through an unpaved ( <i>Kuccha</i> ) road. Canal side road connecting Narol- Sarkhej road to NH 751. The plant has
Approach to site Description of main and subsidiary access	Approach to the site is through the canal side road connected through an unpaved ( <i>Kuccha</i> ) road. Canal side road connecting Narol- Sarkhej road to NH 751. The plant has secured access through Gate with a width of about 5 m
Approach to site Description of main and subsidiary access ways	Approach to the site is through the canal side road connected through an unpaved ( <i>Kuccha</i> ) road.         Canal side road connecting Narol- Sarkhej road to NH 751. The plant has secured access through Gate with a width of about 5 m         Security-Yes         Head for each or the site is the unofficiale for all encode (materiale response)
Approach to site Description of main and subsidiary access ways	Approach to the site is through the canal side road connected through an unpaved ( <i>Kuccha</i> ) road.         Canal side road connecting Narol- Sarkhej road to NH 751. The plant has secured access through Gate with a width of about 5 m         Security-Yes         Used for accessing the site by officials, for all goods/ materials movement, firsfighting others: Yes
Approach to site Description of main and subsidiary access ways	Approach to the site is through the canal side road connected through an unpaved ( <i>Kuccha</i> ) road.         Canal side road connecting Narol- Sarkhej road to NH 751. The plant has secured access through Gate with a width of about 5 m         Security-Yes         Used for accessing the site by officials, for all goods/ materials movement, firefighting others: Yes
Approach to site Description of main and subsidiary access ways Area	Approach to the site is through the canal side road connected through an unpaved ( <i>Kuccha</i> ) road.         Canal side road connecting Narol- Sarkhej road to NH 751. The plant has secured access through Gate with a width of about 5 m         Security-Yes         Used for accessing the site by officials, for all goods/ materials movement, firefighting others: Yes         2,05,000 sq. m., Pentagon
Approach to site Description of main and subsidiary access ways Area Ownership	Approach to the site is through the canal side road connected through an unpaved ( <i>Kuccha</i> ) road.         Canal side road connecting Narol- Sarkhej road to NH 751. The plant has secured access through Gate with a width of about 5 m         Security-Yes         Used for accessing the site by officials, for all goods/ materials movement, firefighting others: Yes         2,05,000 sq. m., Pentagon         AMC
Approach to site Description of main and subsidiary access ways Area Ownership Historic land use	Approach to the site is through the canal side road connected through an unpaved ( <i>Kuccha</i> ) road.         Canal side road connecting Narol- Sarkhej road to NH 751. The plant has secured access through Gate with a width of about 5 m         Security-Yes         Used for accessing the site by officials, for all goods/ materials movement, firefighting others: Yes         2,05,000 sq. m., Pentagon         AMC         STP, Sewage Farm before constructing STP         Evictions STP
Approach to site Description of main and subsidiary access ways Area Ownership Historic land use Current land use	Approach to the site is through the canal side road connected through an unpaved ( <i>Kuccha</i> ) road.         Canal side road connecting Narol- Sarkhej road to NH 751. The plant has secured access through Gate with a width of about 5 m Security-Yes         Used for accessing the site by officials, for all goods/ materials movement, firefighting others: Yes         2,05,000 sq. m., Pentagon         AMC         STP, Sewage Farm before constructing STP         Existing STP         None on site, Saharmati Biver to South of the site
Approach to site Description of main and subsidiary access ways Area Ownership Historic land use Current land use Natural features	Approach to the site is through the canal side road connected through an unpaved ( <i>Kuccha</i> ) road.         Canal side road connecting Narol- Sarkhej road to NH 751. The plant has secured access through Gate with a width of about 5 m         Security-Yes         Used for accessing the site by officials, for all goods/ materials movement, firefighting others: Yes         2,05,000 sq. m., Pentagon         AMC         STP, Sewage Farm before constructing STP         Existing STP         None on site, Sabarmati River to South of the site



Aspects	Existing Vasna 126 MID				
Description of					
evisting facility					
Condition of avisting	The existing STD is almost 18 years ald and many of the project components				
condition of existing	The existing STP is almost 18 years old and many of the project components				
piunt & sujety	are defunct and not working at full capacity. All the civil structures are not				
	good and show damage, cracks and breaks. Internal roads need resurfacing				
	but are in usable condition. STP is guarded by a concrete wall around it to				
	stop any encroachment.				
Description of	Existing footprint: about 75000 sqm, Treatment Capacity: 126 MLD				
existing facility	Technology: UASB				
Baseline Environmente					
Quality of Treated	Parameters	Agreed Standards	Baseline	NGT suggested	
sewage		as per consolidated	quality	discharge standards	
		consent and			
		authorization (CCA)			
		from GPCB			
	BOD (mg/l):	20	28.86	≤ 10	
	COD (mg/l):	100	117.39	≤ 50	
	SS (mg/l)	30	38	≤ 20	
	nH	65to80	7 61	6 5-9 0	
	Fecal Coliform	1000-10000	2X10 <sup>5</sup>	<230/<100	
	MPN / 100 ml	1000 10000	2/10	230/ 100	
	N N		22.60	< 10	
		-	22.00	<u> </u>	
	<u> </u>		2.5	21	
	<b>NI I I I I</b>				
NOISE	Noise levels are hig	gn which are due to exi	sting ongoi	ng construction of	
	Metro Depot (Whic	in is expected to be cor	npleted by	April 2022)	
Ambient air quality	All parameters are	within the permissible			
Plant related air	Gases are emitted	from the sewage and s	ludge. Gase	es like Methane are	
quality issues	released from slud	ge. Gas holders are in p	blace. Move	ment of vehicles in	
	existing plant is ver	ry minimum and emissi	ons of dust	and other vehicular	
	pollutants is neglig	ible.			
Ambient water	Ground Water: Cor	nsidering the monitorir	ng results m	entioned Drinking water	
quality (Ground &	quality standards a	is per latest CPHEEO &	IS code 20	12, the water from these	
Surface)	sources cannot be	used for drinking with	out treatme	nt	
	Surface Water: The	e sampling was carried	out for surf	ace water at Sabarmati	
	near 126 MLD STP	at Vasna. It is observed	l from the n	nonitoring that, BOD,	
	Chlorides and Colif	orm in the water samp	les are exce	eeding the CPCB 1979	
	and BIS 1982 stand	lards of surface water o	quality crite	ria for drinking purpose.	
Soil quality	No sludge disposal	on ground observed			
Fauna & Flora	There are 450-500 numbers of trees on site, mainly of Acacia & Neem				
	species; and plante	ed shrubbery. Existing s	ite has gree	en area which harbors	
	variety of common	birds and insects. Out	fall has grov	wth of <i>Eichhornia sp</i> .	
	(invasive) in Sabarr	nati River.			
Proposed Rehabilitation	Proposed Rehabilitation works				
Proposed activity	The construction o	f STP is proposed in tw	o sections.	Initially Section I of STP	
(including Upstream	with minimum cap	acity of 120 MLD shall	be construc	ted to meet better	
and downstream	discharge standard	ls (NGT suggested norn	ns with TSS	<10 mg/l); in the	
linked infrastructure	available 10 ha lan	d parcel. After commiss	sioning of S	ection I STP, existing STP	
proposed for	will be demolished	, and the area thus ret	rieved, and	the available remaining	
upgradation)	site area will be use	ed to construct the rem	naining can	acity of STP (255 MLD)	
	and odor control system				
	Existing upstream infrastructure will be retained with electrical mechanical				
	instrumentation, m	ninor civil structure rep	air at three	TSPSs.	



Aspects	Existing Vasna 126 MLD
	Biogas facility is proposed for biogas generation from sludge.
	Rising Main will be laid from TSPS to the site (ex.76MLD TSPS to ex.126 MLD
	STP). Upgradation of approach road is included in Vasna 240 MLD STP sub
	project.
Key environmental	Discharge qualities need to be brought to NGT suggested standards and
issues to be	Consent to Establish to be received from GPCB, bypass quality reuse without
considered to design	chlorination not to be done, material storage shall be made proper, waste
mitigation measures	and sludge storage, reuse to be improved. TSPS need to be repaired.
	Sludge, demolition waste and wastewater management during demolition of
	existing STP needs to be planned.

#### Social Baseline

The baseline socioeconomic predictions used and discussed in the ESIA study are provided by master planning consultant for ward Number 52 for Sarkhej in which the STP is located. The population of this ward is estimated to be 144524 and population density is 4899 for the year 2021.

The estimated contributing population for this zone is about 14.53 lakh. As per the SCADA records, about 338 MLD sewage is generated at present in this zone. Proposed new STP works are in the premises of existing 126 MLD STP. It is a gated and secured property under the ownership of AMC, exclusively used for STP purposes. There are no occupants at the proposed expansion site and no disadvantaged/vulnerable groups.

There is a squatter settlement which is located near the STP between the Fatehwadi canal and the STP boundary. There are roughly 600 to maximum 700 households residing in temporary structures in the squatter settlement. The settlement comprises of mainly migrants.

Migrants in Ahmedabad, living in squatter settlements, comprise of two groups of workers – seasonally migrant construction workers who migrate from the tribal belt comprising of Dahod in Gujarat and Jhabua and Banswara in neighbouring states and long-term migrants from the Nomadic Tribes and De-Notified Tribe (NTDNT) communities. The government does not enumerate these settlements and does not provide any public services to these settlements. Majur Adhikar Manch (MAM), a trade union of informal workers, has been working with the residents of these squatter settlements. The settlements will experience temporary impacts related to dust, traffic movement, labor movement and related issues which will be mitigated during project implementation. Impacts and mitigation measures are discussed in details in the relevant chapters.

Gender based issues/ concerns - Women in the nearby settlement are working, mainly in the unorganized sector as semi-skilled and unskilled labour, domestic workers, construction/masonry work. Safety and security concerns for women/children were raised due to the labour influx for construction activities, open defecation, lack of street lights and similar issues as the settlement is informal. This has been addressed in the mitigation measures through community health and safety measures, employment of labour, for both men and women from the informal settlement, setting up labour camp at suitable site to prevent any disturbance to the settlement, SEA/SH measures and provision of services such as drinking water supply and sanitation for the settlement through government schemes and programs.

#### 7. Assessment of Risks and Impacts

The project is a brownfield project comprising of rehabilitation of existing STP and improvement/repair to pumping station and laying of new rising main. Some of the key expected Environmental & Social impacts during construction and operations stages are given below;



- Generation of substantial debris, top soil and muck during the construction of new 375 MLD STP and demolition of existing 126 MLD STP.
- Dust and noise generation and emissions to air (resulting in pollution, health impacts and odour) due to demolition, excavation, cutting, back filling, compaction operations and other construction activities, and Operations and maintenance works
- Noise and vibration and other disturbances to residents and businesses during material movement, construction demolitions, and laying of rising main
- Temporary flooding due to excavation during monsoons
- Land and water contamination due to construction waste and operation phase sludge handling
- Spillage of chemicals, fuel and oil
- Safety hazards to labours (Occupational Health and Safety) and public (Community Health and Safety)
- Increased traffic inconvenience (emissions, congestions, longer travel times, blockage of access), during transport of men and materials to the site, especially as the approach road connecting the STP also is a connecting road from NH 64 to the nearby areas
- Impacts of any accidental discharge from STP, TSPS or the rising main on adjoining communities, especially during construction phase, and discharge of treated sewage into River Sabarmati, downstream communities/ river users.
- Adverse social impacts on adjacent communities and squatters (e.g., security of women and girls due to labor influx)
- Accumulated sludge (of past years) in existing USAB reactors will have to be planned for proper disposal and demolition of existing UASB reactors will generate demolition wastes and other defunct equipment's which need to be managed.
- Area occupied by the existing plant and UASB reactors will have to be remediated as required and made ready for construction of the new plant on vacant land, may cause pollution and contamination of the soil.

Based on the relevance of each ESS, and national/ state Legal, Regulatory and Institutional Framework, ensuing sections summarize the environmental and social risks and impacts likely due to the proposed interventions followed by the mitigation measures considered. The risk and impacts are grouped in respect of the applicable ESSs as follows:

Applicable ESS	Risk and Impacts assessed		
ESS1	ESIA was conducted, and assessed all risks and impacts as applicable to ESSs 2-10. The risks and impacts of the proposed sludge management facility will also be assessed by AMC once the technology and location is finalised, considering it as an associated facility if applicable		
ESS2- Labour and Working Conditions	Various types of labourers employed and impacts and risks due to their working conditions		
ESS3- Resource Efficiency and Pollution Prevention and Management	Minimal risks and Impacts on Physiography, land use, Geology, Soil, biodiversity, and people due to proposed rehabilitation of existing STP		



Applicable ESS	Risk and Impacts assessed		
	Risks and Impacts on Water Resources, Water Quality due to construction activities, operation and maintenance, and discharge of treated sewage		
	Risks and Impacts on Air Quality, Noise levels during construction, operations		
	Risks and Impacts due waste generation/ disposal due to proposed rehabilitation activities and operation of existing/rehabilitated STP, and the proposed biogas facility.		
	Aspects to ensure better resource efficiency include reuse of treated sewage, energy recovery from sludge, energy-efficient mechanisms, and machinery		
ESS4: Community Health and Safety	Risks and Impacts on Community Health and safety during construction, pollution, also considering flooding related aspects of the upstream barrage; Impacts of discharge from STP on adjoining communities, especially during construction phase; increased risk of gender-based violence, sexual exploitation and abuse and sexual harassment (GBV and SEA/ SH) for women and girls due to larger labor presence and; other labor influx related risks. The risks and impacts of the proposed sludge management facility on community health and safety will also be assessed by AMC once the technology and location is finalised, considering it as an associated facility if applicable		
ESS5: Land Acquisition, Restrictions on Land Use and Involuntary Resettlement	Not currently relevant for this sub-project as no land acquisition is envisaged and no impact on squatter settlement is envisaged. Land use will not change due to the proposed project upgradation and rehabilitation of STP		
ESS6: Biodiversity Conservation and	Risks and impacts on ecology and biodiversity		
Sustainable Management of Living Natural Resources	Risk and impacts on natural habitat.		
ESS8: Cultural Heritage	Risks and impacts on potential cultural heritage during construction activities		
ESS9: Financial Intermediaries	Not relevant as no FIs are involved in this project.		
ESS 10: Stakeholder Engagement and Information Disclosure	Risks and impacts due to lack of stakeholder engagement Risks and impacts due to non-disclosure of information regarding project activities Risks and impacts due to failure to redress grievances and concerns of project-affected parties in a timely and satisfactory manner and failure to provide feedback.		

#### Assessment and Management of E&S Risk and Impact (ESS 1)

As all the proposed major structural interventions are within the STP or TSPS sites or their structures, no direct adverse impacts are envisaged on physiography or land use. Laying of the proposed rising main (around 2 km) is along public infrastructure and government land and will be along the boundary wall of the 240 MLD STP. Trenchless method is proposed for laying the rising main across the kuccha roads or lanes to prevent disturbance. The proposed rising main may create temporary disturbances to people and traffic during the construction and maintenances stages, which could be managed through traffic diversions, information to communities, barricading and safety precautions (for



communities and workers), and watch and ward in important areas. The proposed subproject involves civil, electromechanical, and paint work mainly; labour-intensive in the odorous area near sewage/ wastewater, and their stay and work at or near the site for about 4.5 years. Treatment of sewage along with new construction/modifications required for technology upgradation, discharge of treated water and disposal of sludge and other wastes including large quantities of construction and demolition (C&D) wastes, use of resources such as water and power during construction pollution from storage and handling of materials, use of paints and other chemicals for construction activities, transportation of raw materials, wastes and sludge, disposal and/or reuse of treated sewage for irrigation will pose risks and impacts. Work requires very detailed and clear sequential planning, scheduling as the existing operations shall not suffer during construction works. The activities will be labor intensive with risks of accidents such as working at heights, excavations, work in enclosed areas, and activities near ponded sewage in large tanks. Impacts and risks are moderate and can be managed by following regulations, adopting best practices for similar projects, training of staff/ manpower; and ensuring implementation of avoidance, monitoring, and implementation of mitigation measures.

No direct adverse impacts are envisaged on communities including on the disadvantaged or vulnerable people. However, there may be indirect impacts on communities such as increased access due to replacement of kuccha road by resurfaced pucca road, increase in labor due to increased labor opportunities, benefits due to movement of pedestrian due to better road and increased safety due to project related pedestrian movement and availability of lights during evening and nights in the sub project, Project will need to make extra efforts to reach out through stakeholder engagement and effective GRM, to the disadvantaged and vulnerable persons and groups to involve them in both preparation and implementation.

#### Labour and Working Conditions (ESS 2)

Labour and employment opportunities will be generated during the construction period. Unskilled and semi-skilled labor work can be sourced from the squatter settlement as per availability and willingness of labor. Women can also be hired for specific tasks from the squatter settlement. Since the settlement is nearby some women may be willing to work on-site as labor.

Proposed construction works will require labor for construction activities for almost 4.5 years and a labor camp will need to be set up for accommodating the workers who are not local. Occupational Health and Safety risks and impacts are identified on construction activities and includes workers working at height, excavations, working near sewage tanks, confined spaces, gaseous place, working with electrical equipment, cleaning of UASB reactors and sludge drying beds and closed environments getting exposed to potential accidents. Workers near high noise equipment may experience health issues such as hearing loss if no care is taken. Considering the vegetation growth, snake or scorpion bite may occur during site clearance or construction. These impacts are expected during both construction and operation of STP and related infrastructure, but can be managed following good practices, adopting Standard Operating Procedures for work types, preparing and following OHS management plans, ensuring the use of safety equipment onsite, and Personal Protective Equipment, Incident management, regular health check-ups and emergency support, and improving the awareness of the workers. For USAB reactors , maintenance activity, workers' health and safety will be addressed and mechanical cleaning will be recommended strongly and any manual cleaning will be avoided. Labour will also require periodic health check-ups as they are working in areas where there is sludge and wastewater, sanitary facilities at the construction site, drinking water, PPEs, shade for resting, first aid, etc. Labour compliances will also be required to be met under various local laws such as labor licenses, permission, training, payments, insurance as mandated under law, etc. All engagement of laborers will follow the project level Labor Management Procedure (LMP). Child labor and forced labor will be prohibited. All workers will have access to project's worker's grievance redress mechanism (GRM).

Area and site under AMC for labor camp within accessible distance from STP to be identified by DBOT contractor and necessary permission/ approval to be taken from AMC. Workers in the labor camp will



need sanitary facilities such as toilets, washing areas, and sanitary waste disposal areas. Adequate and safe accommodation with proper ventilation, comfortable stay, sanitation, first aid facilities, water, fire safety, protection from weather conditions and extreme events, facilities including cooking and lighting is essential. Covid- 19 precautions for such camps to be planned and implemented.

#### **Resource Efficiency and Pollution Prevention and Management (ESS 3)**

With respect to Resource Efficiency, the project preparation and the ESIA process will identify feasible measures for efficient (a) energy use; (b) water usage and management to minimize water usage during construction, conservation measures to (energy efficient pumps, appurtenances, biogas facility for gas generation from sludge to generate electricity, solar rooftop) offset total construction water demand and maintain balance for the demand of water resources; and (c) raw materials use by exploring the use of local materials, recycled aggregates, use of innovative technology to minimize project's foot prints on finite natural resources. The project would also need to address the management of materials (such as construction materials, chemicals used for STP operations, fuels, paints etc.) solid (screenings, wastes, sludge, construction and demolition (C&D) wastes, e-waste from electro-mechanical equipment) and liquid waste (from construction activities, run-offs, waste water/ sewage from labour camp, leachate from sludge, treated sewage, accidental leakage of untreated sewage) generated during the construction and operation phases. Contractor will prepare management plans (OHS, CHS, Waste Management etc) and implement those. All wastes will be managed following National regulations and WB EHS: C&D wastes will be sent to the AMC C&D waste management facility where it is converted into useful products for recycling back for construction purposes; some of those will be used in the construction purposes and site development for this subproject thus ensuring resource efficiency. Standards suggested by national guidelines for sludge quality and WB EHS will be followed. Sludge will be transferred to the biogas generation facility and gas will be generated following which the digested slurry will be transferred to the proposed proposed Sludge management facility of AMC, along with any other surplus sludge from other parts of STC, such as Primary treatment where it will be treated and disposed following the consent conditions. During monitoring, if hazardous content is detected, it will be sent to TSDF. Contractor will discuss with AMC the monitoring results & manage sludge as per Sludge & Waste Management plan & present plan shall be upgraded in ESIA. The sludge and waste management plan which shall be prepared and approved at the pre-construction stage should clearly indicate how the existing sludge in UASB reactors and C&D waste will be temporarily stored on site and disposed without impacts on workers and communities. Screenings, plastics and wastes will be treated and disposed at AMCs solid waste management facility. Machines/equipment's will be auctioned to authorised recyclers. E-waste including Solar panels will be sent to GPCB approved e-waste recyclers and all these requirement will be made part of DBOT contract. Site and material storage areas will be provided with cut off drains to collect and treat liquid wastes.

Pollution of water bodies receiving STP discharges due to reduction in efficiency or non-working of STP due to breakdowns, routine maintenance, and impacts on downstream users is important. Other pollutants include dust, chemicals materials transported and used without care, sludge, and other wastes generated during rehabilitation and O&M. The project being upgradation of the sewage treatment plant will enhance the sewerage treatment and help control pollution and its impacts on all environmental components. This also ensures conservation of resources through their reuse and recycling, use of better energy and water-efficient appliances and mechanisms. Adoption of best environmentally appropriate technology to ensure the quality of treated sewage as per Consent Conditions and regulations, and minimization of Green House Gas (GHG) emissions, adoption of the best standard in case the treated water is to be reused for agriculture based on detailed study and consultations, are important also considering overall pollution loads due to multiple discharges into the river. Temporary construction stage pollution impacts on water, soil, fauna/ flora, workers and communities are moderate and can be managed by following regulations, adopting best practices,



training; and ensuring implementation of avoidance, monitoring, and implementation of mitigation measures.

Treated sewage will be discharged from the STP during the construction (from existing STP) and operation phases (from the new STP) into the river Sabarmati. Discharge standards for treated sewage, suggested by National Green Tribunal, with additional monitoring parameters for Bathing water quality (class B, as per CPCB Designated Best Use criteria), and use of river for irrigation (CPCB Class D: Designated Best Use criteria) will be followed. This NGT standards is an improvement over and more stringent than Environmental Protection (EP) Rules 1986 of the Ministry of Environment and Forests and Climate Change (MoEFCC) of the Government of India. (Discharge Standards in EP Rules 1986 is mentioned as accepted national standards under WB EHS standards for Water and Sanitation). The subproject will follow the most stringent criteria among all available standards/ limits. Irrigation Department of the Government of Gujarat had requested AMC to supply treated sewage from the STPs for downstream agriculture uses, by discharging through Fatehwadi Canal. With improved quality of treated sewage, such reuse can be encouraged. In case AMC and irrigation department decides to use treated sewage for agriculture from the bank supported project, (i) permit for the same shall be obtained from GPCB (and that AMC has already informed irrigation department that they can discharge into the canal only after receiving permit for this from GPCB), (ii) AMC & Irrigation Department shall discuss & decide on the quantity of water required for such discharge after obtaining permit; (iii) AMC with the support of Irrigation Department shall undertake a study on reuse of treated effluent for irrigation in line with the Central Pollution Control Board's Guidelines of Reuse of Treated Water for Irrigation, 2018, through reputed Agricultural University with stakeholder consultations as per the Guidelines and after agreement with stakeholders and permit from GPCB, discharge the treated sewage so as to avoid any negative environmental and health issue on downstream communities.

#### GHG Emissions

In a business-as-usual scenario, where the plant is not upgraded, the carbon emissions due to methane from treated and untreated wastewater alone would be 43,583tCO2e/yr. With the proposed technologies, carbon emissions would reduce to 8,895 tCO2e/yr from the biological treatment alone. The carbon emissions due nitrous oxide would also reduce from 30,739 tCO2e/yr to 4,477tCO2e/yr through the biological treatment process.

In a project intervention scenario, although the quantum of wastewater treated would increase in the design year, 2039, it would only result in increased GHG emissions from use of electricity at TSPS as well as STP, and increased sludge quantum and subsequent transport of dried sludge to BARC plant. However, the methane and nitrous emissions from treatment of wastewater and disposal of sludge would significantly be reduced due to improved methane correction factors in the proposed technologies. Furthermore, project intervention would ensure that there is no discharge of untreated sewage into the water bodies, thus reducing emissions from untreated wastewater discharged into the water bodies. Through the project intervention, 41,449 tCO2e/yr of GHG emissions can be saved on an average.

Increased plantation will aid in carbon sequestrations. The new STP will have a green belt around the plant (minimum of 30%-33% of area) as per existing national regulations and along internal roads. With this increased tree cover, 2783 tCO2e/yr of emissions can be reduced.

#### Community Health and Safety (ESS 4)

Community health and safety issues may result from poor quality of treated sewage, or discharge of untreated sewage/bypass during maintenance or extreme events and its impacts in downstream villages. Community Health and safety risk during construction may also be due to air pollution (dust & air emissions), odor, traffic movement, congestion & Safety, noise, others). Impacts due to flooding of STP premises during monsoons also need consideration. Impacts and risks on nearby communities



(especially squatter settlements) are expected during the construction phase and can be avoided, and managed by proper work activity planning, scheduling, training, and adopting mitigation measures. Impact on downstream users due to release of untreated sewage is also identified. This may happen due to failure of the functioning and during the construction phase. After the upgradation of the STP, there will be an improvement in the quality of the treated water released in the Sabarmati River which will benefit downstream users. Appropriate mitigation measures such as a Traffic Management plan and diversion of wastewater during construction will be required to avoid and minimize the impacts occurring and potentially identified on downstream users.

Settlements are located across the highway from the STP cluster. There is a squatter settlement that has come up after the STPs were commissioned, located along the service road and the Fatehwadi canal that may experience impacts largely related to dust & air emission traffic and related movement of material, equipment, and labor during construction. The present access road to the STP is 'kuccha' (mud road) and is not suitable for the movement of heavy vehicles and equipment. Road repair and upgradation, as part of the project, has been recommended to mitigate dust and air pollution during the construction phase of the project. This suggestion of the ESIA has been incorporated, and the proposed access road improvement is included as part of the subproject: Upgradation of existing 240 MLD STP at Vasna. As the existing mud road will be improved without any additional land requirement and as there is no houses right by the road, this will not cause any adverse social impacts.

Women and girls in the adjacent settlements and communities may face increased risk of genderbased violence, sexual exploitation and abuse and sexual harassment (GBV and SEA/SH) for women and girls due to larger labor presence and other labor influx related risks. The sub-project will implement the project level SEA/SH action plan (to be prepared by AMC prior commencement of civil work) to minimize and mitigate these risks. The project's GRM will have specific processes to handle grievances related to SEA/SH.

Considering the disaster proneness of the area, especially the flooding and safety aspects of the Vasna Barrage ; hydrological and flood assessment including a study on Dam Break Analysis & Flooding Stimulation, preparation of inundation maps and emergency action plan for Vasna Barrage has been done and results of that has to be considered in design of the facility construction and operations and emergency response plans appropriately considering community and worker health and safety and pollution impacts specifically during emergencies, and climate events .

Outcome/output of this assessment shall be incorporated in the design of all STPs which might be impacted and subsequently assessed in C-ESIA & mitigation measures if required included in C-ESMP. Emergency Preparedness and Response Plan and Disaster Management Plan will be part of C-ESIA/C-ESMP.

#### Land Acquisition, Restrictions on Land Use and Involuntary Resettlement (ESS 5)

The augmentation and upgradation of technology are proposed to be carried out within the existing STP premises boundary. An Informal settlement is located adjacent to the STP which will not be impacted due to road repairs and upgradation or any of the STP related activities during construction or operation.

There are no potential involuntary resettlement issues identified, as there is no land acquisition of private land or alienation of additional government land for the proposed upgradation. There are no restrictions to access the river or public infrastructure or change in land use due to the proposed rehabilitation of the STP. No families are located within boundary premises.

#### Biodiversity Conservation and Sustainable Management of Living Natural Resources (ESS 6)

The nearest key biodiversity area for this site is Thol Wildlife Sanctuary (man-made) in Mahesana district, which is around 20 km from the project site, with 10 km of intervening urban high density



mixed land use. The lake received water from rains and Narmada Canal, westward of the city and is not affected by outflows or air, noise, dust or vibration during construction and operations of the proposed STP.

On site, currently there are around 200 trees of various ages, mostly along the periphery of the site and internal roads, in addition to shrubs and over growth. Trees majorly include Peltophorum pterocarpum and Azadirecta indica. No endangered fauna / flora are observed on existing STP site. Measures to protect old trees will be considered during designing of the project. Clearing of shrubs will not have any impact on natural vegetation of the region. The proposed project may also require tree planting based on the number of trees cut. It was observed that the entire stretch of Sabarmati is infested with the Pistia sp. and Eichhornia crassipes which has altered the natural habitat. Sabarmati River stretch is a modified habitat as the water is being sourced from Narmada canal and stored at the river front stretch using the shutters of the Vasna Barrage. The riparian zone of the Sabarmati is converted into the riverfront in the Ahmedabad city. The region around is heavily industrialised, and fast converting into urban land uses, with pollutants reaching the already dry river. However, Hon'ble NGT has constituted River Rejuvenation Committee which has initiated the process of river rejuvenation, but curtailing pollution, monitoring e-flow, undertaking plantations etc, through various stakeholder departments. No tree cutting has been envisaged on STP site, as the construction will occur within footprint and site of existing STP. ESIA was prepared on the basis of the draft FR shared and in April 2022, there has been a change in the design and now it is proposed that in section I, STP of minimum capacity of 120 MLD shall be constructed in available 10 ha land. After demolishing of the existing STP and commissioning of the section I STP the remaining land area will be utilized to construct the remaining capacity of the STP. Based on discussions with design consultants, vacant land and land under existing UASB reactors and sludge drying beds may be utilised for construction of new STP and related aspects. Therefore, after finalization of design by DBOT, number of trees required to be cut will be finalized and must be mentioned in the CESMP.

Temporary construction stage impacts are expected on the existing flora and fauna on-site, due to air and water pollution and noise due to construction activities. However, the existing site is in the noisy neighbourhood where Metro Depot Construction work is ongoing. No uprooting of trees on site is expected, as proposed activities will be carried out on existing premises and/or structures. The proposed area is an existing STP and is a modified habitat hence the impacts on ecological aspects of the site are not envisaged.

Discharge of untreated/ sub-optimally treated sewage and waste into the waterbodies (mainly Sabarmati and Fatehwadi Canal) may impact the biological process of macrophytes and aquatic fauna. River Sabarmati is already an altered area/ modified habitat due to decades of low water flow as it is non-perennial, and inflow of water from Narmada Canal. There are no critical species here, and there will be no impact since the site is not natural and is a modified habitat with no ecological importance presently. NO RET species are recorded from the study area. However, the subproject interventions to improve the discharge quality will thereby improve the biodiversity in the river and the region downstream of the discharge point, thus supporting overall biodiversity improvement.

#### **Cultural Heritage (ESS 8)**

Assessment for heritage structures and cultural places was carried out. The nearest monument is the Fateh Baug Fort at a distance of 1.6 km from the STP which will not be impacted by the proposed activities in the existing STP site. Chance finds procedure to be implemented considering the status of the historic core of Ahmedabad as a World Heritage City.

#### Stakeholder Engagement and Information Disclosure (ESS 10)

Consultations were held with stakeholders including squatter settlement inhabitants, STP operators, AMC officials during the preparation of ESIA for sub-project and SEP for G-ACRP project and post disclosure of the ESMF and ESIA. The key findings from consultation with the residents of the squatter



settlement reveal that the squatter households do not have access to municipal services. They live in temporary structures in poor conditions. The slum dwellers do not have access to sanitary toilets and piped water. They experience odor from the STP and thus expect that the rehabilitation of the STP will help remedy this issue. The slum residents feel that labor influx may cause insecurity for them and they are not aware of grievance mechanism of AMC. The sub-project will implement the project level SEP to engage with relevant stakeholders including the poor and vulnerable groups. Any grievances regarding the sub-project activities will be processed through the project level GRM as specified in the SEP. AMC will conduct awareness campaign to inform the settlement dwellers about the GRM.

The ESIA for Upgradation of Vasna 375 MLD STP addresses the above suggestions of the stakeholders' post disclosure by including mitigation measures for issues raised in consultations such as access to public services, health and safety concerns during construction, improvement in the treated sewage quality, reduction is odor in operation phase, etc. Post disclosure of ESMF and ESIA consultations were carried out in February and March 2022. Public consultation was conducted on 07/06/2022 by AMC in Pandit Dindayal Upadhyaya Auditorium, Bodakdev, Ahmedabad. The key concerns raised by stakeholders have been incorporated in the ESIA for 240 MLD STP. The suggestions of the stakeholders by including monitoring of noise, sludge, air and water and its analysis for defining the baseline and mitigation measures. The project suggests improved management of all wastes and treated water quality to confirm with latest NGT suggested standards (with TSS<10 mg/l). Labour health and safety will be given high priority and appropriate measures to follow and monitor labour regulations have been suggested in the ESMP.

#### **Cumulative Impacts**

The cumulative impact assessment shows that the upgradation of 240 MLD sub-project and construction of new 375 MLD STP (within the STP site boundaries) at the site of existing 126 MLD STP (and then demolishing the existing STP), and rehabilitation of Pirana 180 MLD STP will have positive impacts on all the environmental parameters particularly the water quality of the Sabarmati River and/or Fatehwadi Canal and downstream uses<sup>3</sup>.

Existing operating STP BOD, COD, TDS, concentrations load were found higher which after treatment and meeting the NGT guidelines would significantly decrease these loads and will have positive impacts on the Sabarmati River water quality. It can be expected that the biological diversity may increase in this non-perennial river in the long run, and ground water quality in the region would improve.

The Vasna 126 MLD capacity plant treats about 9% of the total sewage generated in AMC. New STP of 375 MLD capacity in place of the existing one will reduce the environmental load on BOD, COD and TSS (including that of untreated/sub-optimally treated sewage getting directly/indirectly reaching the river) by around 70 to 80%.

Existing sewer lines and TSPSs cater to this STP. Minor improvements to TSPS are proposed as part of the rehabilitation of the STP.

Air quality during construction may have a temporary cumulative impact due to the ongoing construction activities at the Gyaspur metro depot situated to the northern side of the proposed subproject site. The project was expected to be completed by April 2022, which might get delayed due to the ongoing third wave of Covid 19. However, it is expected that the construction would get completed before initiating site works for the proposed new Vasna 375 MLD STP construction. The rehabilitation of Vasna 240 MLD STP will also contribute to the incremental air pollution due to construction activities if carried out simultaneously. However, demolition activities at Vasna 240 MLD STP would begin before demolition activities at Vasna 126 MLD STP where the construction of STP is proposed in two sections. Initially Section I of STP with minimum capacity of 120 MLD shall be constructed to meet better

<sup>&</sup>lt;sup>3</sup> In case GPCB provides consent for disposal of treated sewage into Fatehwadi Canal to reuse for irrigation



discharge standards (NGT suggested norms with TSS<10 mg/l); in the available 10 ha land parcel. After commissioning of Section I STP, existing STP will be demolished, and the area thus retrieved, and the available remaining site area will be used to construct the remaining capacity of STP (255 MLD) and odor control system. Hence such cumulative impact is expected to be for a limited period during overlapping construction periods if any. Since the site is surrounded by STPs Metro Depot, and the river; sensitive receptors of noise and dust impacts are the squatter settlements along the access road. Short-term impacts on receptors are associated with the impacts due to increment in air pollutants like dust, and emissions from vehicles and machinery, increment in noise levels due to movement of vehicles, and operation of machinery which could be mitigated by adopting best practices and mitigation plans.

The surfacing of the approach road to 240 MLD STP and 126 MLD has been included in the rehabilitation of Vasna 240 MLD STP. The construction of all-weather roads will significantly mitigate air pollution during the construction phase.

Sabarmati River carries discharges from multiple sources including industries, STPs, effluent treatment plants, 'mega line' carrying treated effluents from CETPs of industrial areas, commercial / residential areas, storm water drains, canals etc., in the city of Ahmedabad, and the region upstream (which has agricultural areas, and city of Gandhi Nagar and other local bodies), and downstream (agricultural areas and industrial centres).

Currently, the quality of treated sewage from the Vasna 126 MLD STP is suboptimal as it is old, obsolete, not able to treat to the required discharge standards as per the Consent to Establish and Operate Conditions laid down by GPCB. AMC aims to achieve the stringent quality of treated effluent in its new STPs and those proposed under G-ACRP, and at the same time reuse treated effluents<sup>4</sup> to ensure resource efficiency and reduce Biological Oxygen Demand (BOD) load on receiving water bodies. It is estimated that the subproject with increase in capacity to 375 MLD (from 126 + 35 MLD, with treated sewage meeting NGT prescribed stringent standards with TSS<10 mg/l and WB EHS) can ensure around 70-80 percent reduction in BOD, Suspended Solids, Phosphate and Nitrate pollution load due to this facility if implemented. Therefore, it is not expected that the proposed Vasna STP project will be resulting in negative cumulative impacts for the receiving body but will contribute to improving the quality of water in the receiving water body.

#### 8. Environmental and Social Management Plan (ESMP)

ESMP for the design/ pre-construction, construction, and operation stages of the project has been developed based on the assessment conducted. It presents the management of environmental and social impacts adopting mitigation hierarchy - (a) Anticipate and avoid risks and impacts; (b) Where avoidance is not possible, minimize or reduce risks and impacts to acceptable levels; (c) Once risks and impacts have been minimized or reduced, mitigate; and (d) Where significant residual impacts remain, compensate for or offset them, were technically and financially feasible. ESMP will be incorporated in the bid documents while bidding out DBOT contracts so that the contractor allocates the required resources and mechanisms to implement these measures.

The treated sewage quality for discharge into Sabarmati shall comply with the standards suggested in this ESIA (NGT prescribed standards with TSS<10 mg/l) and/ or most stringent standards prescribed by the GPCB/NGT/regulators at any point of time. If AMC and Irrigation Department wishes to reuse treated water for agricultural purposes consent for disposal of treated sewage to Fatehwadi Canal shall be arranged from GPCB and after conducting a detailed study through Agricultural University based on the CPCB guidance on reuse of treated water for irrigation. The design shall incorporate mitigations measures and emergency preparedness to protect from flooding; AMC has conducted hydrological and flood assessment including a study on Dam Break Analysis & Flooding Stimulation,

<sup>&</sup>lt;sup>4</sup> FR mentions the same ins Chapter 1 in Provision of Sustainable Green Interventions



preparation of inundation maps and emergency action plan for Vasna Barrage has been done and results of that has to be considered in design of the facility construction and operations and emergency response plans appropriately considering community and worker health and safety and pollution impacts specifically during climate events. Provision to hold untreated sewage, diversion to other STPs or other suitable measures are required to be made so that during any STP breakdown/ shutoff or emergencies, the untreated sewage does not flow into the water body or nearby premises and downstream villages; in line with NGT and High Court orders on release of untreated sewage into the environment.

Responsibility to prepare Sludge Management Plan is with the Contractor, and will be approved by AMC. Mechanical cleaning will be recommended strongly and any manual cleaning will be avoided for USAB reactors and all sludge management mechanisms.

Regular cleaning/ removal of sludge and solid waste to minimize odor nuisance and its disposal shall be ensured by AMC, in their facilities as per existing regulations. Solar lighting/ use of solar energy as much as feasible (provided disposal of hazardous and e-waste including solar disposal is arranged as per regulations, proper storage and use of PPEs while working with damaged panels are ensured). Energy saving fitting (LED lighting) and equipment, motors are fitted with variable frequency drive (VFD).

Special attention to include vulnerable groups in project benefits and continuous stakeholder engagement to ensure such inclusion. Preparation of Standard Operating Procedure (SOP) for various activities which includes training, PPEs use, templates for permissions, recording and reporting, by contractors/ PIU. IEC materials shall be planned, printed and displayed during construction, creating awareness, display of posters etc. Training and capacity building of the designated persons for implementing of various plans.

#### 9. Monitoring Plan

During the construction phase, Environmental and social monitoring will be carried out to check the quality of the environment and triggering of social impacts during ongoing construction activities. It will be carried out through a contractor and PIU will be responsible for the review of the implementation of monitoring. Monitoring will include assessment of Ambient air quality, Intake sewage quality, outfall treated water quality, Ambient noise, Ground water quality, soil quality, and sludge quality. This monitoring shall also include OHS aspects, community safety, and workers safety, labor and working conditions, livelihoods impacts, consultations as part of Construction Supervision and Quality Control by the PMC.

During the operation phase, environmental monitoring will be conducted to understand the impacts on environmental attributes due to project activities. It will be carried out through the DBOT/ O&M contractor and AMC will be responsible for the review of implementation. Monitoring will include Ambient air quality, Inlet sewage quality, outlet treated water quality, Ambient noise, Ground water quality, Soil quality & sludge quality.

To ensure adherence to the ESMP, maintenance of the plant and CTE conditions E&S audit shall be conducted by a third party during the operation phase.

The annual E&S audit to include:

- 1. Physical assessment of the STP and units' operation status and premises
- 2. Identification and assessment of environmental management practices
- 3. Health and safety risks for workers and communities including GBV, SEA/ SH risks
- 4. Compliances to ESS, National, State, and Local laws and mandatory and statutory compliances including permissions, consent conditions, labor health, safety, security, welfare, etc
- 5. Implementation of EHS, GRM, various action plans at the site.
- 6. Maintenance of documents, records, and reports required for the site.
- 7. LMP compliances.



- 8. Assessment of capacities, technology in achieving NGT standards with TSS<10 mg/l and for design specification
- 9. Environmental monitoring analysis pre and post-treatment
- 10. Sludge generation and treatment.
- 11. General work safety records and incident reporting
- 12. Compliance to CTE (in the construction phase) and CTO (in operation phase) conditions or other regulatory conditions.
- 13. Support provided to slum communities

## 10. Capacity Building

Capacity building will be required at all stages including planning, construction, and operation. It will include various workshops and seminars for AMC project staff, concerned PIU, Contractors staff, supervisors, consultants, environmental and social experts, laborers, stakeholders, etc. The topics for training will include Health and Safety, Environmental management and ESMP implementation, regulatory requirements, Monitoring requirements, Gender equality, biodiversity and wildlife awareness, and others.

## 11. Grievance Redressal Mechanism

The types of grievances stakeholders may raise include, but are not limited to:

- Construction related impacts cracks, damages to structures; dust damaging crops/ trees
- Health and safety risks.
- Negative impacts on the environment.
- Negative impacts on communities, which may include, but not be limited to financial loss, physical harm, and nuisance from construction or operational activities and GBV, SEA/SH.

AMC has a functional complaint system (CCRS, http://www.amccrs.com) which includes a web portal and a toll-free number. It records almost 40-50 thousand complaints every month. Any complaint registered in the system is forwarded to respective zones for action. Each complaint has a proper system by which it can be escalated if one is not happy with the resolution. If some complaints come directly to the zonal office (mostly from the urban poor) they are recorded in the main system. The CCRS is synced with the Gujarat Government's CM Helpline and any complaints coming there are also recorded in the system.

# **12.** Implementation Arrangements

This ESIA is prepared at the Feasibility stage of the proposed subproject. At this stage, Feasibility for rehabilitating the STP and its implementation mechanism has been examined and the Feasibility Report suggests bidding out the proposed subproject in a technology-agnostic manner under Design -Build - Operate (DBOT) Format, where the bidder can suggest the best environmentally appropriate technology to ensure the suggested discharge standards. In this case, since the technology is not finalized at this stage, it is proposed to include the ESMP in the procurement documents to enable the DBOT contractor to understand the E&S requirements and include required resources and implementation mechanisms to ensure the management/ mitigation measures. Once the design is finalized during the implementation stage, the DBOT contractor will get the ESMP updated based on actual technology/ design. Sustainable Urban Development Unit (SUDU) of the PIU constituted at AMC, along with PMC will review and send the document for World Bank review and approval. PMC will supervise E&S aspects and OHS / CHS as part of construction supervision and quality control. The third-party audit will be conducted annually during each year of the project, also including a review of all E&S aspects during construction including ESMP implementation, OHS/ CHS and environmental monitoring. The E&S audit will be shared with the World Bank for review and comments, and finalised based on comments/ suggestions and corrective/improvement measures will be implemented in a time bound manner. Subproject details will be monitored through ESMIS.



## 13. Estimated Budget for Implementation and supervision of ESMP

Total project cost for design and upgradation of STP to meet NGT standards with TSS<10 mg/l, biogas plant and transportation of sludge to disposal facility, Grid-connected Solar Roof Top system, odor control unit, construction of bituminous road, setting up of contractors' yards, contingences is INR 693 Crores (INR 69 million). ESIA, CESMP updation by separate ESIA consultant, and E&S specialists with the Contractor to oversee implementation shall be made part of project design & Human Resources Fee; in addition to green belt development cost, labour camp establishment (if required), permits/licence/ consent fees. The total residual cost of ESMP implementation during design/ preconstruction (6 months to 1 year), construction (4.5 years) and operations stages (15 years) is INR 4.93 Crores (INR 49.36 million, USD 631505.54<sup>5</sup>) during pre-construction/ construction stages; and annual cost of INR 23.31 lakhs (INR 2.33 million, USD 29876.46) every year of O&M. This includes Monitoring Costs and ESMP Residual Costs (other than those made part of Contractors Works Costs such as labour camp, green belt, PPEs etc, C-ESIA/ CESMP cost, Permit/ Licence Costs and Human Resources Cost).

#### 14. Aspects for inclusion in ESCP

Disclosure and consultation of this ESIA, inclusion of the ESMP prepared here in procurement documents for agreement from the contractor on E&S requirements, and Updation of ESIA and ESMP for the subproject after finalizing the detailed design shall be included in ESCP.

Design should be responsive to the quality of sewage received at the inlet, and measures shall be incorporated to meet the suggested standards. Bidding documents and contracts to include ESMP and Monitoring Plan to enable the DBOT contractor to allocate appropriate time, resources (manpower and budget) for implementing ESMP Update as required, get approvals, disclose and implement the Environmental and Social Management Plan (ESMP) for Proposed Rehabilitation of Vasna 375 MLD STP subproject.

A detailed study on flooding and its impact on investments shall inform the building of resilient infrastructure. C-ESIA, C-ESMP shall be prepared by the DBOT contractor for the design prepared, incorporating the recommendations of the assessment on flooding which has been completed. In addition, AMC shall have adequate capacity to implement and monitor the sub-project E&S requirements, ESMP, Monitoring Plan, and Capacity Building requirements identified here, as stipulated in ESCP.

Monitor all emissions/discharges/ disposal of wastes (including sludge, slurry) from project facilities during construction and operation stages and ensure that the discharges from project facilities into the environment are as per the latest limits suggested by MoEFCC, GPCB, WB EHS and National Green Tribunal whichever is stringent for each parameter. The technology shall be upgraded to meet the directions of GPCB in the consent orders, and any stringent standards suggested by regulators. Conduct earthquake proneness, and flooding/ other risks if any due to presence of Barrage or any disasters; and incorporate avoidance, mitigation, and management measures and Prepare Disaster Management Plan including Standard Operating Procedures for each STP (as part of DPR, ESIA). Operations shall also follow the latest Disaster Management Plan for Gujarat.

#### **15.** Stakeholder consultations

Consultations were carried out for the preparation of the draft ESIA report. Consultations have been carried out with various stakeholders including squatter settlement inhabitants, STP operators, AMC officials during the preparation of ESIA for sub project. Stakeholder consultation is a dynamic process and consultations will be carried out during the life cycle of the G-ACRP project. Draft and Final ESIA, ESMPs (in English, with translated summary in Gujarati) has been disclosed on the website<sup>6</sup> of the implementing agency, namely AMC, and in the external website of the World Bank on Feb 10, 2022.

<sup>&</sup>lt;sup>5</sup> Based on average from 9<sup>th</sup> to 18<sup>th</sup> May 2022, INR to USD exchange rate was 77.45.

<sup>&</sup>lt;sup>6</sup>https://ahmedabadcity.gov.in/portal/web?requestType=ApplicationRH&actionVal=viewAttachment&queryType=Select &screenId=2900003&AttachmentFileName=ESIA-126-MLD-STP.pdf



Consultations were also carried out after a month of disclosure of ESIA and ESMP on the website of AMC. The suggestions of the stakeholders are incorporated, and the documents will be re-disclosed.

#### 16. Recommendations and the Way Forward

This ESIA/ ESMP shall be updated once the detailed sub-project design is finalized during the implementation stage. ESIA has assessed and outlined important points which shall be included in the Procurement Documents and the detailed design during the implementation stage; for ensuring environmentally and socially beneficial works and operations. The key impact of the subproject will be overall benefits due to the improved quality of treated sewage discharged into the Sabarmati River, resulting in an overall improvement in the environment and health of the people in the city and its region. The ESIA highlights the moderate level of risks and impacts on environmental and social parameters due to the proposed sub-project. These are not long-term – irreversible; but mostly expected to occur during the construction phase and can be avoided, mitigated, and managed. There is no involvement of land acquisition for this project as the proposed activities will be conducted within the existing boundary. There will be minor to moderate construction and operation stage risks and impacts on (i) Noise and Air quality due to construction and demolition, transportation activities, (ii) Occupational and Community Health and Safety risks and impacts, (iii) minor disturbances to local/onsite flora and fauna and nearby locally important cultural assets (graveyard) during construction phase, (iv) generation of sludge and wastes including (solid waste, non-biodegradable wastes, E-wastes, Hazardous Wastes, and C&D Wastes) which need to be managed well to minimize risks and impacts, (iv) accidental discharge of sub-optimally treated sewage or flooding v) Impacts of discharge from STP on adjoining communities, during construction phase and downstream communities during operations phase; vi) increased risk of gender based violence, sexual exploitation and abuse and sexual harassment (GBV and SEA/SH) for women and girls due to larger labor presence and; other labor influx related risks. ESMP lists out mechanisms to avoid, mitigate and manage these risks and impacts through good design, adoption of stringent discharge standards and regulatory compliance; and following good international industry practices. Mitigation measures for the same are provided. There will be cumulative impact due to the outflow of treated sewage from this and other STPs proposed to be upgraded through G-ACRP which will be highly beneficial given the project objective to ensure stringent discharge standards. After implementation of the subproject treated water quality will be improved and the same will help improve the ecological balance of the Sabarmati River which is currently a modified habitat with no water during most of the year, thereby resulting in an overall better environment and health of the city and its region.



# SUMMARY (in Local Language)

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BOD(mg/l):	20	28.86	$\leq 10$
COD(mg/l):	100	117.39	$\leq$ 50
SS (mg/l)	30	38	≤ 10
pН	6.5 to 8.0	7.61	6.5-9.0
Fecal Coliform MPN / 100 m	1000-10000	2x10 <sup>5</sup>	<230/ <100
Ν	Nil	22.68	≤ 10
Р	Nil	2.5	≤ 1




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# **CHAPTER 1. INTRODUCTION**

# 1.1 Background

The Government of Gujarat (GoG) has requested the Bank to support the Ahmedabad Municipal Corporation (AMC) in developing resilient urban infrastructure to address the evolving needs of rapidly expanding urban population in the city, through the Gujarat Resilient Cities Partnership: Ahmedabad City Resilience Project (G- ACRP). The city which is a key economic growth centre for the state, has expressed that there are key gaps in basic urban infrastructure relating to wastewater management/recycling and reuse, storm water drainage, lake and water body rejuvenation and flood risk management. Further, there are several institutional, planning, financing and governance issues related to service delivery including lack of integrated multi-sector approach for sustainable and resilient municipal service delivery, primarily across various service sectors.

The proposed development objective of G-ACRP proposed to be supported by the World Bank's Investment Project Financing (IPF) is to develop resilient and sustainable urban service delivery and financial systems in Ahmedabad. As a first phase of a programmatic partnership, G-ACRP will provide financing and technical support to Ahmedabad city for implementing reforms and investments to improve service delivery and establish a solid foundation to extend support to other cities in Gujarat. G-:ACRP will support AMC in addressing key institutional, financial, and service delivery constraints to improve the resilience and sustainability of priority urban services. G-ACRP project consists of three major components which will strengthen AMC's institutional and financial systems and revenue performance; Improving wastewater management services; and develop state level institutional systems and capacities. The proposed subject of the construction of STP is proposed in two sections. Initially Section I of STP with minimum capacity of 120 MLD shall be constructed to meet better discharge standards (NGT suggested norms with TSS<10 mg/l); in the available 10 ha land parcel. After commissioning of Section I STP, existing STP will be demolished, and the area thus retrieved, and the available remaining site area will be used to construct the remaining capacity of STP (255 MLD) and odor control system and upgradation of the allied infrastructure including existing three terminal sewage pump station/s at Vasna, Ahmedabad is being undertaken under the ACRP project. Details of the sub project are discussed in details in section 1.3 below. AMC intends to implement this subproject in a Design-Build-Operate -Transfer format and is in the process of preparing Feasibility Report for this subproject. Royal Haskoning DHV Consulting Pvt. Ltd. in consortium with TTI Consulting Engineers (India) Pvt. Ltd. has been appointed as Consultant to prepare the Feasibility Report with preliminary design for the project.

AMC has appointed TATA Consulting Engineers Limited (TCE) to prepare ESIA reports for the subprojects which would be taken up during initial two years under G- ACRP. This report is the ESIA prepared by TCE for the proposed subproject **CONSTRUCTION OF NEW 375 MLD STP AND UPGRADATION OF THE ASSOCIATED INFRASTRUCTURE INCLUDING EXISTING THREE TERMINAL SEWAGE PUMP STATION/S AT VASNA, AHMEDABAD** 

# 1.2 Rationale for the Proposed Sub-Project: CONSTRUCTION OF NEW 375 MLD STP AND UPGRADATION OF THE ASSOCIATED INFRASTRUCTURE INCLUDING EXISTING THREE TERMINAL SEWAGE PUMP STATION/S AT VASNA, AHMEDABAD

Ahmedabad city is unique in its geographic features (such as almost flat terrain, Sabarmati and Khari rivers draining the city and its region, presence of lakes), climatic conditions (hot-semi arid with less rainfall, scorching summers, and very cold winters), and environmental characteristics; and is prone to extreme events (such as floods and earthquake). The population of Ahmedabad



the fifth largest city in India was 5.57 million in 2011 (Census) estimated to be 6.3 million by 2020. With the increasing opportunities for trade and commerce and as a centre for higher education, this heavy growth continues. It is highly industrialized, with a high-density population living hand in hand with a beautiful heritage. Water availability is less mainly dependent on Narmada waters, while the demand for industrial effluent and wastewater management, sanitation, and waste management are increasing day by day. Today, with its status as a predicted megacity, upgrading and developing sustainable urban environmental infrastructure is very important for its people and environment.



Figure 1 Sewerage Catchments in AMC

There are six (6) Sewerage (drainage) zones in Ahmedabad. The city has 98 percent water supply network coverage with adequate bulk water treatment capacity. The current per capita water supply is estimated to be 150-160 lpcd, which is slightly more than national benchmark level of 150 lpcd as per the CPHEEO manual. AMC is divided in 6 sewerage catchment areas, three of these are at eastern side and other three are at western side of the River Sabarmati. There are 68 sewage pumping stations, out of these 10 are terminal sewage pumping stations.





Figure 1 Location of STPs including Vasna 126 MLD

The City has 3302 km sewer network with 1.27 million house connections, 64 Sewage pumping stations and 18 Sewage Treatment Plants with a total treatment capacity of 1248 MLD. Around 90% of the city area is served by the existing sewer network.

Population in the catchment area of the Vasna STPs Including Vasna 240 MLD, Vasna 126 MLD, Vasna 35 MLD and Vasna 48 MLD STPs) will increase from 1.5 million in 2021 to 2.3 million in 2039 which will increase the sewage quantity to be treated from 209.26 to 315.15 MLD in the same period.

Ahmedabad was granted the status of a Metropolitan city in 2014. Accordingly, the per capita water supply to Ahmedabad is 150 lpcd. Thus, the sewer network design and treatment capacity of STPs would have been based on 122 lpcd of sewage generation as shown in the Table 1 below. Additional quantity of about 7% of the sewage shall be allowed on account of infiltration into the sewers. The CPHEEO Manual restricts the infiltration flow to a maximum of 10%.

SI. No	Description	Prior to 2014 (lpcd)	After 2014 (lpcd)
1	Water Supply to residents (Excluding UFW)	135	150
2	Allow supply for commercial institutional &	7.5	7.5
	Civic amenities (minimum)		
3	Total per Capita water supply	142.5	157.5
4	Sewage generation (80% of water supply)	114	126
5	Infiltration- 7% (Maximum 10%)	7.98	8.8
6 Total per capita sewage generation		122	135

Table 1: Sewage Generation Details

The sewage generation based on 150 lpcd water supply and the estimated population of 7.13 million in 2021 is 963 MLD. Not all sewage generated in the catchments reaches the STPs for treatment as some of the sewers in the trunk sewer network of the catchments are dysfunctional or partially defunct. However, when the problematic sewers in the network are rehabilitated, the STPs are expected to receive the full amount of sewage.



Western Zone -2 covers approximately 75 sq. km. area of AMC. Catchment to the 126 MLD treatment Plant at Vasna include Area Between 132 feet Ring Road and S. G. Highway, Old AUDA area, Chandlodiya, Ghatlodiya, Memnagar, Vejalpur, Prahaladnagar, Satellite, Vastrapur, Maktampura.

The estimated contributing population for this zone is about 14.53 lakh. As per the SCADA records, about 338 MLD sewage is generated at present in this zone.

The entire sewage from this zone is ultimately conveyed to four STP at 60 MLD Jal Vihar, Vasna 48 MLD, Vasna 35 MLD and Vasna 126 MLD at Vasna through three TSPS.

Vasna Barrage TSPS receives wastewater from the interceptor sewer and feeds to 35 MLD STP. Vasna Terminal 76 MLD TSPS feeds to 48 MLD STP while the Vasna (AUDA) 126 MLD TSPS feed to 126 MLD STP. The wastewater from Chandrabhaga drain is intercepted and taken to Jal Vihar STP. The Western Zone 2 catchment has four STPs Viz 60 MLD Jal Vihar, 35 MLD Vasna, 48 MLD Vasna and 126 MLD Vasna. At Vasna, the three STPs viz 240 MLD (Activated Sludge Process (ASP)), 35 MLD (ASP) and 126 MLD (Up flow Anaerobic Sludge Blanket (UASB)) are located in close vicinity. The study of their respective upstream sewerage infrastructure revealed that some part of catchment area of 126 MLD and 35 MLD are common while there is altogether different catchment area for 240 MLD STP.

As stated above, there is a gap between the amount of sewage generated within the AMC limits and the total amount of wastewater treated. Existing large STPs established more than 10 - 12 years back have been working in a suboptimal manner due to operation and maintenance issues, which has also contributed to increasing the pollution load in the river Sabarmati to which they discharge the treated water as suggested in the Consent Conditions issued by the regulator, namely Gujarat Pollution Control Board (GPCB). At various locations along the Sabarmati River, it has been observed that wastes, domestic wastewater, sewage and effluent from few industries are being directly discharged into the river. This has affected the quality of water in Sabarmati River, the farmlands and communities downstream which are dependent on the river and the ground water quality in the nearby localities.

This plant is based on UASB technology and currently, has to abide by the discharge standards in the Consent Conditions issued by GPCB based on MoEFCC 2017 standards. The quality of treated sewage however is not as per consent conditions and needs improvement. AMC aspires to upgrade the plant to meet stringent standards put forth by NGT for important parameters and the CPCB General Discharge standards for other parameters, as these are either more stringent (for BOD, COD, TSS) or at par (for N P, Oil and grease) with the discharge standards suggested in WB EHS. The earlier design parameters did not consider the Biological Nutrient Removal i.e., BNR capability which affect the quality of treated effluent for discharge. Hence, the existing Sewage Treatment Plant (STP) of 126 MLD capacity at Vasna is proposed for capacity augmentation under the G- ACRP project. AUDA had setup this STP in 2010 under Jawaharlal Nehru National Urban Renewal Mission of the Government of India at a cost of INR 842 million to treat sewage at Vasna site. Many of the systems and equipment in the STP require upgradation and replacement. This STP is not functioning optimally as evident from the quality of treated sewage. AMC proposes to (i) increase the capacity of the STP and change the treatment process to enable it to accept and treat the sewage generated by all occupants in its catchment optimally. (ii) ensure higher efficiency and achieve service level benchmark set by National agencies and regulators, (iii) achieve a better quality of treated sewage as suggested by the National Green Tribunal (which would meet the prevailing MoEFCC 2017 discharge standards as well). This will reduce discharge, and bypass untreated or suboptimally treated sewage and sludge in waterbodies and land in its catchment and area of influence minimize contamination of surface and ground water sources, and overall improvement in the health of the environment and the society.



# **1.3** Proposed Sub-project Details

The existing Sewage Treatment Plant (STP) of 126 MLD capacity at Vasna is proposed for upgradation to 375 MLD capacity under the G- ACRP project. The proposed project design as per FR submitted was for 375 MLD in existing premises. In April 2022, there was a change in design and STP is, now, proposed to be constructed under sectional completion. Section I of min. 120 MLD capacity shall be constructed in available vacant land in existing premises within 2.0 years and after its commissioning, flow received at existing 126 MLD STP shall be diverted to new Section I STP.

The construction of STP is proposed in two sections. Initially Section I of STP with minimum capacity of 120 MLD shall be constructed to meet better discharge standards (NGT suggested norms with TSS<10 mg/l); in the available 10 ha land parcel. After commissioning of Section I STP, existing STP will be demolished, and the area thus retrieved, and the available remaining site area will be used to construct the remaining capacity of STP (255 MLD) and odor control system. ESIA has been revised based on discussions held with design consultants (DHV), AMC, and TCE experts. Construction period is considered for 4.5 years and O&M period – 15 years.

The existing STP was built in the year 2002 and over the years, its functioning is deteriorated as evident from the quality of treated sewage, and many of the infrastructure is dilapidated. AMC proposes to:

- i. change the treatment process to enable it to accept and treat the sewage generated by all occupants in its catchment optimally,
- ii. ensure higher efficiency and achieve service level benchmark set by National agencies and regulators,
- iii. achieve better quality of treated sewage as suggested by the National Green Tribunal (NGT) which would meet the prevailing MoEFCC 2017 discharge standards as well.

Following are the components proposed in this sub-project -

- i. STP Upgradation– New STP will be constructed with 375 MLD capacity (instead of the existing 126 MLD STP (proposed for demolition) and 35 MLD STP (presently noted as to be abandoned in FR) to meet at the minimum, the agreed discharge standards.
- ii. Demolition of existing 126 MLD STP at Vasna, after construction of new STP is complete, and abandonment of Vasna 35 MLD STP as per FR. Though it is expected that none of the existing civil structures would be used at STP but exact details of defunct civil structures would be known only at the Design stage after the contract is awarded.
- iii. Terminal Sewage Pump Stations - There are minor defects like seepage/leakage in the structures, corrosion of reinforcement, spalling of concrete, minor cracks, damaged railing, damaged water proofing, spalling of plaster etc in structure observed during the visual inspection of the TSPS structures. All these minor defects will be repaired for the intended use by grouting, repair mortars, geniting etc. as per the rehabilitation methodology; and electromechanical and other works will be undertaken. Electric works include At Vasna AUDA 126 MLD TSPS, there will be six nos 250 KW of pumps and two nos of 132 KW pumps in the proposed scheme and will be fed from the new LT panel. At Vasna Barrage 35 MLD TSPS, 11 KV panels will be replaced with new panels of same capacity and will be controlled from SCADA. The two nos of 1250 KVA transformers will be replaced with new one and the secondaries will be connected to an LT panel having two incomers bus coupler system. The LT panel will be replaced with new one with two incomers bus coupler system. At Vasna 76 MLD Terminal TSPS, two nos of 2000 KVA transformers will be used, and the secondaries will be connected to an LT panel having two incomers bus coupler system. Programmable logic controller (PLC) based control panel and SCADA interface - A new PLC based Control



Panel is proposed with latest configuration which will enhance the automation level of the126 MLD (AUDA) Vasna TSPS operations and monitoring.

- A new pumping main of 2000 mm diameter to be laid from TSPS to the upcoming 375 MLD STP Vasna to supply 160 MLD raw sewage for treatment on an average and to carry the maximum spontaneous flow of 320 MLD
- v. Outfall facilities it is proposed to consider two nos. of 1800mm diameter sewers with a new outfall structure for discharge into Sabarmati as existing outfall to Sabarmati River will become insufficient wrt 375 MLD capacity and therefore shall have to be abandoned. Outfall towards Fatehwadi canal is already closed by AMC and same shall continue.
- vi. Sludge management Biogas plant is proposed along with AMCs proposed Sludge Management Facility

Available land at existing 126 MLD STP is approximately 22.0 hectares. Design will consider land optimising options in terms of technology and economizing land requirement. Land to be reserved for future expansion of the STP.

The estimated cost for the proposed upgradation works is approximately 800 to 850 crores.

# Table 2: Cost Estimate for the Proposed STP Rehabilitation and allied facilities is based on thefollowing

Sr. No.	Description of Item	Qty
1	survey and investigation by total station, Geotechnical survey, Hydraulic designs & drawings, Structural designs & drawings, detailed estimates/BOQs with all necessary reports (Preliminary and Detailed Design reports, any technical notes as required) including preparation of as-built drawings, vetting of design & drawings from NIT/IIT etc complete as per directions of Engineer in Charge. The cost of preliminary works such as setting up offices for contractor and client, Contractor's yard etc is included in the cost.	LS
3.	Terminal Pump Station: Upgrading 3no. of Pump Station and its allied rising mains for 126 MLD Vasna (AUDA), Vasna Terminal and Vasna Barrage Terminal Pump Stations. Design, supply, install, commissioning of step screens, pumps, motorised valves, local PLC system, electromagnetic flow meters, street lighting etc. complete to accommodate in the existing pump stations including all Civil, mechanical, Electrical and Instrumentation works etc. Complete.	1 Lot
4	Designing, constructing, hydraulic testing, commissioning and giving satisfactorily trial runs of 375 MLD STP (two sections) of Advanced modern Sequential Batch Reactor Technology with Biogas generation which can be accommodated in the limited identified land space consisting of Preliminary, Secondary and tertiary units and necessary outfall pipes with outfall structure etc. complete as per the requirement of NGT Standards with relevant national/ international codes etc. necessary piping work with required valves, gates, drains, path Ways, Administration Block cum Laboratory, Blower house and watchmen quarters as necessary, Laboratory Equipment, Internal Roads, Pathways, Tools and plants, Treated effluent arrangements etc. complete as turnkey job with all involved Civil, electrical, Instrumentation and mechanical works, units as per detailed specifications for civil, electrical, Instrumentation and mechanical components complete to achieve discharge standards BOD < 10ppm, TSS <10ppm, COD <	375 MLD



Sr. No.	Description of Item	Qty
	50ppm for disposal to river (for 375 MLD) as mentioned in the employers requirements in the Bid documents. Plant shall be constructed in two sections. The contractor shall dismantle the units and equipment's as per the requirement and as per direction of the EIC. The plant should be completely automated with SCADA etc complete.	
5	Solar Roof Top System with local metering	Lot
6	Approach Road	Lot
7	Dismantling of STP	Lot



# 1.4 Objectives and Scope of the ESIA

The subproject has to comply with the Environmental and Social Framework (ESF) of the World Bank (WB) and its Environment and Social Standards (ESS). The sub project also needs to comply with various Central and State Government standards, guidelines and statutory requirements. As per the Environmental and Social Management Framework (ESMF) prepared by AMC for the G- ACRP, all proposed subprojects activities shall be screened, and risks categorised, to determine the extent of E&S due diligence required. Hence, for the proposed upgradation of existing 126 MLD STP at Vasna, Initial Environmental and Social Screening (IESS) was conducted using the screening format in the ESMF, and risk level was determined. Since the upgradation of existing Vasna 126 MLD STP was identified as a Substantial risk subproject, it requires assessment of E&S risks and impacts along with the preparation of Feasibility Report/ Detailed Project Report. The subproject will be bid out for implementation on a Design – Build – Operate – Transfer (DBOT) mechanism, also integrating the ESMP prepared through this ESIA in the procurement documents, so that the contractor can plan and arrange the required capacity and resources for implementing and managing the E&S aspects. At this Feasibility Report Stage, before detailed design of the proposed rehabilitation works, it is established that the location of the facility will not change. Suggested technological options and plan for upgradation are outlined in the Feasibility Report. Based on this and the regulatory requirements, the ESIA assesses the potential risks and impacts of this subproject. While the location will not change, almost all existing Electro-mechanical and instrumentation assets at STP and majority of them at TSPS will become defunct after commissioning of STP and TSPS. It is expected that none of the existing civil structures would be used at STP but exact details of defunct civil structures would be known only at the Design stage after the contract is awarded The handling and disposal of same is in Contractor's scope. , the DBOT contractor once on board will further update the ESIA and ESMP based on the final technology which would be adopted, and the detailed design which will be prepared for the subproject.

Proposed upgradation activities i.e., Demolition of existing structures, construction, remodelling, upgradation of existing structures to, preparing access roads, High pressure wash water screening, installation of equipment such as TSS analyser, replacement of screens, belt conveyor, SCADA system, upgradation of laboratory, screenings and sludge management etc. must adhere to the best standards for sustainable environment, social acceptability and economic viability. As per the World Bank ESF, prior to investing into such development projects the Environmental and Social Impact Assessment is to be carried out.

Tasks undertaken by TCE while preparing the ESIA:

- Supporting the Client in updating the ESMF Stage 1 & 2 Screening
- Environmental & Social Audit of the existing STP
- Review of key environmental & social legislations applicable to this project and necessary regulatory requirements, Word Bank ESF, ESMF for G- ACRP and other guidance.
- Assessing the baseline status of air, water, noise, soil, land, ecology, cultural heritage and socio-economic aspects. In order to assess these impacts baseline monitoring was conducted for the sub project site and its immediate surroundings and areas within 5 km radius.
- Conducting stakeholder consultations for environmental & social issues.
- Assessing the Social and Environmental risks and impacts of the subproject due to the upgradation/ construction and operational phases including cumulative impacts due to other STPs and other activities nearby, and climate change vulnerability



- Socio-economic assessment to identify the vulnerable groups (e.g., elderly, femaleheaded households, migrants/ squatters/ urban poor, extreme poor) that may be affected by the sub-project activities
- Analysis of proposed project site, technology, design, and operations from the perspective of likely environmental and social risks and impacts and develop the ESMP to mitigate/ offset/ reduce the impacts & risks.
- Preparing the and E & S monitoring plan, cost estimate/ budget for ESMP implementation and monitoring, and institutional arrangements for managing and mitigation of the E&S risks and impacts

# 1.5 Environmental and Social Risks: An overview

The subproject is Capacity augmentation & rehabilitation of existing 126 MLD capacity STP at Vasna (and to include the flow from the current Vasna 35 MLD Plant), the capacity of the STP will increase to 375 MLD. This will ensure full treatment of sewage from western zone 2 of the city covering 1.453 million people. The estimated contributing population for this zone is about 14.53 lakh. As per the SCADA records, about 338 MLD sewage is generated at present in this zone. The entire sewage from this zone is ultimately conveyed to four STP at 60 MLD Jal Vihar, Vasna 48 NLD, Vasna 35 MLD and Vasna 126 MLD at Vasna through three TSPS. AMC intends to follow the best available discharge standards namely, the discharge standards suggested by the Hon'ble National Green Tribunal (NGT) while rehabilitating the STP, to ensure the best effects on the water body River Sabarmati, where treated sewage is discharged by the existing facility as per the Consent Conditions of the regulator; GPCB. This will result in better quality of 375 MLD sewage reaching Sabarmati, with benefits on the environment, overall health, and economy of the inhabitants in western zone 2 of the city, and downstream villages to the south of Ahmedabad, on both sides of the Sabarmati flow path.

# **1.6** Structure of the Report

The ESIA has been structured as follows:

EXECUTIVE SUMMARY	NON-TECHNICAL SUMMARY OF THE ESIA REPORT
CHAPTER 1.	<b>INTRODUCTION</b> provides project (G- ACRP) description, project components and the rationale for the proposed Subproject (This Chapter).
CHAPTER 2.	<b>POLICY AND REGULATORY FRAMEWORK</b> discusses applicable National/ State/ local regulations, WB ESF/ESSs, and applicable standards/guidance applicable for the proposed subproject
CHAPTER 3.	<b>ENVIRONMENTAL AND SOCIAL BASELINE</b> provides the present status of environmental & social parameters which will be affected due to the proposed development. This includes Environmental Audit conducted for the existing STP.
CHAPTER 4.	<b>ANALYSIS OF ALTERNATIVES</b> looks at possible alternatives to the proposed subproject including a 'no' project scenario
CHAPTER 5.	<b>ENVIRONMENTAL AND SOCIAL RISKS AND IMPACTS:</b> describes potential impacts and risks due to the proposed subproject and related activities in line with applicable regulations and WB ESSs
CHAPTER 6.	<b>ENVIRONMENTAL AND SOCIAL MANAGEMENT PLAN AND MONITORING PLAN</b> presents the need to avoid certain risks and impacts on valued environmental components, mitigation/ management measures for identified risks and impacts, with institutional responsibility for implementing these



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CHAPTER 7.	<b>INSTITUTIONAL ARRANGEMENTS</b> discuss the proposed intuitional arrangements					
	to implement, review and supervise subproject risk and impact mitigation					
CHAPTER 8.	PUBLIC CONSULTATION AND INFORMATION DISCLOSURE presents the					
	consultations undertaken and proposed to be undertaken, institutional					
	responsibility, mechanisms, and schedules to disclose the subproject E&S					
	documents					
ANNEXURES	ANNEXURE I: INITIAL ENVIRONMENTAL AND SOCIAL EXAMINATION					
	ANNEXURE II: APPLICABLE REGULATIONS					
	ANNEXURE III: WORLD BANK ESSs APPLICABLE TO THE PROJECT					
	ANNEXURE IV: BIODIVERSITY ASSESSMENT: FLORA & FAUNA					
	ANNEXURE V: OHS RISKS DURING VARIOUS SUBPROJECT PHASES					
	ANNEXURE VI: DISUSSION ON MAJOR PROPOSED/ ONGOING PROJECTS IN AHMEDABAD					
	ANNEXURE VII: ENVIRONMENTAL AUDIT OF EXISTING VASNA 240 MLD STP, AHMEDABAD					
	ANNEXURE VIII: MOM - SAMPLE STAKEHOLDER CONSULTATIONS FOR 375 MLD STP AT VASNA AHMEDABAD					



# **CHAPTER 2. POLICY AND REGULATORY FRAMEWORK**

There are various national, state level policies and regulations applicable to proposed subprojects. The Ministry of Environment, Forests and Climate Change (MoEFCC) and the Central and State Pollution Control Boards (CPCB and SPCBs) together form the regulatory bodies; while National Green Tribunal (NGT) is tasked with providing an effective and expeditious remedy in cases relating to environmental protection, conservation of forests and other natural resources, and enforcement of any legal right relating to the environment.

Applicable regulations include international environmental treaties to which India is party, National and State regulations, laws and procedures applicable for the sub project encompassing environmental Conservation and management, regulations related waste management, Acts/ Rules applicable to Land Acquisition, RoW use, Encroachments on municipal drains, Acts and legislation with respect to various labor acts and labour welfare, Other regulations/ Policies/ Guidelines applicable to various construction/ implementation activities and other miscellaneous acts. The important legislations are included in the ESMF for the G-ACRP project and compiled in Annexure II, Table 54. Guidelines pertaining to the sub-project specifically are discussed below:

- Guidelines for Management of Sanitary Waste, 2018; CPCB
- Guidelines on Environmental Management of Construction & Demolition (C & D) Wastes, CPCB
- Guidelines for Utilisation of Treated Effluent in Irrigation, September 2019, CPCB
- National Building Codes (Part IV Fire and Life Safety), Bureau of Indian Standards
- AMC Building byelaws

#### 2.1 Technical Guidelines on Sewerage and Drainage at National Level

Central Government agencies have issued various guidelines for various aspects and associated aspects of sewerage and drainage projects. Central Public Health and Environmental Engineering Organisation (CPHEEO), Ministry of Urban Development (MoUD) has the responsibility of

- i) Preparation of Technical Guidelines in the form of Manuals in the field of Public Health & Environmental Engineering which are used as basic documents by the State Public Health Engineering Departments/ State Water Boards/ UTs/ Urban Local Bodies in their functions of planning, designing, construction and operation & maintenance of water supply and sanitation schemes in the above sectors.
- Technical scrutiny of water supply, sanitation including solid waste management and storm water drainage schemes submitted by the States/ UTs/ Urban Local Bodies for urban sector seeking assistance from external funding agencies such as World Bank/ JICA/ ADB and Bilateral agencies etc.
- iii) Technical assistance to other Central Ministries/ Departments like Ministries of Environment, Forests & Climate Change, Economic Affairs, Jal Shakti, New & Renewable Energy, Social Justice & Empowerment, Health & Family Welfare, Commerce & Industry, Labour & Employment, Steel, Mines, etc. in respect of various projects and problems referred to by them.

The most important guidance applicable to this subproject is listed here, with a description of the guidelines presented in *Annexure II*.

• Manual on Sewerage and Sewage Treatment Systems, 2013



- Manual on Storm Water Drainage Systems, 2019: Applicable as the manual states that combined storm water and sewage in the same pipeline has resulted in several adverse effects in the process of treatment, operation, maintenance and also on the environment. Manual recommends that sewage should be separated from the storm water drainage system as it is currently in practice all over the world
- Manual on Operation and Maintenance of Water Supply System, 2005
- Manual on Solid Waste Management (applicable to screenings, sludge, grit, other wastes from premises)
- Manual on Municipal Solid Waste Management 2016
- Manual on Water Supply and Treatment -1999

**Guidelines and Advisories** are issued by the CPHEEO and MoUD. Though water supply and sanitation are a State subject, CPHEEO provides policies, strategies and guidelines to the States & UTs Governments including Municipal Corporations/ Committees. It acts as an Advisory body at Central level to advise the concerned State agencies and Urban Local Bodies (ULBs) in implementation, operation & maintenance of urban water supply, sanitation and solid waste management projects and helps to adopt latest technologies in these sub sectors. CPHEEO also provides technical assistance to central ministries including MOEFCC in respect of various projects and problems referred by them. The advisories cover various thematic areas including environment, health, safety, public. The below mentioned guidelines and advisories are issued by CPHEEO which are relevant to the designing, planning and implementation of the project.

- Guidelines for Decentralized Wastewater Management
- Standard Operating Procedure (SOP) for Cleaning of Sewers and Septic Tanks
- Advisory note on Septage management in Urban India
- National Policy on Faecal Sludge and Septage Management
- Advisory on Public and Community Toilets
- Advisory on Tariff for Water supply and Sewerage
- Recent Trends in Technologies in Sewerage System.

Details of applicable regulations is presented in Annexure II.

# 2.2 Standards for Discharge of Treated Sewage

Standards for Discharge of Treated Effluents was initially published in India by MoEFCC under Environment (Protection) Act, 1986. MoEFCC in 2015 and 2017 revised the standards to be followed for disposal of treated sewage. Sewage discharge standards for disposal into water bodies were also discussed by the National Green Tribunal, the environmental watch agency of the country in its many important judgments. The following **Table 3** presents a comparison of sewage discharge standards.

S.	Parameters		General Norms <sup>g</sup> 1986			Draft	MoEF&CC	NGT
NO.		Inland Surface Water	Public Sewer	Land Irrigation	Marine Coastal Areas	Nov. 2017** 2019 Peas 2015**	Order 2019**	
1	BOD (mg/l)	30	350	100	100	10	30 20 (in metro cities <sup>h</sup> )	10
2	COD (mg/l)	250	-	-	250	50	-	50

#### Table 3: Comparison of Sewage Discharge Norms/ Orders in India



S. No.	Parameters	Parameters General Norms <sup>g</sup> 1986			Draft	MoEF&CC	NGT	
		Inland Surface Water	Public Sewer	Land Irrigation	Marine Coastal Areas	Norms Nov. 2015**	2017**	Order 2019**
3	TSS <sup>i</sup> (mg/l)	100	600	200	100 (process	20	100	20
					water)		50 (metro cities)	
4	рН	5.5-9	5.5-9	5.5-9	5.5-9	6.5-9	6.5-9	5.5-9
5	TN <sup>j</sup> (mg/l)	100	-	-	100	10	-	10
6	Ammoniacal Nitrogen as N	50		-	50	5 <sup>k</sup>	-	-
7	Free NH3 (mg/l)	5			5	-	-	-
8	Nitrate (mg/l)	10			20	-	-	-
9	Diss. PO4 as P (mg/l)	5	-	-	-	-	-	11
10	Faecal Coliform (MPN/100 ml)	-	-	-	-	<100	<1,000	<230

<sup>9</sup> standards set in 1986 cover in total 40 parameters, which are not depicted in this illustration. NOTE: industrial wastewater standards are regulated under CETP (Common Effluent Treatment Plant) set, which is not focus on this study.

<sup>h</sup> Metro Cities, all state capitals except in the state of Andhra Pradesh, Assam, Manipur, Meghalaya, Mizoram, Nagaland, Tripura, Sikkim, Himachal Pradesh, Uttarakhand, Jammu and Kashmir and Union Territory of Andaman and Nicobar Islands, Dadar and Nagar Haveli, Daman and Diu and Lakshadweep Areas/regions.

\*\* Standards applicable for discharge into water bodies and land disposal/applications, while reuse is encouraged.

<sup>i</sup> As SS in (mg/l) in General Norms, 1986.

<sup>j</sup> As Total Kjedahl Nitrogen in General Norms, 1986

#### <sup>k</sup> As NH4-N

<sup>1</sup> Valid for Phosphorus Total (for discharge into ponds and lakes)

Existing STPs were designed to comply with the sewage discharge standards prevailing during the year 2017 and need process/ technology up-gradation to comply with the latest discharge standards. Consent granted by GPCB to STPs in Ahmedabad stipulates upgrading the facilities to meet the MoEFCC 2017 standards in five years whereas NGT suggested standards are more stringent as presented in **Table 4** above. NGT has in 2017 suggested stringent standards for discharge of treated sewage. AMC aspires to follow these guidelines for all proposed activities under G- ACRP, so as to bring in better environmental effects.

Parameter	NGT Suggested treated effluent discharge standards for STPs, 2017	Prevailing MoEFCC 2017 <sup>7</sup>
рН	5.5-9.0	6.5 -9.0
BOD	<10 mg/l	20
TSS	<20 mg/l	<50
Total Nitrogen	< 10 mg/l	-
Phosphorus – Total	< 2 mg/l	-
Faecal Coliform (MPN/100 ml)	<230	<1000
	Parameter pH BOD TSS Total Nitrogen Phosphorus – Total Faecal Coliform (MPN/100 ml)	ParameterNGT Suggested treated effluent discharge standards for STPs, 2017pH5.5-9.0BOD<10 mg/lTSS<20 mg/lTotal Nitrogen<10 mg/lPhosphorus – Total<2 mg/lFaecal Coliform<230 (MPN/100 ml)

#### Table 4: NGT suggested Discharge parameters for Treated Sewage

Source: NGT, Original Application No. 1069/2018, (M.A. No. 1792/2018, M.A. No. 1793/2018, I.A. No. 150/2019 & I.A.No. 151/2019).

<sup>&</sup>lt;sup>7</sup> These Standards shall apply to all STPs to be commissioned on or after the 1st June, 2019 and the old/existing STPs shall achieve these standards within a period of five years from date of publication of this notification in the Official Gazette.



Environment (Protection) Amendment Rules, 2017. G.S.R. 1265 Dated 13th October 2017.

A comparison<sup>8</sup> of India's Standards with those in other countries presented in the Table 5 below. It reads that NGT suggested standards for disposal of treated sewage is stringent than that of other prevalent standards.

<sup>&</sup>lt;sup>8</sup> Schellenberg Tatjana, Subramanian Vrishali, Ganeshan Ganapathy, Tompkins David, Pradeep Rohinim, 2020. Wastewater Discharge Standards in the Evolving Context of Urban Sustainability–The Case of India, Journal: Frontiers in Environmental Science, VOLUME-8 Available at: https://www.frontiersin.org/article/10.3389/fenvs.2020.00030 Accessed on : September 7, 2021

# Table 5: Comparison of Treated Sewage Discharge Standards across Countries

Country	PE Treated	рН	t (°C)	SS (mg SS/I)	DO (mg O <sub>2</sub> /I)	COD (mg COD/l)	BOD (mg BOD/l)	TN (mg N/l)	Total Ammonium	Total Ammonia	TP (mg P/l)	Microbiological Indicators
									(mg NH4-N)	(NH3-N)		
EU Urban	>2,000			35/90%		125/75 %	25/70-90 %	-			-	
wastewater				reduction		reduction	reduction					
treatment	10,000-							15			2	
Directive	100,000											
(UWWTD) <sup>p</sup>	>100,000							10			1	
Ireland	≤10			30			20	5	20		2	
	>2,000		UWWI	FD apply as a minim	um, but may	be more strin	gent to comply	with Water	r Framework Dire	ctive (WFD)		
France	<20			30			35					
	20-2000	6-8.5	<25	50%reduction		60%	35, 60%					
						reduction	reduction					
	>2000		UWWI	FD apply as a minim	um, but may	be more strin	gent to comply	with Water	r Framework Dire	ctive (WFD)		
Romania	>2000		UWWI	FD apply as a minim	um, but may	be more strin	gent to comply	with Water	r Framework Dire	ctive (WFD)		
Ecuador		6-9	±3q	130		200	100	50 TKN	30		10	<2000 FC MPN/100 ml
Tanzania		6.5-8.5	20-35	100 TSS		60	30	15 TKN			6	<10,000 TC counts/100 ml
Jordan				60 TSS	>1	150	60	70			15 as T-	<1000 E. coli MPN/100 ml
											PO <sub>4</sub>	Nematodes <1
India 2015		6.5-9		20 TSS		50	10	10	<5			<100 FC MPN/ 100ml
India 2017-18	Metro	6.5-9		50 TSS			20					<1000 FC MPN/ 100ml
	Non-metro			100 TSS			30					
India NGT		5.5-9		20 TSS		50	10	10			1	<230 FC MPN/ 100ml
2019												
India 1986 <sup>r</sup>	Inland	5.5-9	<5	100		250	30	100		5 as free	5 diss.	
	Water							TKN		NH3	PO4 as	
											Р	
	Land			200			100					
	Irrigation											

Note to table: Coliforms represented includes E. Coli, Faecal Coli (FC) and Total Coliforms (TC)

° Detail for ranges of permitted consents omitted from this version for clarity

<sup>p</sup> TP and TN only considered in designated "sensitive" area

<sup>*q*</sup> of the receiving water body

<sup>r</sup> Total set covers a range of 40 parameters and three further application areas for discharge into public sewer, marine coastal areas.



In addition, as per CPCB, designated best use class of any river in the country would be determined based on the following. Most stretches of Sabarmati confirmed to Class B during pre-COVID-19 lock down period, as per GPCB's recent report<sup>9</sup>. NGT has suggested polluted river stretches (Sabarmati is one) be maintained at < BOD 3mg/L and Faecal Coliforms at <500MPN. So, considering the assimilative capacity, since the existing poor discharge quality maintains the river at B Class, it is clear that following NGT Standards would help maintain this, and probably elevate to higher class.

Designated-Best-Use	Class of water	Criteria
Drinking water source	А	Total Coliforms Organism MPN/100ml shall be 50 or less
without conventional		pH between 6.5 and 8.5
treatment but after		Dissolved Oxygen 6mg/l or more
disinfection		Biochemical Oxygen Demand 5 days 20C 2mg/l or less
Outdoor bathing (Organised)	В	Total Coliforms Organism MPN/100ml shall be 500 or less pH between 6.5 and 8.5 Dissolved Oxygen 5mg/l or more
		Biochemical Oxygen Demand 5 days 20C 3mg/l or less
Drinking water source after conventional treatment	С	Total Coliforms Organism MPN/100ml shall be 5000 or less pH between 6 to 9 Dissolved Oxygen 4mg/Lor more
and disinfection		Biochemical Oxygen Demand 5 days 20C 3mg/l or less
Propagation of Wildlife and	D	pH between 6.5 to 8.5 Dissolved Oxygen 4mg/l or more
Fisheries		Free Ammonia (as N) 1.2 mg/l or less
Irrigation, Industrial	E	pH between 6.0 to 8.5
Cooling, Controlled Waste		Electrical Conductivity at 25C micro mhos/cm Max.2250
disposal		Sodium absorption Ratio Max. 26
		Boron Max. 2mg/l
	Below-E	Not Meeting A, B, C, D & E Criteria

# Table 6: CPCB Designated Best Use Classification of Rivers

# 2.3 The World Bank ESF and Environmental and Social Standards (ESS)

- ESS-1 Assessment and Management of Environmental and Social Risks and Impacts
- ESS-2 Labour and Working Conditions
- ESS-3 Resource Efficiency and Pollution Prevention and Management
- ESS-4 Community Health and Safety
- ESS-5 Land Acquisition Restrictions on Land Use and Involuntary Resettlement
- ESS-6 Biodiversity Conservation
- ESS-7 Indigenous Peoples
- ESS-8 Cultural Heritage
- ESS-9 Financial Intermediaries
- ESS-10 Stakeholder Engagement and Information Disclosure

Annexure III discusses the relevance of the described ESS to the project.

<sup>&</sup>lt;sup>99</sup> https://gpcb.gujarat.gov.in/uploads/GPCB\_STUDY\_REPO\_DRAFT\_IMPACT\_LOCKDOWN\_WATER\_UPTO\_JUNE2020.pdf



# 2.3.1 GRCP-A: ESMF

Considering the National/ State Regulations and requirements and WB ESF requirements, AMC has prepared an ESMF to guide screening, scoping, identification of risk/ impacts and their assessment, and preparation of mitigation measures, monitoring plan, institutional mechanism and budget for managing the risks and impacts associated with all subprojects under G-ACRP. **ESMF** disclosed The is and is available at: https://ahmedabadcity.gov.in/portal/web?requestType=ApplicationRH&actionVal=viewAtt achment&queryType=Select&screenId=2900003&AttachmentFileName=ESMF.pdf and ESIA is uploaded at:

https://ahmedabadcity.gov.in/portal/web?requestType=ApplicationRH&actionVal=viewAtt achment&queryType=Select&screenId=2900003&AttachmentFileName=ESIA-126-MLD-STP.pdf

# 2.3.1.1. Sub-project Screening and Categorisation

All subprojects are subjected to two-stage screening exercise, Stage 1: using the exclusion list, and Stage 2: using the E&S screening checklist. The subproject sites are initially screened to determine if they are to be excluded from G-ACRP during Stage 1 screening.

Table 7: Activities Excluded	from G- ACRP as per ESMF
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SI No:	Non-permissible Activities
1	Sub-projects in sites/ locations which should be excluded as per prevailing Rules/ Laws on
	Natural Habitats and Forests or Archeologically Protected Monuments (National, State, Local):
	(i) any construction in demarcated Forest areas or protected natural areas or their buffers, (ii)
	any subproject which would impact critical natural habitats, (iii) any subproject which shall be
	excluded as per AMASR Act, (iv) any subproject components or activities in the Historic Walled
	City of Ahmedabad – the UNESCO World Heritage Site
2	Sub-projects in sites/ locations which should be excluded as per applicable siting criteria
	prescribed by GPCB, Master Plan, Excluded Disaster Zones, or other applicable criteria set out
	by National, State, Local Body
3	Subprojects involving (i) Activities that impact the safety of Dams/ Barrages, (ii) purchase,
	storage, and use of Banned Pesticides/ Insecticides/ chemicals/ Asbestos, (iii) Construction of
	CETPs or any facilities to manage industrial/ hazardous wastes or effluents
4	Sub Projects displacing more than 200 tribal households or 100 Primitive Tribal households

Since the above exclusions are not applicable to the proposed subproject, Stage 2 screening was undertaken by the E&S specialists of the PIU using a combination of the literature review, stakeholder consultations, and the site reconnaissance survey.

The key steps involved in the process are briefly outlined below.

Step 1: (a) Review available project details, location map, and regulatory aspects, (b) conduct reconnaissance site visits for ground-truthing and screening

Step 2: Screen for the presence of any environmentally sensitive areas, project components of high risk, and probable benefits. Study of detailed topographic maps of the project sites with details of ecologically sensitive areas, culturally sensitive areas, archeologically sensitive areas, habitat areas, Reserve Forest, Wildlife Sanctuary, settlements, public amenities/ facilities etc. to undertake screening exercises.

Step 3: Revisit the screening checklist and ascertain the outcomes of the screening checklist after collection of baseline data, monitoring, surveys and consultation

Step 4: Determine the project category based on screening and E&S instruments to be prepared.



As per indicative categorisation of subprojects in ESMF, upgradation of existing STP may be a **Substantial** Risk subproject, however, this categorisation is indicative, also depending on other ESS risks and sensitivities identified through screening.

A matrix is presented below to summarize each type of potential E&S risks and impacts.

The proposed subproject is Construction of new Vasna 375 MLD STP in place of existing 126 MLD STP, which involves construction of new STP, demolition of existing 126 MLD STP, abandonment of existing 35 MLD STP, laying of new Trunk Main, repairs to three Sewage Pump Stations (SPSs). As per the Feasibility Report prepared, new construction activities will take place in the existing STP site. Activities involve Installation of New pumps at Vasna Barrage 35 MLD SPSs and Vasna 76 MLD Terminal Pump Station, New Transformer, new pumping main of 2000 mm dia to be laid from this TSPS to the upcoming 375 MLD STP Vasna, replacing Belt filter press, installation of PLC based control panel & SCADA interface, new construction of SBR units, new internal pipelines, sludge pipeline, UV channel, biogas facility, construction of new outfall structure etc. It is mentioned in the FR that the proposed outfalls are into the Sabarmati River; and the FR also proposes abandonment of existing Vasna 35 MLD STP. Further, the area occupied by existing Sludge Drying Beds (SDBs) will infringe with the units for new STPs, which may impact the sludge handling process. The land available might not be sufficient for new construction, while at the same time operating the treatment process for existing 126 MLD of sewage which would continue to come to the STP. Though, at present these SDBs are hardly under operation as the UASB reactors are almost nonfunctional, yet the impact during the construction stage can be minimized by adopting a modular approach for construction. Considering the OHS aspects, land constraints, multiple upstream infrastructure which would not be confined to the existing land parcel, and anticipated pollution impacts with managing treatment of 126 MLD sewage and sludge while constructing the plant; the risk is rated *Substantial*.

ESMF also presents the E&S due diligence procedures to be followed for each type of risk categorisation *(Table 8).* 

Sub-Project Phase	Procedures	Responsibility		
	Moderate Risk Projects			
Sub-project Identification/ Pre- Feasibility	IESE of the sub-project (Using Exclusion Criteria & Screening Format (filled format in <i>Annexure 1</i> )) Risk Categorisation	PIU		
	Consultations with key stakeholders (as per SEP)	PIU		
	Preparation of ToR for ESIA to be prepared along with DPR	Prepared by PIU, reviewed, and cleared by the WB		
Feasibility Study/ Design	Conduct IEE/ ESA or E&S Audit (in case of the existing facility) and prepare ESMP also using ECOPs by Feasibility/ Design Consultant. Update ESMP based on a design by DBOT Consultant	PIU, Consultants		
	Public consultations (as per SEP)	PIU, independent consultant		
Detailed Design & Tendering	Use ECOPs or Biodiversity Management Framework/ Cultural Heritage Management Framework if applicable; to prepare ESMP	PIU, independent consultant		
	Ensure Mitigation measures (from ESMP) included in Design	PIU – PIU technical specialist to send documents to E&S Specialists to		

Table 8: Phase wise Procedures for 'Substantial' Risk category of Projects



Sub-Project Phase	Procedures	Responsibility				
	Moderate Risk Projects					
		ensure required procedures are met, before finalizing the designs				
Detailed Design & Tendering	Ensure ESMP, Monitoring Plan, and LMP aspects are included in Bidding Documents	PIU - PIU procurement specialist to send pre-& post review documents to E&S Specialists to ensure required procedures are met, before initiating the bidding process				
Construction Works	Implement and monitor ESMP	PIU				
	Update IEE (and ESMP) as required	PIU, Contractor/ Consultant				
During Construction Works Just before	ESMP & ESHS Audit by external consultants (Annual Audit) Construction Supervision & OHS/ Safety Audit by CSQAC (Continuous)	PIU, External Auditors				
– Post Construction	ESMP Audit (self-audit by PIU)	PIU, Consultant, Contractor				

As per the ESMF, since this is a Substantial risk subproject, it is important to prepare ESIA at the Feasibility stage before the subproject is bid out on DBOT format. This ESMP and its requirements will be made part of procurement documents, which contractor has to follow during design, construction and operation & maintenance stages. As the detailed designs will be prepared only during design sage, by the DBOT contractor; the ESIA, ESMP will be updated (or freshly prepared in case of much deviation from the proposal in Feasibility Report) and additional mitigation measures for construction, O&M stages will be derived from this updated/ new C-ESIA.

This report presents the ESIA for the subproject at the feasibility stage, and will be updated based on the detailed design, after the design is prepared by the DBOT contractor.

# **CHAPTER 3. ENVIRONMENTAL AND SOCIAL BASELINE**

# 3.1 Methodology for Environmental Baseline Data Collection

## 3.1.1 Area of Influence

The subproject deals with construction of new STP in place of existing 126 MLD STP at Vasna, also merging the flows from existing 35 MLD STP at Vasna, and it is expected that key risks and impacts will be on OHS during construction phase, which are largely manageable and reversible by adoption the best practices and vigilance. The subproject aims at adopting the Best Available/ stringent standards for treated sewage, and hence overall the impacts will be beneficial in the entire region.

The term 'area of influence' is understood as "such area where significant environmental and social impacts caused by project performance are evident on physical, biotic and socioeconomic components, in each component of such environment". In this case, all works will be confined within existing STP site; and treated sewage discharge will be the only aspect which might impact regionally. (i) discharge of treated sewage and bypasses occur through Sabarmati and Fatehwadi Canal, and hence villages downstream till Vautha (where tidal influence and joining of Vatrak River happens) in case of Sabarmati, and villages in command area of Fatehwadi Irrigation Project are taken as the larger region of influence for cumulative impacts from the perspective of water quality and availability; (ii) air and odor impacts are expected to occur in the immediate vicinity of STP, and hence an impact area of 5km around the site is considered as the area of influence also considering cumulative impacts due to nearby Gyaspur Metro Station, which is a major influential land use in this case. Noise impacts also are expected to be confined to the site, as it is located between two other STPs, and has a larger noise generating activity (metro depot) next door.

Accordingly, a Monitoring Plan for environmental and social parameters was prepared and agreed with the Client to finalize the parameters, number of samples required for the sub-project, and sampling locations best suited for sampling.

The environmental and social audits were conducted for the STP in August 2021, consultant's team visited the STP sites, for a physical audit of the STP and interacted with the third party STP, O&M personnel, and collected the available data on treatment units and STP water quality monitoring, Primary monitoring of environmental parameters like Air, Water, Noise, Soil & Biodiversity were conducted in the post-monsoon season. For assessing socio-economic impacts, transect walks and consultations were conducted. Secondary data and wards maps were collected to understand the population and demographic details of the ward in which the STP is located. Information, data on issues and concerns due to the STP functioning, Sabarmati River, Fatehwadi Canal, impact on downstream users and farmers issues was also collected.



Figure 2 Region of direct & indirect influence

Monitoring locations are for environmental parameters are shown in the following Figure 4



**Figure 3 Monitoring Locations for Environmental Parameters** 

The sampling methodology and procedure for undertaking environmental baseline monitoring is as follows:

# 3.1.2 Ambient Air Quality Monitoring<sup>10</sup>

The ambient concentrations of  $PM_{10}$ ,  $PM_{2.5}$ ,  $SO_2$ ,  $NO_x$ , CO and HC in the ambient air was monitored for the area of influence and baseline data was generated. Analysis of the baseline data was carried out and based on the interpretation mitigation measures are provided.

# 3.1.3 Noise Levels

Ambient noise levels near habitations, was monitored for the period at various locations from area of influence. Sensitive environmental receptors i.e., hospitals, schools, public open spaces were identified for the noise monitoring. Monitoring was carried out for 24 hours to understand the noise levels throughout the day and night as per CPCB guidelines.

## 3.1.4 Water and Wastewater Quality Monitoring

To identify the critical aspects linked to the water pollution, baseline monitoring for water quality was conducted in upstream and downstream of the river taking discharge location as a reference point. Also, audit was conducted for STP which included the monitoring the characteristics of the sewage. Methods prescribed in "Standard Methods for Examination of water and Wastewater" prepared and published jointly by American Public Health Association (APHA), American Water Works Association (AWWA) and Water Pollution Control Federation (WPCF).

# 3.1.5 Monitoring of Groundwater

The groundwater samples (Nos. 06) were collected from locations of upstream and downstream and analysed for understanding baseline of groundwater characteristics.

#### 3.1.6 Land Environment

Soil samples were collected from the riverbank at upstream and downstream to understand the Physical, Chemical and Biological soil characteristics and sludge contamination.

# 3.1.7 Sludge

Sludge samples were collected from the STP site as well as from river bottom at upstream and downstream to understand the Physical, Chemical and Biological characteristics and sludge contamination.

#### 3.1.8 Biological Environment

Ecologically important and sensitive locations were identified and surveyed for biodiversity. Total 17 locations were surveyed in and around the project area. Modified line Transect method was used for data collection of flora and fauna. For flora, three quadrats of dimension 10m X 10m each were laid along the line, of the length of a kilometre. In each quadrat trees, shrubs and herbs were counted. A line transect method was used for fauna with line dimension of 100m Avifauna, mammals, Butterflies, and herpetofauna were counted. Data was recorded digitally on the tabs. GPS co-ordinates of each transect were recorded to prepare the maps. Places where laying line transacts was not possible, inventory of flora and fauna was prepared. Data was compiled and analysed to obtain frequency, density, and richness of the flora and fauna. All the observations related to ecology were noted down. Interviews of locals were conducted for information regarding past and present status of land use, resource utilisation and status of flora & fauna, wildlife.

<sup>&</sup>lt;sup>10</sup> 2003\_CPCB\_Guidelines\_for\_Air\_Monitoring.pdf (indiaairquality.info)

# 3.1.9 Socio-Economic Environment

Secondary data such as the Census 2011, socio-economic profile of the district, district profile, data available on the AMC website related to city, population, city profile and services provided by AMC was collated. Data was also collected from Health Officer of AMC, crime statistics for city, and other data required for the project, etc. Transect walks and consultations were conducted to understand the critical issues related to the project. Socially sensitive stakeholders i.e., squatter settlement, STP staff, Contractors of AMC, officials of AMC from concerned department, etc. were consulted during the social impact assessment. Since the upgradation is within the existing premises, no involuntary impacts are envisaged.

# 3.1.10 Data Analysis

The monitored data is collated, analysed and compared with the baseline levels as established in the EIA study and the regulatory standards specified by different Government agencies. The standards against which the different environment components are compared and are as per the following **Table 9**.

Sl. No.	Aspects	Applicable Standards				
1	Ambient Air Quality	National Ambient Air Quality standards, CPCB				
2	Noise Quality	Ambient Air Quality Standards with				
		Respect to Noise, CPCB				
3	Surface water Quality	IS:2296: Class 'B', 'C' Water, CPCB				
4	Ground water Quality	IS: 10500 Standards, BIS				
5	Soil Quality	IS 1498 standards BIS				
6	Sludge Quality	Schedule II of Hazardous Waste Management &				
		Handling Rules 2016,				
		Use as a fertiliser & manure as per CPHEEO Manual on				
		Sewerage and Sewage Treatment System, 2013				
7	Treated Sewage Water Quality	NGT Standards – Order dated Date of hearing:				
		30.04.2019 – Discharge into surface water				
		NGT Standards – Order dated Date of hearing:				
		30.04.2019 – Discharge on land				
	IS 3307(1974)- Discharge for agricultural use					

Table 9: Applicable Standards for Various Environmental Parameters

# 3.2 Project Location

The 126 MLD STP is located at Vasna and was commissioned in 2006 by EPC Contractor. The plant is spread over an area of about 53.8 acres in **Ward No 52 Sarkhej**, Ahmedabad city of **Gujarat**, in between Vasna 35 MLD and Vasna 240 MLD STPs of AMC. The location map of the STP is presented in *Figure 5* below.



Figure 4: Subproject Location
Neighbouring Landuses of the existing Vasna 126 MLD STP is presented in *Table 10*, while *Figure 6* presents the site layout.

Directions	Particulars
North	Canal and Road at around 50 m and 70 m respectively
East	240 MLD STP at around 20 m
South	Sabarmati River at around 240 m
West	Residential area adjacent to STP

Table 10: Neighboring Land uses of Vasna 126 MLD STP



Figure 5: Site Layout and Neighboring Land uses

As mentioned in the **Table 10** above, to the north of the existing 126 MLD STP the features include access road to STPs, Fatehwadi canal road parallel to project boundary, Canal (within 5 to 15 metres). On the opposite side of the Fatehwadi canal road there is Gyaspur metro depot and Vasna 48 MLD STP. Vasna 35 MLD STP is located within 200 metres to the east of Vasna 126 MLS STP, while Sabarmati River is located to the south within 5 metres from the boundary and Vasna 126 MLD STP is located to the east (100 m from the boundary).

# 3.3 Environmental Audit of the existing STP

The treatment technology adopted in the 126 MLD STP is the UASB Reactor. The major units in the Sewage treatment plant are Inlet Chamber, Screen Chamber, Grit Chamber, UASB reactors, Pre-aeration tank, Flash mixer, Clariflocculator, Sludge drying bed and Gas Holder.

The raw sewage is received in inlet chamber from AUDA's pumping station. The raw sewage is passed through 8 nos. of screens for removal of floating material, from screen it will be fed to grit chambers of 4 nos. for removal of grits. The sewage from grit chambers is fed to 10 nos. of UASB reactors for biological treatment, the biologically treated sewage from UASB is fed to 2 nos. of pre-aeration tanks. The pre-aerated sewage is added with alum in flash mixer before being fed to clariflocculator for settling. There is provision for gas collection from the UASB reactor and storing in Gas holder tank. The sludge from the clariflocculator is sent to sludge drying bed for drying. There is no disinfection in the 126 MLD STP. The treated sewage after clariflocculator is released for final discharge in the Sabarmati River as per permit. It was being

discharged into Fatehwadi canal, however due to issues with treated sewage quality raised by the farmers, this discharge into the Canal has been temporarily suspended.



Figure 6: Existing STP Layout and Design Components

Source: AMC. 2019. Upgradation of 126 MLD STP Located at Vasna to 189 MLD capacity with Biological Nutrients Removal (BNR). Prepared by CC Patel and Associates.

AMC has constructed a new sewage pumping station and sewage treatment plant at Vasna for the recently merged areas in the western zones of AMC. There are 68 Sewage Pumping Stations and of which 10 are Terminal Sewage Pumping Stations pumping sewage to STPs in Ahmedabad. There are 52 SPS in Eastern Area and 16 are in the Western area.

Pumping arrangement include the Vasna barrage 35 MLD Sewage Pump Station, Vasna (AUDA) 126 MLD Pump station and Vasna 76 MLD Terminal Pump Station.

Since the STP is almost 16 years old, many units and equipment of the STP are not functioning as per the design or dysfunction due to wear and tear. Following are some of the observations of the STP after the site assessment/ audit in the month of August 2021.

- Inlet chamber bypass gate not working at the time of visit.
- mechanical screens are not in operation at the time of visit.
- Grit chamber scraper and deflectors are not working.
- UASB reactors are not functioning, hence there is no gas generation and due to which gas holder is idle and rusted and not functioning.
- One surface aerator was not working in pre-aeration tank
- One flash mixer was not working during the assessment
- Both the clariflocculator were not functioning
- There is no chlorination/ disinfection done for the treated sewage before final discharge.
- Treated sewage visibly looks clear but has odor.
- The DG set is defunct, there is no storage of diesel.
- There is no storage of chemicals except alum.

The detailed observations along with the photographs of the STP and units are given in Audit report and same is annexed with this report.

Detailed Audit of existing facility is presented in Annexure VII

#### 3.4 Environmental and Social Baseline

#### 3.4.1 Key Aspects

#### 3.4.1.1 Topography

The whole Ahmedabad city area is monotonously flat except few undulating topography owing to the presence of stabilized dunal land forms. The land surface elevation is from 40 m to 60 m AMSL with a master slope towards the southern direction. The average elevation of the city is about 48m AMSL. Isolated high grounds, with elevations more than 60m AMSL, are observed on both sides of river Sabarmati.

The major water body within Ahmedabad city is the Sabarmati River. The oldest irrigation scheme i.e., Kharicut Canal Scheme passes through the eastern part of Ahmedabad city which also serves as one of the Storm water carriers for the city during monsoon. There are many lakes within the AMC boundary namely, Kankaria, Chandola, Vastrapur, etc. which are recharged from the storm water. The slight slope from both east and west towards the south of the city and to the Sabarmati River makes Vasna and Pirana at the south at the river edge, the best suited to receive the sewage for centralized treatment. Hence, Vasana was the preferred location for the first placement of STPs on the west side of the city, while those in the east were located at Pirana.



Figure 7: Topographic Map, Ahmedabad<sup>11</sup>

<sup>&</sup>lt;sup>11</sup> https://en-in.topographic-map.com/



Figure 8: Site Elevation

The above image shows that the highest elevation of the Vasna 126 MLD site as 42 m. while the lowest is around 38 m, almost at par with the HFL at Vasna barrage, which is 41.77 m<sup>12</sup>. This indicates the need for measures to protect the infrastructure from possible flooding during peak monsoon flows and the need to prepare a disaster management plan for the facility as once the design and operational details are finalised.



Figure 9: Cross Section of Vasna 126 MLD site and the river

# 3.4.1.2 Climate

Ahmedabad city has a hot & dry climate in summer and humid in other seasons. As per the Indian Meteorological Department, summer days are very hot with mean maximum temperature of 48°C in the hottest month (May 2016) while, nights are pleasant with mean minimum temperature of 27°C. The mean maximum and minimum temperatures in coldest

<sup>&</sup>lt;sup>12</sup> http://iwai.nic.in/sites/default/files/1814791015NW-87%20Sabarmati%20Final%20FSR.pdf

month (January) of winter are 28.1°C and 12.4°C respectively. The average annual maximum temperature is 34.4°C and the average annual minimum temperature is 21.0°C. Ever recorded maximum temperature was 47.8°C on 19<sup>th</sup> May 2016<sup>13</sup> and ever recorded minimum temperature was 2.2°C on 06<sup>th</sup> February 1920. Dust storm occurs occasionally in summer and early part of southwest monsoon season. Fog occurs occasionally during winter season.

The city has faced major heat wave in 2010 which caused many casualties. A Heat Action Plan (HAP) has been prepared by AMC and the key pillars of this action plan are as follows,

- Building public awareness and community outreach
- Initiating an early warning system and inter agency coordination
- Capacity building among health care professionals
- Reducing heat exposure and promoting adaptive measures such as Ahmedabad Cool Roofs Program.

The HAP provides clear demarcation of responsibilities of various department and agencies during the heatwave's days. It also includes activities and protocol to be followed for different heat alert levels.

The average annual rainfall of the area is 782 mm, although there is a considerable variation from year to year. It occurs generally during the months of June to September though the average annual rainy days are 34. Rainfall during the southwest monsoon season is about 95% of annual rainfall. Thunderstorm during April to October is sometimes accompanied with squall. Ever recorded heaviest rainfall in 24 hours is 41.5 cm on 27<sup>th</sup> July 1927. *Table 11* gives the rainfall statistics for Ahmedabad district for the four monsoon months, southwest monsoon season and annual based on the daily rainfall data from 1989 to 2018 (29 years).

Period	Mean Rainfall (mm)	Coefficient of Variation (CV)
June	94.7	120.2
July	278.5	46.6
August	208.6	68.4
September	110.1	87.3
Monsoon	691.8	35.0
Annual	710.1	34.8

Table 11: Rainfall statistics for Ahmedabad district <sup>14, 15</sup>

### 3.4.2 Hydrology, Hydrogeology and Soil

#### 3.4.2.1 Hydrology

The River Sabarmati is one of the major west flowing rivers of India and Ahmedabad and Gandhinagar are the major cities that are located on its banks. Sabarmati basin extends over the states of Rajasthan and Gujarat having an area of 21,674 Sq. km with maximum length and width of 300 km and 150 km respectively. While 48 km of the river length is in Rajasthan, 323 km is in Gujarat.

<sup>&</sup>lt;sup>13</sup> NRDC: Ahmedabad Heat Action Plan 2017 (PDF) (niua.org)

<sup>&</sup>lt;sup>14</sup> https://imdpune.gov.in/caui/smartcities.html

<sup>&</sup>lt;sup>15</sup> Observed Rainfall Variability and Changes Over Gujarat State, India Meteorological Department

Gandhinagar City Ahmedabad City Destination of Sabarmati

The Sabarmati basin extends over parts of Udaipur, Sirohi, Pali and Dungarpur districts of Rajasthan, Sabarkantha, Kheda, Ahmadabad, Mahesana, Gandhinagar and Banaskantha districts of Gujarat. The terrain of Sabarmati basin is hilly in the early reaches up to Dharoi

dam after which the river flows mostly in alluvial plains with gentle slope. There are a total of 50 dams in the Sabarmati basin among which 17 dams fall in Sabarmati lower sub basin and 33 dams,10 weirs, 2 barrages fall in the Sabarmati upper sub basin. At Ahmedabad city of upper Sabarmati basin, the river encompasses a total catchment area of 10,370 sq. km., out of the total basin area of 27,820 sq. km.

Sabarmati enters Ahmedabad city near Karai village and exits the city near Gyaspur after passing through the Ahmedabad city. A barrage has been constructed in 1976, 5 km downstream of Nehru Bridge Ahmedabad (at Vasna) for irrigation purposes and water is supplied to barrage through the Narmada canal since 2002. The length of the barrage and anicut is 610.67 m. After the construction of the Sardar Sarovar Project the water quantity in Sabarmati has reduced. Though the river gets dried up in the summer, leaving only a small stream of water flowing.

### Figure 10: Hydrological Features

The Narmada Canal, which crosses Sabarmati a few kilometres upstream from the city, is part of a larger canal network of Sardar Sarovar Dam. The canal feeds/siphons water to the Sabarmati River in the city area and maintains the level of water, required by the Sabarmati Riverfront Project with the help of Vasna barrage. Effluents are released by the industries which is a source of pollution. Details of Vasna barrage are presented in section 3.7.

Another river passing beyond the east and south boundaries of the city is River Khari. The Khari River originates near village Kesharpura of Himatnagar taluka of Sabarkantha district. In the Ahmedabad district, it enters Dahegam taluka and flows near the villages of Chekhala, Babra, Halisa, Vadvasa, and Nandol. Thereafter it enters the Dascroi taluka and passes by Pardhol, Vahelal, Huka, Navrangpura villages. The total length of this river is 160 km, of which 53 km is through Ahmedabad district. The Khari River runs almost parallel to the Sabarmati towards the east, beyond the city limits. It joins Vehari near Kheda, downstream of the city.

Water table near the river is high, as in the case of the present site, which need to be considered while planning STP tanks and other infrastructure and flood effects will be pronounced, as the site is along the edge of the river. River is practically dry during most part of the year as it holds water received from Narmada Canal at the riverfront.

#### 3.4.2.2 Water Impounding Structures: Vasna Barrage

There are many barrages on Sabarmati upstream of Ahmedabad. The nearest one is Vasna Barrage is constructed to divert the water from Sabarmati to the Fatehwadi canal. It holds water from Vasna Barrage (Ch 135.7 km) to Sardar Patel Ring Road Bridge (Ch 156 km). Depths of 0.5 - 1.0 m (above C.D.) are available for all round the year-360 days. Depths of 1.0 - 1.5 m are available for around 75-90 days during monsoon (75 days)

The C.D. at Subhash Bridge is nearly 2.5 m above Riverbed level at Subhash Bridge gauging site. A part of this stretch near Sadar bazaar up to Wasna Barrage had already developed as Sabarmati waterfront by Govt of Gujarat. At upstream of Indira Bridge, released water from Narmada canal ensures all-round the year availability of water in this stretch and downstream. This stretch is feasible for navigation class II waterway.

Afterwards depths of about 5 m are available for 10 km upstream of Vasna barrage near Sabarmati waterfront developed by Govt of Gujarat.

In case of dams, weir and barrages, maximum observed water level of last twenty years or Maximum Water level as mentioned in CWC data has been adopted as (Highest Flood Level) H.F.L.

Chainage	Structure	H.F.L (m)
135.7 km	Vasna Barrage	41.770

#### 3.4.2.3 Water availability

**Gauge station is at Subhash Bridge** is located at 135.7 km upstream of river mouth. Daily gauge- data for period 1979 to 2010 was collected from WRIS and analysed. Only water level gauge data for period June to October is available. The Ahmadabad city experienced heavy flood in August 2006 when high flood level of 47.45 m MSL was reported at this gauge for highest observed flood discharge.

In Monsoon period depths in the range of 0.5 m to 2m above CD will be available for periods as below.

0.50 m to 1 m and above: 114 days

1.0 m to 1.5 m and above: 75 days

1.5 m to 2.0 m and above: 36 days



Figure 11: Water levels at Vasna Barrage

The Vasna barrage is connected to other dams and canal network for water releases during monsoon. The release from Dharoi and Vasna is decided based on the flood conditions at each location and responsibility is designated in various documents including Irrigation Dept, various central and state depts concerned with the Irrigation department - Head/ Canal Command and CWC. DSO, GERI has conducted studies related to dam safety of projects in Gujarat and made critical observations and recommendations for the same which are mentioned in the report. Water releases has also been addressed for dams/barrages etc by Government of Gujarat in its Disaster Management Plan 2021: Flood Warning Arrangements available in the public domain.

### 1.1.1 Land Use & Land Cover

Land use patterns under the AMC area from 1976 to 2017, indicates that the built-up area has increased by 156.93 km<sup>2</sup> whereas, agricultural land, open spaces, urban vegetation, and water bodies have decreased during the last 4-decades from 1976 to 2017.

The city is currently being developed as a smart city under 'Government of India's flagship Smart Cities Mission' Development of industries and industrial estates has led to the growth of residential areas around the industrial units in Ahmedabad. Its industrial history dates back to two decades of textile, chemical industries; and at present many well-established business groups like Adani Group, Reliance Industries, Arvind Mills, Bosch Rexroth (Germany) have operations in Ahmedabad city and its nearby areas. High density residential and mixed-use developments have taken place in Vasna area, due to sprawl and growth of this very important city. The neighbourhood also has a very important transport infrastructure – the Gyaspur Metro depot, the terminal point and depot for Ahmedabad metro.

The Vasna 126 MLD STP is located on the western side of Sabarmati River. As per the Revised Development Plan 2021 prepared by AUDA, the project area is demarcated for Sewage Treatment Plant. This area is in low-lying part of the city earlier allotted for sewage farm. So as per Master Plan for the city, proposed works will be in the existing STP premises, situated in the area allotted for sewage treatment.



Figure 12: Reservation as per Development Plan 2021 for Ahmedabad

### 1.1.2 Cultural Heritage

The walled city of Ahmadabad, founded by Sultan Ahmad Shah in the 15th century, on the eastern bank of the Sabarmati River, presents a rich architectural heritage from the sultanate period, notably the Bhadra citadel, the walls and gates of the Fort city and numerous mosques and tombs as well as important Hindu and Jain temples of later periods. The urban fabric is made up of densely packed traditional houses (pols) in gated traditional streets (puras) with characteristic features such as bird feeders, public wells and religious institutions. The city continued to flourish as the capital of the State of Gujarat for six centuries, up to the present. The historic walled city of Ahmedabad has it all to be the first city in India to be inscribed in UNESCO's World Heritage City list of 2017. However, the Vasna 126 MLD STP is to the west of Ahmedabad, outside the walled city. Baseline reconnaissance and monitoring established that here are no cultural heritage areas within 500 m buffer area of this STP. The location of the subproject does not have any ancient monuments and/ or archaeological site(s), protected area of local importance. As per the Heritage Department of AMC and data available, there are no tangible or intangible Cultural heritage or protected monuments within the STP premises or adjacent to it. The nearest monument is the Fateh Baug Fort at a distance of 1.5 kms from the STP.

The subproject to repair & rehabilitate existing TSPS & STP respectively within the demarcated project boundary except for the laying of pipeline from TSPS which will be on government land. FR mentions road construction on the current kuccha approach road to the STP. During road repairs and upgradation, it will be ensured that none of the Squatter residential units will be affected or dismantled. Road repairs and upgradation will be undertaken in manner to allow accessibility to the STP and river from the Fatehwadi canal road. To avoid access issues to river, 240 MLD STP and 126 MLD STP, trenchless method is proposed to be used laying of rising main to 126 MLD STP. Road construction will improve the general access and mobility issues on the kuccha access roads for the squatter settlement also. The image for the proposed access road repairs and upgradation is presented below in *Figure 14*.



*Figure 13* Present Status of Approach Road for 375/126 MLD STP and proposed road repairs and upgradation

Local important religious/cultural sites like Masjid Mohuddin at 135 m from the boundary and Ibrahim Masjid at 188 m from the boundary on the western side in Juhapura (non-notified) slum.

Bag E Sukun Kabrastan (Shia Isthna Ashri Kabrastan) is located 1.2 km away from the STP boundary and is accessible by highway 64 and also through service road. It is located 1.6 km from the gate of the STP compound.

Marthoma Church Ahmedabad Cemetery is located 1.6 km away from boundary and from the gate it is about 1.6 kms. Therefore, impacts on the same is not anticipated due to project activities. Impacts are not expected considering the nature of activities associated with the subproject, multiple accesses are available to the cemeteries which are different from that of STP. However, once the proposed design details are available during implementation stage, it will be important to review the vibration impacts, and work out work schedule and pattern of movement of construction vehicles and inform the communities on work schedule and coordinate during any emergencies.

Considering the proximity to the Heritage city, chance find procedure shall be framed and implemented for any such discovery for all excavation and construction activities



Figure 14: Vasna 126 MLD STP and its 500m Buffer

# 1.1.3 Ecology and Biodiversity

Ecology & Biodiversity assessment was conducted during August 2021, for the 126 MLD Vasna STP and surrounding 10 km area as it is an urbanized environment. At present untreated water is discharged into the Sabarmati River from the following location: i) Vasna Terminal TSPS – approx. 135 MLD as the TSPS is connected to only 48 MLD STP and therefore, sewage in excess of 48 MLD remains untreated and is being discharged directly to Sabarmati River. Ii) Vasna Barrage TSPS- approx. 20 MLD as the TSPS is connected to both 35 MLD and 126 MLD STPs; however due to limitation of pumps at TSPS, on an average, 45 MLD sewage is pumped to STPs (35 MLD to 35 MLD STP and 10 MLD to 126 MLD STP) and about 20 MLD untreated sewage is directly discharged to Sabarmati River. The existing outfall is a 1600mm diameter sewer discharges treated water from the clariflocculator to outside of the compound and from where it discharges to Sabarmati River. Earlier, treated sewage used to be diverted to Fatehwadi Canal, upon request from Irrigation Department to divert 126 MLD.

However due to scanty rainfall, since 2002, this stretch from North of the city is receiving inflow from Narmada Main Canal. However, water is held at Vasna barrage for retaining for the ambience of the riverfront and water flow from barrage to Fatehwadi Canal and the river is minimal. Thus, the river has become a modified habitat, also reeling under pollution from nearby industries, wastes and other discharges, not just from the city but also from the region

around. There is another bypass to Fatehwadi Canal, which serves agricultural areas downstream of the city which branches beyond the city limit.

The nearest key biodiversity area for this site is Thol Wildlife Sanctuary (man-made) in Mahesana district, which is around 20 km from the project site, with 10km of intervening urban high density mixed land use. As per the Notification of MoEF&CC published dated 09.02.2015, Central Government notifies Thol Wildlife Sanctuary in the State of Gujarat, as Eco sensitive Zone, up to 2.244 kilometres from the boundary of the Thol Wild Life Sanctuary<sup>16</sup>. The lake received water from rains and Narmada Canal, westward of the city. Hence this is not affected by outflows or air, noise, dust or vibration during construction and operations.

Following are the survey locations considered for undertaking the Ecology & Biodiversity Assessment.

Sr.	EB Site	Coordinates	Land use
No.			
1.	Thol WLS	23° 8'46.04"N	Wildlife Sanctuary
		72°23'51.11"E	
2.	EB STP	22°58'53.05"N	Project Site
		72°31'31.85"E	
3.	EB outfall	22°58'37.53"N	Existing project outfall in Sabarmati River.
		72°31'29.10"E	Riverbank
4.	EB Near STP	22°59'1.41"N	Between Fatehwadi canal & STP
		72°31'49.79"E	
5.	EB Agri	22°57'31.07"N	Agriculture on banks of Sabarmati
		72°29'49.23"E	(Downstream)
6.	EB 2	22°59'0.09"N	Sabarmati River Upstream
		72°32'36.48"E	
7.	EB River	22°59'23.14"N	Sabarmati River Upstream
		72°33'4.30"E	
8.	EB 3	22°57'9.21"N	Sabarmati River Down stream
		72°30'57.91"E	
9.	EB Downstream	22°57'6.77"N	Sabarmati River Down stream
		72°30'42.88"E	
10.	EB Canal	22°57'16.37"N	Fatehwadi Canal Downstream
		72°30'3.52"E	
11.	EB Agri	22°58'39.62"N	Agriculture near outfall of STP
		72°32'20.31"E	
12.	EB Sarkhej	22°59'39.32"N	Sarkhej pond
		72°30'14.15"E	
13.	EB LJ	22°59'35.55"N	Educational institution
		72°29'31.93"E	
14.	EB lake	23° 0'24.50"N	Malav Lake
		72°32'22.01"E	
15.	EB Nehru Nagar	23° 1'20.50"N	Urban
		72°32'31.66"E	
16.	EB 1	22°58'20.05"N	Pirana STP
		72°32'58.42"E	
17.	EB 14 Downstream	22°55'58.90"N	Sabarmati River Down stream
		72°32'14.05"E	

#### Table 12: Ecology and Biodiversity Survey Locations

<sup>&</sup>lt;sup>16</sup> http://environmentclearance.nic.in/writereaddata/Online/EDS/07\_Dec\_2016\_143943053GC62JOF7MoMreply.pdf



Figure 15: Location of Thol WLS with respect to Project Site



Figure 16: Location of Chandola Lake with respect to Project Site

The nearest nationally recognized wetland is Chandola Lake at 5-6 km radially from the site, across Sabarmati, on its eastern side (opposite side), also with intervening high density mixed land-use comprising other STPs to the east of Sabarmati.

It is a large lake in Ahmedabad city and has great potential to serve as a habitat for migratory birds, but the lake edges are encroached, and recreational uses and settlements are developed which has polluted the lake. Lake shows the presence of invasive *Euchornia sp.* which indicates higher sewage inflow into the lake. Chandola Lake is not connected to the Sabarmati River but to the Kharicut canal, no direct discharge to any lake from STP is envisaged.



Figure 17: Location of Santej and Vasai Lake with respect to Project Site

Other two wetlands i.e., Santej talav (to the northwest) and Vasai talav (to the southeast) are outside the AMC boundary and 9.2 km and 14.5 km respectively, from the proposed project. Both the lakes are man-made, and not directly connected to Sabarmati. Santej is surrounded by residential area and Vasai is surrounded by agricultural fields.

### Flora

A floral enlistment of trees, shrub and climbers, herbs, common crop plants in the area studied, with their scientific names, common names and the family to which they belong are presented in *Annexure III*. Neem (*Azadirachta indica*) and acacia (*Acacia senegal*) trees are common in this area. In urban areas Copperpod (*Peltophorum sp.*) and neem are dominant. Common cultivated crop plants in the study area include Wheat, Chillies, Sugarcane, Cotton, grass (Fodder), other food and non-food crops are also grown at some places. No sightings of exotic or endangered flora have been observed in the site or its 500m buffer. At the STP site, *Lantana camara* is observed which is an invasive species. No RET (Rare, Endangered & Threatened) as per IUCN Red list species are observed in the study area.

### Fauna

Fauna was assessed for the study area. Having a river crossing the city Ahmedabad generally have a high number of aquatic birds which also include migratory species. Indian Peafowl and Monitor lizard are the Schedules I species as per WPA. The list of Fauna is attached as *Annexure III*. No sightings of exotic or endangered flora have been observed in the site or its 500m buffer. No RET species were recorded in the study area. The important bird areas (IBAs), bird migratory route through India were reviewed for the proposed project area, also considering the proposed solar and energy capture installations . *Figure 19* depicts important bird areas through India. The analysis of these routes to the proposed project site reflects this does not fall in any important bird area or the bird migratory route within a 50 Km radius of the project site. Nal Sarovar and Khijadia (in Jam Nagar) are important areas in the central Asian flyway but are away from the city. <sup>17</sup>

<sup>&</sup>lt;sup>17</sup> http://datazone.birdlife.org/userfiles/file/sowb/flyways/7\_Central\_Asia\_Factsheet.pdf



Figure 18: International Flyways and Bird Migratory Routes through India

Proposed augmentation will be implemented within the existing boundary of 126 MLD STP hence there will be no land clearing required which may harm existing flora and fauna. Activities of construction, operations, and maintenance will generate air pollutants, and noise is expected to cause temporary reversible impacts and risks on the fauna residing in the dense urban setting near the project.

As the project area is a degraded and modified habitat the impacts on flora and fauna will be very minimum. Activities like plantation and greenbelt development will enhance the biodiversity of the area. Also, the aquatic biodiversity of Sabarmati will improve as the quality of treated sewage discharged from the STP would improve.

### **Aquatic Biodiversity**

The aquatic biodiversity study was conducted in the Sabarmati River in the stretch of Valad village (upstream of Sabarmati River – beyond inlet from Narmada Canal) to Vanzar village (downstream after Vasna Barrage – Sabarmati River) of approximately 20 Km. The stretch of the study area is given in the *Figure 21* below.



Figure 19: Study Region: Sabarmati River stretch

The biodiversity study was based on secondary data and field observations. Following are the findings of this study:

1) It was observed that the entire stretch of Sabarmati is infested with the *Pistia sp.* and *Euchornia crassipes* which has altered the natural habitat.

- 2) Sabarmati River stretch is a modified habitat as the water is being sourced from Narmada canal and stored at the river front stretch using the shutters of the Vasna Barrage. The riparian zone of the Sabarmati is converted into the riverfront in the Ahmedabad city.
- 3) Downstream of the river has a riparian zone with tree growth majorly Prosopis sp. The entire stretch including downstream of river after Vasna Barrage has presence of plants like *Pistia sp., Euchornia crassipes* (water hyacinth), *Ipomea* sp., *Typha* sp., *Wolffia* sp. (water meal or duckweed) etc. These are clear bioindicators of water pollution or eutrophication. These varieties are also used effectively in phytoremediation, particularly for the rhizofiltration of effluents contaminated by heavy metals.
- 4) Pisces fauna of the river includes majorly *Tilapia sp., Gambusia sp., Clarius batrachus, Garra gotyala, Catla, Channa sp.* etc. *Tilapia* is an invasive species which was found in Sabarmati River, Vasna Barrage area and downstream area of Sabarmati River. These are mainly contributed by the inflow from Narmada Canal.
- 5) Aquatic birds including migratory birds are observed along the Sabarmati and Khari River in areas apart from riverfront area due to no riparian zone.
- 6) Aquatic flora in the river and downstream provides habitat for aquatic birds like Purple moorhen, Bronze winged jacana, white breasted waterhen, Red Wattled lapwing egrets, herons etc.

It can be concluded that overall aquatic ecology is influenced by invasive species. The poor water quality supports the species like *Pistia, Euchornia, Tilapia* etc, dominant in nature, which does not allow native species to grow and survive.

The proposed project will help in improving the water quality and in turn the diversity in aquatic ecosystem.

# 1.1.4 Air Quality

Air quality monitoring is also being conducted by GPCB at various locations. Which indicates that  $PM_{10} \& PM_{2.5}$  exceeds the set standards considerably. GPCB monitoring indicates that the vehicular emission is the major emitting factor in the study area.

Sr.	City	Location	Parameter(µg/m³)			n³)
			<b>PM</b> <sub>10</sub>	Pm <sub>2.5</sub>	SO <sub>2</sub>	NOx
		National Ambient Air Quality- Standards	60	40	50	40
1	Ahmedabad East	Naroda GIDC	156	50	14.6	27.3
2	Ahmedabad City	Cadila, Narol	166	53	14.7	30.1
3		L.D.Engg. College	142	46	13.4	27.1
4		Shardaben Hospital	154	50	13.9	28.3
5		R.C. Tech. High School	143	46	13.2	28.5
6		Behrampura Referal Hospital	160	51	14.1	29.6
7		Dynowash, Pirana	188	56	15.8	32
8		SolaL.T. Chankyapuri	159	51	14	29.2
9		Rakhiyal Pumping Station	159	51	13.9	29.3
10	Ahmedabad Rural	Zydas infratech-Changodar	134	43	14.9	27.2

# Table 13: Air Quality in Ahmedabad City<sup>18</sup>

It is seen from the table that, the readings of  $PM_{10}$  and  $PM_{2.5}$  are exceeding in all the places of monitoring, attributed to the vehicular traffic related emissions and dust generation. Since

<sup>&</sup>lt;sup>18</sup> GPCB data 2020

the existing air quality especially  $PM_{10}$  and  $PM_{2.5}$  are already higher in the neighbourhood, it is important to minimise such impacts from the proposed project activities.

Air quality monitoring and assessment was carried out for the subproject site. The ambient concentrations of PM<sub>10</sub>, PM<sub>2.5</sub>, SO<sub>2</sub>, NO<sub>x</sub>, CO and HC in the ambient air was monitored at the locations finalised based on the environmental sensitivity in the area of influence. The samples were collected from 15<sup>th</sup> September to 15<sup>th</sup> October 2021. Following are the locations of the baseline monitoring,

Sr.	Location	Location Name		Coordinates	
No.	Code	-	Location Remark	Lat. (N)	Log.(E)
1	A 15	Vasna STP location –	200m. Away from	22°58'51.4158"	72°31'31.5978"
		Project Site	STP Aerobic		
			system		
2	A 16	Pirana STP	150m. Away from	22°58'23.8974"	72°32'56.202"
			STP Aerobic		
			system		
3	A 1	Residential area near 180	Village Location	22°58'1.041"	72°32'14.3412"
		MLD Pirana STP site –			
		Against the Wind direction			
		- Gyaspur Village			
4	A 2	within 05 km of 180 MLD	100m. Away from	22°59'24.504"	72°33'8.5572"
		Pirana STP site –	Road		
		Windward Side – Near L J			
		Institute of Engineering			
5	A 4	within 05 km of STP site –	700m. Away from	22°59'27.3618"	72°34'32.916"
		Against the Wind direction	Pirana Dumping		
		- Chhipakuva	Site		
6	A 6	within 05 km of Vasna STP	250m. away from	23°0'30.5562"	72°33'8.5572"
		site – Against the Wind	main road		
		direction – V R Shah School			

Table 14: Air Quality Baseline Monitoring Locations



Tuble 15. Results of buseline All Quality Monitoring
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Location Code					Parameter	Analysis Re	sult					
couc	PM10 μg/m3	PM2.5 μg/m³	SO2 µg/m³	NO2 µg/m³	CO mg/m3	TVOC μg/m3	HC µg/m3	Methane µg/m3	NH3 µg/m3	H2S µg/m3	Location Identify	Odor
A 15	60	24	6.57	14.5	0.56	21.5	15.4	4.7	BDL	8.7	200 m. Away	Pungent
	73	31	9.15	18.7	1.15	17.8	13.1				from STP Aerobic system Downwind	Odor
A 16	93	44	21.5	25.5	1.55	35.6	14.5	5.2	5.5	9.2	150 m. Away	Pungent
	60	35	11.69	20.4	2.53	29.8	12.6				from STP Aerobic system Downwind	Odor
A 1	40	14	< 4.0	7.4	0.25	2.4	1.2				Village Location Upwind	No Odor
	62	18	8.04	9.5	BDL	1.5	BDL					
A 2	49	25	9.5	13.8	1.18	5.2	1.9				100 m. Away	No Odor
	54	31	5.5	16.5	2	7.6	2.5				from Road Upwind	
A 4	90	36	20.5	17.6	2.33	11.2	4.8				700 m. Away	Light
	74	25	15.2	2.8	1.15	16.3	5.7				from Pirana Dumping Site Upwind	Pungent Odor
A 6	55	19	5.84	13.5	1.12	1.2	BDL				250 m away from	No Odor
	42	13	10.7	14.8	0.65	2.8	1				main road Upwind	
СРСВ	60	40	50	40	-	-	-	-	-	-	-	-
prescribed limits												

The baseline monitoring conducted shows that the air quality at the STP site and other locations is within the limits prescribed by CPCB. Though  $PM_{10}$  is higher i.e.,  $90 \ \mu g/m^3 \& 93 \ \mu g/m^3$  near the Pirana dumping ground and Pirana STP respectively mostly attributed to movement of heavy vehicles. Pungent odor is recorded at the STP locations indicating the presence of NH<sub>3</sub>, Methane and H<sub>2</sub>S emissions from the treatment process and related aspects, calling for process upgradation ensuring more oxygen supply, thermal protection, better circulation of waste water, covers and maintenance requirements, sludge management etc. Impacts of odor on plant workers and neighbours is important considering the communities around. The Ambient Air Quality (AAQ) levels at project site are well below the prescribed standards by GPCB. Proposed activities may result in increment in Particulate matter during construction activities and maintenance works.

# 1.1.5 Water Availability and Quality

### 3.4.2.4 Surface Water & Sewage

Surface water quality was assessed for the upstream, downstream and outfall from the STP into the river. Sampling was conducted during September 2021. Sewage quality was assessed at the inlet point. Sampling locations are presented in the *Figure 4*.



# Table 16: Surface Water Quality Monitoring Results

Sr.No.	Parameter	Unit of	Sampling Point Location					
		Measurement	<b>W1</b> 9	<b>W</b> 20	W4	W3	W2	
			Inlet of 126 MLD	Outlet of 126 MLD	Chandola Lake	Sabarmati River, upstream of outfall from Vasna 126 MLD	Sabarmati River, downstream of outfall from Vasna 126 MLD	Surface water standards
1	pH @ 25 ° C		7.56	7.56	7.6	7.33	7.63	6 to 9
2	Colour	Pt. Co. Scale	95	80	75	155	200	-
3	Odor		Unobjectionable	Unobjectionable	Unobjectionable	Objectionable	Objectionable	-
4	Turbidity	NTU	5	1	1	10	5	-
5	Temperature	°C	31	30	30	32	32	-
6	Total Dissolved Solids	mg/L	968	848	394	584	1296	1500
7	Total Suspended Solids	mg/L	78	BDL(MDL:4.0)	18	316	100	100
8	Total Hardness as CaCO₃	mg/L	239.2	218.4	197.6	160	254	
9	Chloride as Cl <sup>-</sup>	mg/L	191.9	159.1	56.2	88.9	294.8	600
10	Fluoride as F	mg/L	0.5	0.4	0.5	0.5	0.4	2
11	Calcium as Ca	mg/L	50	50	41.7	49	79.1	-
12	Magnesium as Mg	mg/L	27.8	22.7	22.8	9.2	13.8	-
13	Sulphate as SO <sub>4</sub> <sup>-2</sup>	mg/L	57.3	65.4	33.1	41.7	125.5	-
14	Nitrate as NO <sub>3</sub>	mg/L	1	0.4	0.8	1.6	0.8	10
15	Total Alkalinity	mg/L	407	351.2	183.9	262	434.9	-



Sr.No.	Parameter	Unit of Measurement	Sampling Point Location					
			<b>W1</b> 9	<b>W</b> 20	W4	W3	W2	
			Inlet of 126 MLD	Outlet of 126 MLD	Chandola Lake	Sabarmati River, upstream of outfall from Vasna 126 MLD	Sabarmati River, downstream of outfall from Vasna 126 MLD	Surface water standards
16	Oil & Grease	mg/L	BDL(MDL:2.0)	BDL(MDL:2.0)	BDL(MDL:2.0)	BDL(MDL:2.0)	BDL(MDL:2.0)	-
17	Dissolved Oxygen	mg/L	BDL(MDL:0.2)	BDL(MDL:0.2)	1.6	3.5	BDL(MDL:0.2)	Min 4
18	Ammoniacal Nitrogen	mg/L	20.5	BDL(MDL:2.0)	BDL(MDL:2.0)	BDL(MDL:2.0)	15	50
19	Chemical Oxygen Demand (COD)	mg/L	171.2	44.8	36.7	265.6	136.8	250
20	Biochemical Oxygen Demand (BOD)	mg/L	48	13	10	80	40	30
21	Phenolic Compound	mg/L	BDL(MDL:0.01)	BDL(MDL:0.01)	BDL(MDL:0.01)	BDL(MDL:0.01)	BDL(MDL:0.01)	-
22	Total Residual Chlorine	mg/L	BDL(MDL:0.1)	2.4	25.2	BDL(MDL:0.1)	BDL(MDL:0.1)	1
23	Total Nitrogen	mg/L	48	7.2	5.7	8.7	37.2	-
24	Total Kjeldahal Nitrogen (TKN)	mg/L	27.5	5.3	4.4	7.5	22.2	100
25	Free Ammonia	mg/L	1.46	BDL(MDL:0.2)	BDL(MDL:0.2)	BDL(MDL:0.2)	1.4	5
26	Sodium as Na	mg/L	216.4	181.1	47.3	115.2	317.4	-
27	Potassium as K	mg/L	12.3	10.9	2.3	10.2	18.5	-
28	Nickel as Ni	mg/L	0.029	0.026	BDL(MDL:0.02)	BDL(MDL:0.02)	BDL(MDL:0.02)	3
29	Copper as Cu	mg/L	BDL(MDL:0.05)	BDL(MDL:0.05)	BDL(MDL:0.05)	BDL(MDL:0.05)	0.064	3



Sr.No.	Parameter	Unit of Measurement	Sampling Point Location						
			<b>W1</b> 9	<b>W</b> 20	W4	W3	W2		
			Inlet of 126 MLD	Outlet of 126 MLD	Chandola Lake	Sabarmati River, upstream of outfall from Vasna 126 MLD	Sabarmati River, downstream of outfall from Vasna 126 MLD	Surface water standards	
30	Lead as Pb	mg/L	BDL(MDL:0.01)	0.016	0.021	0.079	0.056	0.1	
31	Iron (as Fe)	mg/L	0.902	0.507	0.262	0.934	0.608	3	
32	Zinc as Zn	mg/L	0.071	BDL(MDL:0.05)	BDL(MDL:0.05)	BDL(MDL:0.05)	BDL(MDL:0.05)	5	
33	Cadmium as Cd	mg/L	0.13	BDL(MDL:0.003)	0.028	0.006	0.017	2	
34	Arsenic as	mg/L	BDL(MDL:0.01)	BDL(MDL:0.01)	BDL(MDL:0.01)	BDL(MDL:0.01)	BDL(MDL:0.01)	-	
35	Manganese as Mn	mg/L	0.166	BDL(MDL:0.1)	BDL(MDL:0.1)	BDL(MDL:0.1)	0.146	2	
36	Mercury as Hg	mg/L	BDL(MDL:0.001)	BDL(MDL:0.001)	BDL(MDL:0.001)	BDL(MDL:0.001)	BDL(MDL:0.001)	-	
37	Total Chromium as Cr	mg/L	BDL(MDL:0.05)	BDL(MDL:0.05)	BDL(MDL:0.05)	BDL(MDL:0.05)	BDL(MDL:0.05)	2	
38	Cyanide as CN	mg/L	BDL(MDL:0.05)	BDL(MDL:0.05)	BDL(MDL:0.05)	BDL(MDL:0.05)	BDL(MDL:0.05)	-	
39	Hexavalent Chromium as Cr+6	mg/L	BDL(MDL:0.05)	BDL(MDL:0.05)	BDL(MDL:0.05)	BDL(MDL:0.05)	BDL(MDL:0.05)	-	
40	Cobalt as Co	mg/L	BDL(MDL:0.5)	BDL(MDL:0.5)	BDL(MDL:0.5)	BDL(MDL:0.5)	BDL(MDL:0.5)	-	
41	Total Phosphorous	mg/L	1.83	1.96	0.085	1.27	1.8	-	
42	Salinity	ppt	0.35	0.29	0.1	0.16	0.53	-	
				<b>Biological Analy</b>	vsis				
41	Total Coliform	CFU/100ml	80	69	32	78	80	-	
42	Faecal Coliform	CFU/100ml	59	48	24	70	71	-	

From the results obtained from monitoring it can be seen that the pH is alkaline which could be due to inflow of the discharge from STP in the river. BOD and COD are higher in the upstream which is due to inflow of multiple STPs, Mega line carrying combined treated effluents from CETPs and ETPs in the city, and other ETPs, and drains. Also, presence of faecal coliform indicates the polluted nature of the water. It is estimated that the improvement under G-ACRP will help enhance the water quality of the Sabarmati River. Odor was observed objectionable in all cases expect for the Lake. Iron, Zinc, Cadmium, Nickel and Manganese are detected at STP inlet, but much below the allowable limits. At outlets it is seen that there is reduction in levels of these. DO level at Sabarmati, downstream of the outfall from Vasna STPs is a concern (BDL as against min 4 mg/l required). BOD, COD, N P values are much higher than the MoEFCC standards prescribed in the Consent conditions, and thus, the NGT prescribed limits. These indicate the need for upgrading the STP to ensure better quality of treated water.

### 3.4.2.5 Ground Water

The district forms a part of the Cambay Basin and drains into the Gulf of Cambay or Khambhat. The depth to ground water level (DTWL) during the pre-monsoon period (May 2019) ranged from 2.25 to 27.55 mbgl. The range of ground water level in the district is given as below.

No of wells analysed	DTWL	mbg	No of well in different Depth Ranges (m)				anges	
	Min	Max	0 to 2	2 to 5	5 to 10	10 to 20	20 to 40	>40
21	2.25	27.55	0.00%	38.00%	24.00%	29.00%	10.0%	0.00%

Table 17	7: Ground	Water Level	pre-monsoon	<b>2019</b> 19
TUDIC I/	. 0/04/14			2015

Groundwater samples were collected during September 2021 and quality was assessed following CPCB water quality Guidelines 2017. Sampling locations are as follows:

<sup>&</sup>lt;sup>19</sup> DIST-WISE FRQ TEALE OF MAY2019 for website.xlsx (cgwb.gov.in)



# Table 18: Ground Water Quality Monitoring Results<sup>20</sup>

Sr.No.	Parameter	Unit of Measur		Sampling Locations						
		ement	GW20	GW4	GW11	GW2	GW3	GW7	GW10	GW21
1	pH @ 25 ° C		8.3	8.66	7.74	7.86	7.24	7.98	8.17	7.48
2	Colour	Pt. Co. Scale	35	10	30	30	35	25	35	40
3	Odor		Unobjection able	Unobjectionable	Unobjectionable	Unobjectionable	Unobjectionable	Unobjectionable	Unobjectiona ble	Unobjection able
4	Turbidity	NTU	BDL(MDL:0. 1)	BDL(MDL:0.1)	BDL(MDL:0.1)	0.1	0.1	BDL(MDL:0.1)	0.1	0.1
5	Temperature	°C	31	31	32	32	31	31	31	32
6	Total Dissolved Solids	mg/L	1208	876	1356	404	1198	1062	1098	1392
8	Total Hardness as CaCO <sub>3</sub>	mg/L	260	179	338.4	197.4	413.6	150.4	103.4	508
9	Chloride as Cl <sup>-</sup>	mg/L	290.1	145.1	355.6	37.4	205.9	191.9	117	285.4
10	Fluoride as F	mg/L	0.9	1.1	0.7	0.4	0.6	1.1	6	0.6
11	Calcium as Ca	mg/L	58.4	15.1	94.2	67.8	116.8	33.9	15.1	113
12	Magnesium as Mg	mg/L	27.8	34.4	25.1	6.9	29.7	16	16	54.9
13	Sulphate as SO <sub>4</sub> -2	mg/L	109.2	76.6	168.4	21.1	184.3	98.4	56.9	183.8
14	Nitrate as NO <sub>3</sub>	mg/L	3.4	5	4.1	2.9	15.5	7.7	0.4	0.6
15	Total Alkalinity	mg/L	395.8	368	373.5	211.9	401.4	401.4	563.1	473.9
16	Oil & Grease	mg/L	BDL(MDL:2. 0)	BDL(MDL:2.0)	BDL(MDL:2.0)	BDL(MDL:2.0)	BDL(MDL:2.0)	BDL(MDL:2.0)	BDL(MDL:2.0 )	BDL(MDL:2.0 )
7	Dissolved Oxygen	mg/L	5	7.4	3.5	2.5	3.1	4.2	3.8	1.7

<sup>20</sup> Standards recommended by Central Ground Water Board were used for the assessment. http://www.cgwbchd.nic.in/qulstd.htm



Sr.No.	Parameter	Unit of Measur		Sampling Locations						
		ement	GW20	GW4	GW11	GW2	GW3	GW7	GW10	GW21
18	Ammoniacal Nitrogen	mg/L	BDL(MDL:2. 0)	BDL(MDL:2.0)	BDL(MDL:2.0)	BDL(MDL:2.0)	BDL(MDL:2.0)	BDL(MDL:2.0)	BDL(MDL:2.0 )	12.5
19	Chemical Oxygen Demand (COD)	mg/L	BDL(MDL:2. 0)	BDL(MDL:2.0)	20.1	BDL(MDL:2.0)	BDL(MDL:2.0)	BDL(MDL:2.0)	BDL(MDL:2.0 )	16.1
20	Biochemical Oxygen Demand (BOD)	mg/L			6					
21	Phenolic Compound	mg/L	BDL(MDL:0. 01)	BDL(MDL:0.01)	BDL(MDL:0.01)	BDL(MDL:0.01)	BDL(MDL:0.01)	BDL(MDL:0.01)	BDL(MDL:0.0 1)	BDL(MDL:0.0 1)
22	Total Residual Chlorine	mg/L	1	2.1	BDL(MDL:0.1)	0.7	2.8	0.7	BDL(MDL:0.1 )	BDL(MDL:0.1 )
23	Total Nitrogen	mg/L	5.7	5.3	3.7	4.9	4.6	7.2	6.3	31.5
24	Total Kjeldahal Nitrogen (TKN)	mg/L	4.4	4.1	3.1	3.7	3.4	5.3	4.4	19
25	Free Ammonia	mg/L	0.84	1.5	BDL(MDL:0.2)	BDL(MDL:0.2)	BDL(MDL:0.2)	0.54	0.71	0.85
26	Sodium as Na	mg/L	305	219.7	320.3	38.2	215.6	298.3	316.4	255.5
27	Potassium as K	mg/L	3	1.1	4	4.8	18.7	1.5	1.7	13.8
28	Nickel as Ni	mg/L	BDL(MDL:0. 02)	BDL(MDL:0.02)	0.015	BDL(MDL:0.02)	BDL(MDL:0.02)	BDL(MDL:0.02)	BDL(MDL:0.0 2)	BDL(MDL:0.0 2)
29	Copper as Cu	mg/L	BDL(MDL:0. 05)	BDL(MDL:0.05)	BDL(MDL:0.05)	BDL(MDL:0.05)	BDL(MDL:0.05)	BDL(MDL:0.05)	BDL(MDL:0.0 5)	0.054
30	Lead as Pb	mg/L	0.015	0.079	0.065	0.038	0.057	0.059	0.045	0.069
31	Iron (as Fe)	mg/L	BDL(MDL:0. 1)	0.237	0.181	0.744	0.346	0.436	0.249	0.642
32	Zinc as Zn	mg/L	BDL(MDL:0. 05)	BDL(MDL:0.05)	BDL(MDL:0.05)	BDL(MDL:0.05)	BDL(MDL:0.05)	0.08	BDL(MDL:0.0 5)	0.13
33	Cadmium as Cd	mg/L	0.022	0.007	0.02	BDL(MDL:0.003)	0.009	0.008	0.008	0.014
34	Arsenic as As	mg/L	BDL(MDL:0. 01)	BDL(MDL:0.01)	BDL(MDL:0.01)	BDL(MDL:0.01)	BDL(MDL:0.01)	BDL(MDL:0.01)	BDL(MDL:0.0 1)	BDL(MDL:0.0 1)



Sr.No.	Parameter	Unit of Moasur		Sampling Locations						
		ement	GW20	GW4	GW11	GW2	GW3	GW7	GW10	GW21
35	Manganese as Mn	mg/L	BDL(MDL:0. 1)	BDL(MDL:0.1)	BDL(MDL:0.1)	0.341	0.728	BDL(MDL:0.01)	0.143	0.13
36	Mercury as Hg	mg/L	BDL(MDL:0. 001)	BDL(MDL:0.001)	BDL(MDL:0.001)	BDL(MDL:0.001)	BDL(MDL:0.001)	BDL(MDL:0.001)	BDL(MDL:0.0 01)	BDL(MDL:0.0 01)
37	Total Chromium as Cr	mg/L	BDL(MDL:0. 05)	BDL(MDL:0.05)	BDL(MDL:0.05)	BDL(MDL:0.05)	BDL(MDL:0.05)	BDL(MDL:0.05)	BDL(MDL:0.0 5)	BDL(MDL:0.0 5)
38	Cyanide as CN	mg/L	BDL(MDL:0. 05)	BDL(MDL:0.05)	BDL(MDL:0.05)	BDL(MDL:0.05)	BDL(MDL:0.05)	BDL(MDL:0.05)	BDL(MDL:0.0 5)	BDL(MDL:0.0 5)
39	Hexavalent Chromium as Cr+6	mg/L	BDL(MDL:0. 05)	BDL(MDL:0.05)	BDL(MDL:0.05)	BDL(MDL:0.05)	BDL(MDL:0.05)	BDL(MDL:0.05)	BDL(MDL:0.0 5)	BDL(MDL:0.0 5)
40	Cobalt as Co	mg/L	BDL(MDL:0. 5)	BDL(MDL:0.5)	BDL(MDL:0.5)	BDL(MDL:0.5)	BDL(MDL:0.5)	BDL(MDL:0.5)	BDL(MDL:0.5 )	BDL(MDL:0.5 )
41	Total Phosphorous	mg/L	0.04	N.D.	N.D.	N.D.	N.D.	N.D.	N.D.	N.D.
42	Salinity	ppt	0.52	0.38	0.64	0.07	0.37	0.35	0.21	0.52
					Biological A	Analysis				
41	Total Coliform	CFU/10 0ml	12	8	5	Absent	Absent	Absent	Absent	Absent
42	Faecal Coliform	CFU/10 0ml	8	6	4	Absent	Absent	Absent	Absent	Absent



Lead (Pb) is present in the samples in a very small amount. Contamination of ground water is due to the reverse boring of industrial effluents and polluted surface water<sup>21</sup>. pH in GW4 (8.66) exceeds the permissible limit (8.5) as per the standards BIS: IS: 10500, 1991 recommended by CGWB for domestic use<sup>22</sup>. It is estimated that the improvement under G-ACRP will help enhance the water quality of the Sabarmati River.

### 1.1.6 Soil Quality

Soil quality sampling was conducted during September 2021. Following are the locations of the sampling,

				Sampling Point	Location		
Sr.No.	Parameter	Unit of Measurement	\$1	\$3	<b>S</b> 5	<b>S6</b>	S14
1	pН		7.8	8.8	8.96	9.18	8.61
2	Electrical Conductivity	μs/cm	274.3	143.5	152.2	132.7	151.2
3	Magnesium	mg/kg	50.3	100.9	90.6	181.7	315.5
4	Sodium	mg/kg	12	18.2	182.1	116.4	208.6
5	Potassium	mg/kg	61.4	14.4	13.6	3.6	18.9
6	Phosphorous	mg/kg	2961.9	1194.2	593.8	397.2	1378.1
7	Sodium Absorption Ratio (SAR)		BDL(MDL:1.0)	BDL(MDL:1.0)	1.93	1.4	2.01
8	Copper as Cu	mg/kg	61.2	6.1	40.7	7.1	18.4
9	Manganese as Mn	mg/kg	82.8	45.1	178	60.6	154.8
10	Zinc as Zn	mg/kg	71.1	20	125.3	54.8	60.1
11	Nitrogen	mg/kg	252.3	37.4	91.3	59.9	111.5
12	Bulk Density	gm/cc	1.309	1.352	1.348	1.553	1.404
13	Porosity	%	52	48	50	50	52
14	Cation Exchange Capacity	meq/100g	25.6	27.1	26.4	26.6	28.2
15	Nickel as Ni	mg/kg	30.3	5.8	12.1	9.3	18.1
16	Iron as Fe	mg/kg	3383.9	2634.7	6255.1	840.6	7123.7
17	Water Holding Capacity	ml/100 gm	60	72	64	66	56
18	Permeability	Cm/Sec	0.172	0.174	0.183	0.18	0.184
19	Salinity	ppt	0.34	0.51	0.34	0.67	0.67
			Texture Class:				
20	Sand	%	18	986	96.3	98.6	13.8
21	Silt	%	22	0.6	2.8	0.8	18.6
22	Clay	%	60	0.8	1.2	0.6	67.6

# Table 19: Results of Soil Analysis

<sup>21</sup> http://gujenvis.nic.in/PDF/soe-water.pdf

<sup>22</sup> http://www.cgwbchd.nic.in/qulstd.htm



The soil of project site and vicinity is of alluvial in nature and disturbed. In general, the soil pH is varying from 7.8 to 8.96 which is in alkaline in nature. Higher pH at certain places can be attributed to low detritus and organic material.

Soil of the area is mostly disturbed due to large scale construction and urban activities. Some of the published articles also indicate higher level of heavy metals such as Chromium, Cadmium, Manganese, Lead, Zinc in soil, which can be attributed to industrial emissions in the vicinity of Ahmedabad city<sup>23</sup>. It is important to prevent industrial pollution leaching into water sources and soil of the city and set up sensors to detect any such constituents in manholes and wastewater inlets. In this regard the Hon'ble High Court of Gujarat has proactively set up a task force (in September 2021) to disconnect all connections from industrial units into the sewers and drains in the city, now from Eastern part of the river. Till now, the task force has disconnected around 400 such connections and the units are asked to resume operations only after connecting their effluents to CETPs/ETPs. Such due diligence and actions will curtail illegal inflow of industrial effluents into sewer system and STPs.

### 1.1.7 Sludge & Sediment

Sludge samples were collected from the STP, and river bed sediment samples were collected from the Sabarmati River, near STP outlet and Vasna Barrage flow. The locations are provided in the *Figure 4*.

<sup>&</sup>lt;sup>23</sup>Nature Environment and Pollution Technology Vol. 20 163-175 2021, Heavy Metals in Soils and Vegetation from Wastewater Irrigated Croplands Near Ahmedabad, Gujarat: Risk to Human Health



# Table 20 Sludge & Soil Quality

						Sampling	Locations			
Sl.No	Parameter	Unit Of Measuremen t	Sludge 9 - Vasna STP 126 MLD Sludge	Sediment – 1 Downstream Of Sabarmati River after Vasna Barrage (at Shallow Levels	Sediment – 2 Downstream Of Sabarmati River after Vasna Barrage (at Deep Levels	Sediment- 3 Downstream Of Sabarmati River near outfall (at Shallow Levels	Sediment – 4 Downstream Of Sabarmati River near outfall (at Deep Levels	Sediment - Upstream Of Sabarmati River at Shallow Level	Sediment - Upstream Of Sabarmati River at Deep Level	Sediment – Sabarmati Flowing Within the City
1	рН		7.04	8.52	8.9	8.05	8.02	8.48	8.5	8.32
				5.5	5.5	5.5	5.5	5.5	5.5	5.5
				8.5	8.5	8.5	8.5	8.5	8.5	8.5
2	Conductivity	μS/cm	275.6	155.1	156.8	107.8	109	172.3	186	186.7
3	Moisture	%	37.1	25.9	24.4	28.6	40.6	30.8	13.01	26.2
4	Calorific Value	Kcal/kg	BDL(MDL:200)	BDL(MDL:200)	BDL(MDL:200)	BDL(MDL:200)	BDL(MDL:200)	BDL(MDL:200)	BDL(MDL:200)	BDL(MDL:200)
5	Arsenic as As	mg/kg	BDL(MDL:0.05)	BDL(MDL:0.05)	BDL(MDL:0.05)	BDL(MDL:0.05 )	BDL(MDL:0.05)	BDL(MDL:0.05 )	BDL(MDL:0.05)	BDL(MDL:0.05)
6	Nickel as Ni	mg/L	BDL(MDL:1.0)	BDL(MDL:1.0)	BDL(MDL:1.0)	BDL(MDL:1.0)	BDL(MDL:1.0)	BDL(MDL:1.0)	BDL(MDL:1.0)	BDL(MDL:1.0)
7	Cadmium as Cd	mg/L	BDL(MDL:1.0)	BDL(MDL:1.0)	BDL(MDL:1.0)	BDL(MDL:1.0)	BDL(MDL:1.0)	BDL(MDL:1.0)	BDL(MDL:1.0)	BDL(MDL:1.0)
8	Copper as Cu	mg/L	BDL(MDL:1.0)	BDL(MDL:1.0)	BDL(MDL:1.0)	BDL(MDL:1.0)	BDL(MDL:1.0)	BDL(MDL:1.0)	BDL(MDL:1.0)	1.74
9	Chromium as Cr <sup>+6</sup>	mg/L	BDL(MDL:1.0)	BDL(MDL:1.0)	BDL(MDL:1.0)	BDL(MDL:1.0)	BDL(MDL:1.0)	BDL(MDL:1.0)	BDL(MDL:1.0)	BDL(MDL:1.0)
10	Lead as Pb	mg/L	BDL(MDL:1.0)	BDL(MDL:1.0)	BDL(MDL:1.0)	BDL(MDL:1.0)	BDL(MDL:1.0)	BDL(MDL:1.0)	BDL(MDL:1.0)	BDL(MDL:1.0)
11	Zinc as Zn	mg/L	1.01	3.2	1.5	BDL(MDL:1.0)	1.51	BDL(MDL:1.0)	BDL(MDL:1.0)	BDL(MDL:1.0)
12	Mercury as Hg	mg/kg	BDL(MDL:0.05)	BDL(MDL:0.05)	BDL(MDL:0.05)	BDL(MDL:0.05 )	BDL(MDL:0.05)	BDL(MDL:0.05 )	BDL(MDL:0.05)	BDL(MDL:0.05)



Sampling Locations

SI.No	Parameter	Unit Of Measuremen t	Sludge 9 - Vasna STP 126 MLD Sludge	Sediment – 1 Downstream Of Sabarmati River after Vasna Barrage (at Shallow Levels	Sediment – 2 Downstream Of Sabarmati River after Vasna Barrage (at Deep Levels	Sediment- 3 Downstream Of Sabarmati River near outfall (at Shallow Levels	Sediment – 4 Downstream Of Sabarmati River near outfall (at Deep Levels	Sediment - Upstream Of Sabarmati River at Shallow Level	Sediment - Upstream Of Sabarmati River at Deep Level	Sediment – Sabarmati Flowing Within the City
13	Oil & Grease	mg/kg	7	7	9	7	8	6	8	9
14	Colour		Black	Black	Black	Black	Black	Black	Black	Black
15	Texture		Solid	Solid	Solid	Solid	Solid	Solid	Solid	Solid & Paper
16	Odor		Unobjectionabl e	Unobjectionabl e	Unobjectionabl e	Objectionable	Unobjectionabl e	Objectionable	Unobjectionabl e	Unobjectionabl e
17	Bulk Density	gm/cc	0.864	1.229	1.369	1.308	1.16	1.296	1.478	1.314
18	Water Holding Capacity	ml/100 gm	64	48	56	50	44	46	90	54
19	Total Volatile Solids	%	6.83	3.31	3.11	2.94	6.68	4.16	1.21	4.28
20	Total Kjeldahl Nitrogen	mg/kg	924.6	218.2	217.1	242.8	299.3	312.6	107.4	264.6
21	Organic carbon	%	26.4	1.85	0.29	0.94	4.59	0.86	0.75	1.06
22	Phenolic Compounds	mg/kg	N.D.	N.D.	N.D.	N.D.	N.D.	N.D.	N.D.	N.D.
23	Total Phosphorou s	mg/kg	5952.9	296.2	986.3	972.2	1364.1	599.1	396	793.4

At downstream location near outfall and Vasna barrage the pH of sediment define alkaline nature. Nitrogen and Phosphorous contents of the Sludge are high. Sludge also shows presence of Zinc; also, in the sediment of Downstream samples. Currently sludge is being treated at sludge hygenisation plant of AMC and testing of treated sludge is undergoing for assessing its suitability, as a manure. Study is being conducted by AMC. The capacity of hygienisation plant is suitable to manage sludge from the proposed facilities even after proposed upgradation.



# 1.1.8 Ambient Noise

Noise monitoring activity had undertaken during September 2021. Sampling locations are in *Figure 4*.

Table 21 Sampling locations of noise levels

SI No	Location Name	Location Code	Day Time: (6 am to 9 pm)	Night-time: (10 pm to 5 am)
1	Residential area within 05 km of Pirana STP site – Against the Wind direction	N 1	50.74	40.78
2	Within 05 km of STP site, Residential area, Faisal Nagar – Windward Side	N 9	56.27	45.80
3	Within 05 km of Vasna STP site, Residential area, Mastani Nagar Windward side	N 10	55.94	46.68
4	Residential area within 05 km of Vasna STP site Against the Wind direction	N 2	57.79	48.00
5	Vasna STP location – Subproject Site	N 5	60.63	52.55
6	Pirana STP location	N 6	62.34	54.88
7	Near Paldi Bus stop	N 19	65.59	52.88

Primary data provided above shows that during night-time, the noise levels in the residential area within 05 km (against the Wind direction) of Vasna STP site is exceeding limits of 45dB. This may be due the closeness to the highway and ongoing construction works. The rest of the noise levels as per the National Ambient Noise levels are well within the limits set as per regulations for Industrial, commercial and residential areas in Ahmedabad.

Secondary data<sup>24</sup> from 10 - 23 May 2018 at 24 locations shows that the average noise level always exceeded the guidelines of World Health Organization (WHO) for the daytime noise (75 dB(A) for Industrial area, 65 dB(A) for Commercial area, 55 dB(A) for Residential area and 50 dB(A) for Silence zones), which is quite alarming. For a major portion of the traffic corridor (79.6%), even the minimum noise level was above the permissible average noise level which is a matter of great concern. The highest noise level observed was 86.0 dB (A). Traffic corridors near the central business district namely, Akhbarnagar followed by Naranpura were found the nosiest.

Vasna 126 MLD STP is located well away from residential areas except for the slums or informal settlements adjacent to the STP, along western boundary and access road. Noise levels at the location are within limit. It is expected that due to proposed rehabilitation of STP, there will be a temporary localised increase in the local noise levels during construction phase.

<sup>&</sup>lt;sup>24</sup> Current World Environment Vol. 16, No. (1) 2021, Pg. 198-209, Monitoring and Assessing the Environmental Noise along a Busy Traffic Corridor of Ahmedabad City, India





Figure 20: Noise Sampling Locations superimposed on Traffic Corridors



Figure 21: L<sub>max</sub>along Traffic Corridors of Ahmedabad



Figure 22: LAeq along the traffic corridors of Ahmedabad



# 3.5 Traffic Assessment

Traffic assessment is an essential aspect to understand the baseline of the proposed location. Proposed activity may result in increase in traffic movement and increased traffic may attract health and safety issues concerning accidents and emission of pollutants from increased traffic. Hence vehicular traffic in Ahmedabad was studied to understand the major concerns. The vehicular density in Ahmedabad city is increasing at 5-6% per annum, while the road length is largely constant in last 5 years. As per the statement of vehicles registered till 31st March 2021 with COT (Commissioner of Transport Office, Gandhinagar) the number of vehicles in Ahmedabad is 45,19,181. The detailed break up is given in below table:

Sl. No.			Type of Vehicles	Ahmedabad	Ahmedabad
				(GJ-1)	(East) (GJ-2)
1			Goods Vehicles		
	Α.	Τrι	ick/ Lorries	50582	10400
	Β.	Tai	nker	3498	460
	C.	Th	ree-Wheeler	71246	14738
	D.	Ot	her Light Wheeler	43489	7155
			TOTAL	168815	32753
2			Passenger Vehicles		
		Α.	Stage Carriage	21028	0
		Β.	Cont. Carriage	7808	319
		C.	Maxi Cab	6810	1403
		D.	School Bus	1224	243
		Ε.	Private Service Vehicles	1148	4
		F.	Police Van	861	3
			Total	38879	1972
3			Ambulance	1469	15
4		Α.	3-Wheeler Motor Car	11197	0
		Β.	4-Wheeler Motor car	766409	98095
5			Taxi	23814	98095
6			Jeep	32337	3689
7			Auto Rickshaws	202054	967
8			Two-Wheeler	0	32418
		Α.	Motor-Cycle/ Scooter	2871138	0
		Β.	Moped	304210	598624
9			Tractor	56447	600
10			Trailer	29893	3788
11			Other Vehicles	12519	611
			Total	4519181	13858

 Table 22: Type of Vehicles registered with COT (dated 9 June 2021)

Ahmedabad city traffic police jurisdiction area is divided into 14 traffic divisions. 1375 accidents were reported in Ahmedabad city within the period of January to December 2019<sup>25</sup>. Out of this, 350 accidents were fatal in nature and majorly occurred in the night-time after 9 pm. In these accidents the pedestrian users of the city roads are also affected to a great extent.

As per the detailed study conducted by JP India Pvt Ltd. during the year 2019, the major outcomes were:

- There is need for developing pedestrian infrastructure specifically for intersection points.
- Use of Helmets

<sup>&</sup>lt;sup>25</sup> ACCIDENT INVESTIGATION REPORT – AHMEDABAD [2019] by JP Research India Pvt. Ltd. <sup>26</sup> Ahmedabad Accident Research Report by JP Research India Pvt Ltd., Sep 2019 Report



- Road obstructions/ construction causing limited vision
- Surface road defects such as potholes/ cracks/ unevenness etc.
- Defective traffic signals & indiscipline in following traffic rules.
- Violating the vehicle speed rules
- No signage
- Lack of driving skills
- Gap in median section
- Unmaintained vehicles causing break failure

The traffic accidents are usually attributed to human error and violations of traffic rules. However, considering the above points, it can be concluded that city requires better pedestrian infrastructure, signals and road designs.

### 3.5.1 Accidents Prone Locations

The major accident-prone areas are depicted in *Figure 31*. It can be seen that Naroda Narol road and Subhash Bridge area (in reference to the phase I) sub projects is a major accident-prone area. Other road having accident history in the proximity of project sites are shown in *Table 23* and number of accidents and its causes are depicted in *Table 24*, respectively.



Figure 23: Accident prone locations of Ahmedabad<sup>26</sup>

Table	23:	Accidents	during	past	three	years
-------	-----	-----------	--------	------	-------	-------

Road & Intersections	Years		
	2017	2018	2019
NH8 (Narol Naroda Road)	46	63	42
Shyam Shikhar CR to Ajit Mill CR to Hatkeshwar CR to Guruji Bridge			
Shyam Shikhar CR to Ajit Mill CR to Hatkeshwar CR to Guruji Bridge			
Forensik CR to Rameshwar CR			
Soniya Ceramic to D Mart to memco Bridge (Revised to Memco Bridge			
to Meghani Nagar)			
Sardar Patel Ring Road	43	60	45
Ramol Toll Tax to Auda Under Bridge			
NH64 (Narol-Sarkhej Road)	48	58	41
Jashoda Nagar CR to Crozy Hotel			
Naroda to Narol (Revised to Naroda to Jashoda nagar Crossing)			

<sup>26</sup> Ahmedabad Accident Research Report by JP Research India Pvt Ltd., Sep 2019 Report



Road & Intersections	Years		
	2017	2018	2019
132 Feet Ring Road	19	21	14
Naroda Road	17	11	20
Airport Road	18	11	11
Lal Bahadur Shastri Road	13	13	8

Table 24: Major factors for accidents along the major roads falling under the project scope 27

SI.	Factors for accidents	NH8 (Narol	Sardar	NH64 (Narol-
No.		Naroda	Patel Ring	Sarkhej Road)
		Road)	Road	
1.	Helmet not used	13	14	
2.	Injuries to rider due to impact with other vehicle	12	12	3
3.	Injuries to Pedestrian due to impact with other	10	6	
	vehicle			
4.	Runover of Two-wheeler rider/ bicyclist	8	6	
5.	Speeding - Excessive speed for conditions	5	6	3
6.	Injuries due to roadside manmade structures	5	-	
7.	Pedestrian's Dangerous Behavior on Roadway	5	5	3
8.	Poor road marking/signage	4	7	-
9.	Speeding Above Speed Limit	4	4	2
10.	Overtaking in undivided road	3	6	-
11.	Injuries Due to Ejection from Vehicle	3	4	-
12.	Pedestrian's Inattention	3	5	-
13.	Improper lane change/lane usage	3	4	-

The width of the Fatehwadi canal road is sufficient to cater the increased traffic volume as the existing traffic movement is very low. As the STPs have a separate entry/ exit it will not affect movement of any local vehicles.

The above study of traffic signifies the management requirements during construction and pre-construction phases of the project. As the movement of vehicles carrying personnel and raw material for this sub-project will increase traffic movement and may cause conflicts. For the proposed project major concerns related to traffic are 1. Uneven roads, 2. non-marking of roads, 3. Width of canal road is smaller, 4. Approach road connecting canal road and STP has sharp turn, and 5. Absence of signages. Improvement of road infrastructure and providing signages will be necessary. During construction, the project planning should be made in such a way that minimal bypass or diversion is required.

Apart from above measures, AMC (through PMC) should depute their own supervisory team to coordinate with residential and commercial groups for educating the masses about diversions, road blockages and other measures. Prior information should be given to the residents in the area through various media tools such as TV broadcast, Pamphlet etc.

# 3.5.2 Comprehensive Environmental Pollution Index

Comprehensive Environmental Pollution Index (CEPI) was adopted by MoEFCC for depicting the overall pollution Index of Industrialised area. This index is sum of all kinds of pollution viz. air, water, soil, noise, ecological status etc. in the industrial areas of cities and is an indicator of environmental health of the city. The CEPI Index for Naroda/ Odhav industrial cluster of Ahmedabad is comparatively better than other industrialised areas of Gujarat as given below:

<sup>&</sup>lt;sup>27</sup> Ahmedabad Accident Research Report by JP Research India Pvt Ltd., Sep 2019 Report



SI. No.	Name of polluted industrial area (PIA)	CEPI Score As per monitoring during 2018 by CPCB			
1	Vadodara (Critically Polluted Area - CPA)	89.09			
2	Ankleshwar (CPA)	80.21			
3	Vapi (CPA)	79.95			
4	Surat (CPA)	76.43			
5	Vatva (Vatva & Narol) (CPA)	70.94			
6	Rajkot (CPA)	70.62			
7	Bhavnagar (Severely Polluted Area - SPA)	61.94			
8	Ahmedabad (Naroda & Odhav) (Other Polluted Area - OPA)	57.11			
9	Morbi	54.24			
Source: GPCB Annual report 2019-2020					

Table 25: Con	prehensive	Environmental	Pollution	Index o	f Gu	iarat clusters
	ipi chichibit c	Line in Orinine inter		mach 0	,	juiuc ciusteis

Category	CEPI Score
СРА	>70
SPA	60-70
OPA	<60

For managing pollution from industrial areas and industries, collectively and cumulatively, regulatory measures, mechanisms for preventing emissions, treatment facilities for wastes and industrial effluents need to improve.

### 3.5.3 Natural Disaster Assessment

Being near to Sabarmati River, the existing Vasna 126 MLD STP needs to be more vigilant for floods. This STP is also located at around 3 km from Vasna Barrage and south end of the Riverfront. HFL of Sabarmati River is 41.77 m at the Vasna Barrage near the project area. Thus, clear demarcation of HFL is important to identifying the areas which would be impacted.

The lower promenade of the Sabarmati Riverfront got submerged in 2006, 2011, 2015 and 2017. In 2006, low lying slum at Vadaj experienced severe flooding and houses and shops were half submerged and hundreds of slum dwellers from Vadaj and riverbank areas (behind VS hospital and Tagore hall, Khanpur and Shahpur, Behind NID) were relocated to schools.<sup>28</sup> In 2015, the release of 1.8 lakh cusecs of water from Dharoi dam had led to the flooding of the riverfront<sup>29</sup>. People were evacuated from Fatehwadi, Chandrabhaga and Indira bridge area. During 23 - 27 July 2017, Ahmedabad district, City taluka and Bavla taluka reported 81.16%, 107.86% and 115.60% rainfall respectively<sup>30</sup>. Ahmedabad received 828.2 mm rains, as against a normal level of 291.1 mm<sup>31</sup>. Around 200mm of rainfall was received in the city in 24 hours

<sup>&</sup>lt;sup>28</sup> https://www.deshgujarat.com/2015/07/29/blog-year-2006-sabarmati-flood-in-ahmedabad-i-witnessed/

<sup>&</sup>lt;sup>29</sup><u>https://indianexpress.com/article/india/gujarat-floods-submerged-sabarmati-riverfront-throws-up-snakes-and-many-guestions-4775653/</u>.

<sup>&</sup>lt;sup>30</sup> https://gidm.gujarat.gov.in/sites/default/files/educate\_your\_self\_document/Gujarat%20Flood%202017%20-%20A%20Case%20Study%20by%20NDMA%20%26%20GIDM\_2.pdf

<sup>&</sup>lt;sup>31</sup>https://www.business-standard.com/article/current-affairs/a-rare-phenomenon-caused-gujarat-floods-117072900734\_1.html



in 2017.<sup>32</sup> More than 150 factories shut down,<sup>33</sup> and slums in the city were waterlogged while the districts of Ahmedabad and Gandhinagar were also on alert due to the Daroi dam releasing water into the Sabarmati River, which had already received water from the Narmada,<sup>34</sup> and 2800 people from low lying areas were evacuated<sup>35</sup>.

Based on the above experiences with floods, during worst floods scenario, potential risks identified to and in STP premises during construction and operation phases include: submergence of the STP and nearby areas including access roads, trunk mains and outfalls, structural damage of STP components and linked structures; reverse flow from outlet; Impacts on outfall points, wastes, debris, carcasses carried into the premises by flood waters, choked machinery, inlets and outlets, impact of monitoring equipment, submerged equipment and electric short circuits, risks to workers and nearby communities due to flooding, disruption of construction works and material stacked, issues with stored sludge and chemicals, possibility of water borne disease post flood; untreated sewage release and downstream impacts on communities, impaired functioning caused by damage to equipment and machinery.

As per the seismic map of India, Ahmedabad falls under the Zone III (Moderate Damage Risk Zone). Ahmedabad along with other areas of Gujarat had experienced a massive earthquake in January 2001. It is important that the proposed rehabilitation also consider structural strengthening to make the STP resilient to earthquake, flooding and other disasters.

#### 3.6 Socio-Economic Baseline

The baseline socio economic condition used in the ESIA study and discussed has been compiled from the population estimates of Master Planning Consultants of AMC, Census 2011 data for the city and the wards and primary data collection. Other data available in the public domain has also been collated and discussed in the baseline section to understand and present the social baseline condition with respect to the area of influence and area of impact for the project, health condition, downstream impact with respect use of water from Sabarmati River, health issues, groundwater extraction and quality and related issues.

The immediate area of influence in ward no 52 Sarkhej where the STP is location and area of impact is larger and includes the sewerage catchment in zone 1 for the 126 MLD STP, downstream villages using the water from Sabarmati River.

### 3.6.1 Ward Data

STP is located in Ward Number 52 for Sarkhej which is included in 10 kms area of study of existing STP and existing STP and area of influence/impact and has a significant geographic area for the sewerage catchment, in which the STP is located. FR reports that western Zone - 2 covers approximately 75 sq.km. area of AMC. Catchment to the 126 MLD treatment Plant at Vasna include Area Between 132 feet Ring Road and S. G. Highway, Old Auda area, Chandlodiya, Ghatlodiya, Memnagar, Vejalpur, Prahaladnagar, Satellite, Vastrapur, Maktampura. The estimated contributing population for this zone is about 14.53 lakh.

The entire sewage from this zone is ultimately conveyed to four STP at 60 MLD Jal Vihar, Vasna 48 NLD, Vasna 35 MLD and Vasna 126 MLD at Vasna through three TSPS. Vasna Barrage TSPS receives wastewater from the interceptor sewer and feeds to 35 MLD STP. Vasna Terminal 76

<sup>&</sup>lt;sup>32</sup>https://www.indiatoday.in/india/story/ahmedabad-airport-gujarat-floods-heavy-rains-sabarmati-river-gandhinagar-1026704-2017-07-27

<sup>&</sup>lt;sup>33</sup> <u>https://www.theguardian.com/world/2017/jul/31/india-monsoon-floods-gujarat-death-toll-over-200</u>

<sup>&</sup>lt;sup>34</sup> https://hdrc-sxnfes.org/wp-content/uploads/2020/04/Report-Flood-Final-19\_08\_17.pdf

<sup>&</sup>lt;sup>35</sup>https://timesofindia.indiatimes.com/city/ahmedabad/flood-fury-hits-gujarat-25000-people-

evacuated/articleshow/59744404.cms


MLD TSPS feeds to 48 MLD STP while the Vasna (AUDA) 126 MLD TSPS feed to 126 MLD STP. The wastewater from Chandrabhaga drain is intercepted and taken to Jal Vihar STP.

As per the SCADA records, about 338 MLD sewage is generated at present in this zone and all sewage generated will be treated with the implementation of the proposed sub project.

## 3.6.2 Study area profile and limitation

A transect walk was also conducted within the STP plant area to observe specific issues related to the plant site. Consultations were also undertaken with various stakeholders with reference to the STP including AMC Officials, Operators and Squatter settlement inhabitants. Discussion were held during preparation of ESIA and ESMP, after disclosure of draft ESIA/ESMP.

There are few STPs in the Vasna within 100 to 250 m, such as the 35 MLD, 48 MLD, 126 MLD etc. At the time of development of these STPs, there were no settlements, adjoining or near STPs. Since then, some temporary squatter settlements have come up alongside the Fatehwadi canal and kuccha access road near 126 MLD STP and 240 MLD STP. Social impacts are mainly with respect to the environmental issues such as dust, traffic movement, release of untreated sewage, odor and related issues during construction and operation and discussed in section 4.6. The squatters' settlement is not a notified slum and consists of kuccha or makeshift arrangements. The inhabitants are migrants (seasonal and permanent).

Discussions with squatter settlement was undertaken in September in late evening with some inhabitants living in the settlement. During the updating of the ESIA, further consultation with settlement dwellers including women and other vulnerable groups will be conducted by the implementing agency.

The issues related to crimes such as theft, dacoity etc., in the squatter settlement will reduce due to provision of street lighting during night work and movement of vehicles and labour. There will also be increased security due to movement of materials and goods to the STP during construction. Labour camp set up in the area will have enclosure and security to prevent any incidences of crime or conflicts with labour working on project. Lighting will also be provided to ensure safety and security to the labour residing in the labour camp.

Similarly, visits were also undertaken to residential areas, mainly peri urban locality just next door, Juhapura (which is a non-notified slum) to 126 MLD STP, which is accessible from the Fatehwadi canal road. The area is accessible by another route which is more commonly used as it provides easy access to schools, hospitals, markets, residential area, places of worship etc. Area adjacent to the 126 MLD STP consist of both kuccha and pucca structures, building and chawls, places of worship, schools etc. During consultations conducted in the area, issues and concerns were mentioned with respect to the public infrastructure provided in the area, such as quality of water supplied by AMC, lack of community and individual toilets, lack of pucca roads and issue of drainage and water stagnation. With respect to the STP, residents reported there is no odor issue and overall traffic movement is mainly pedestrian and two wheeler traffic on the access road to the 126 STP. Given the gap of services in the area and proposed improvement and expansion of coverage of sewerage catchment and treatment of sewage under the sub project, consultations will be carried out in Juhapura before construction activities are initiated to address issues arising of sub project activities, gaps in services and coverage of the area by providing sanitation services through Central and State government schemes under SWM.

The settlement will not be affected by the sub project activities. Impacts and risks pertaining to and on community health and safety impacts and SEA/SH impacts, impacts related to labor influx etc will be minimized and addressed through mitigation measures.



## 3.6.3 Demographics and Ethnic Composition

## 3.6.3.1 Population Density and Profile

The population density for wards as given in the map below above reflect that the population density in the western zone 1 for YR 2013 ranges from below 10000 persons/sq.km to 40000 persons/sq.m. in Southwest and Northwest zones. The population density was much higher for the eastern wide of the city with inner zones having higher population density ranging from 40000 persons per sq. m to above 60000 persons per Sq. Km.

In the future, it is expected that population density will increase in some of the wards which have population density in the range of 40000 per/sq.m. and below and which are rapidly being integrated within the city due to infrastructure development, improved municipal services and better connectivity. For the estimated population increased in the respective wards, the sub project will enhance sewerage collection and treatment through the proposed sub project.

The sub project is proposed to be carried out within the existing STP premises which is enclosed within boundary. There are no occupants at the proposed expansion site, no disadvantaged/vulnerable groups, etc.

In this section, there is a brief discussion the impacts on communities near the STPs and the downstream users of Fatehwadi canal and Sabarmati river in which the treated sewage is released. For both informal settlement and Arshad Park, Juhapura, land acquisition is not required for road repairs or upgradation or STP related activity with respect to the upgradation or expansion. Current width of kuccha road is large and only 8 m width will be required for road repairs and upgradation which not affect any traffic movement as the proposed road repairs and upgradation will be taken up in a manner to allow traffic movement. Each of these communities and main concerns are discussed under separate sub headings, based on primary data collection and consultations. The various communities include:

- Informal settlement opposite the 126 MLD and 240 MLD STPs. There are also scattered settlements on the Fatehwadi canal. The land belongs to the AMC and all the person/families are squatters on government land and the settlement is non-notified.
- Mixed formal/informal settlement is adjacent to the 126 MLD which comes under Juhapura which can be described as a largely unplanned area with mix of residential buildings, schools, places of worship, etc.
- Few downstream villages/ users of Fatehwadi canal water and Sabarmati river

## 3.6.3.2 Squatter/informal settlement Opposite the STPs

There are approximately 600 to 700 families (roughly 1800 to 3500 persons in the entire stretch) in the squatter settlement and numbers vary as per work availability and return of inhabitants to original villages whenever required. Inhabitants consulted mentioned that they have been living in the informal settlement opposite the STPs since the last 12 years or so. Inhabitants of the settlement are mainly from Jabhua district, Madhya Pradesh and Dahod district, Gujarat. This population living in the settlement is highly mobile and inhabitants often go back to their villages and return after 15 to 20 days.

People have moved to the area, from slums and rented accommodations during Covid pandemic due to loss of income and regular work. Most of the people (men and women) work as labour in the nearby industries. Women also go for domestic work in the nearby areas such as Juhapura.



There are higher proportion of men roughly 60% men and 40% women in the settlement as women move with their families only. More males were observed on the site than women and children. While women are living in the settlement, the numbers are lesser than that of young adult males. The temporary huts put up by the people are made of plastic sheet, corrugated sheets on frames, gunny bags, cartons etc. Very few structures have lower brick walls. Most of the temporary huts put up are used of living and one shop was observed but was not functional or open during any of the visits undertaken in the area. During evening handcarts were observed selling mainly vegetables and other items to the inhabitants. These are not stationery and are used for vending for a short period of time during the evenings/night in the settlement.

Amenities and public services such as electricity, sanitation and water supply facilities are not available in the settlement. One of the respondents reported that he had dug a well on his own, in which good quality water is available at 40 feet. People also approached the existing 240 STP for getting drinking water which is free of cost. People defecate near the highway. Health problems reported in the area includes malaria, fever and swollen hands and legs. Approximately 50 % of the people are vaccinated.

There are 3 to 4 private borewells from which the people take water for drinking and domestic use on payment basis. There are few children in the settlement. Some families keep goats for personal consumption for which they take fodder from STP during monsoon. This activity is restricted as per requirement of grass cutting in the STP during monsoon. People also take the goats for grazing and watering to the river bank which are affected due to the quality of river water.



Figure 24: Location of 126 STP with Respect to Arshad Park Juhapura

## 3.6.3.3 Formal/informal settlement, Arshad Park, Juhapura, Chaloda adjacent to the 126 MLD STP, western side including residents, labour/ workers living within 1.5 km of plant

The settlement is located near the 126 MLD STP on the western side. The area is commonly known as Arshad Park, Juhapura, Chaloda and comes under the Sarkhej ward. There are roughly 5000 persons and above population living in the immediate locality near the 126 MLD plant and the buildings are constructed in unplanned manner. There are gaps in public infrastructure such as roads, drainage, street lighting etc. The settlement consists of largely permanent structures and includes residential buildings/houses, commercial areas such as



shops, places of worships, schools, etc. Part of Juhapura is a ghetto in which municipal services are not available and is a non-notified slum. Some of the informal settlements are located on the canal banks at higher elevation toward Juhapura.

The boundary wall of the STP separates the Juhapura area and a green belt is located within it. The green belt provides a barrier and reduces the environment related issues related to SPT and its operation such as visual/ aesthetics, odor, noise and dust arising from construction and operation activities. Currently as per consultation carried out in Juhapura, there is no odor with reference to the 126 MLD STP. There may be insignificant odor or air pollution issues<sup>36</sup> during construction and operation period due demolition of existing STP units and sewage bypass arrangements made during commission/ operation which will be avoided and or mitigated.



Figure 25: Location of 126 STP with Respect to Arshad Park Juhapura

## 3.6.3.4 Downstream Villagers

Earlier, Ahmedabad used to get its water from Dharoi reservoir, constructed in 1976 upstream of Ahmedabad, that controls water and protects from flooding while Vasna Barrage constructed in 1976 downstream retains water in the Sabarmati river which is monsoon fed, along the city banks and diverts it through Fatehwadi canal for irrigation. The Fatehwadi feeder canal was first built in 1976 and channels water to four major talukas Sanand, Dholka, Bavla and Daskroi. The canal system has a command area of 28,000 to 30,000 hectares. The Narmada Canal, which crosses Sabarmati a few kilometres upstream from the city, is part of a larger canal network of Sardar Sarovar Dam. After the drought from 1980 to 1989, permission was sought to get water from the Narmada canal. The Narmada canal can feed excess water to the river and maintains the level of water in the river which is retained through Vasna Barrage.

The downstream villages get drinking water from the borewell/ tube well and through the Narmada canal. People also use borewell for irrigation. The villages are covered under the Jal

<sup>&</sup>lt;sup>36</sup> As per analysis of primary Air Quality monitoring, there are no critical issue with regards to air pollution from STP in this area.



Jeevan Mission (JJM) which envisions to provide safe and adequate drinking water through individual household tap connections by 2024 to all households in rural India. Jal Jeevan Mission (JJM) has been launched in partnership with States, to enable every household in villages to have Functional Household Tap Connection (FHTC) in the next 5 years. It is envisaged that with FHTC, each household will have potable water supply in adequate quantity. Implementing agencies include Water and Sanitation Management Organization (WASMO), Gujarat Water Infrastructure Limited (GWIL) and Gujarat Water Supply & Sewerage Board (GWSSB). GWSSB mentions that the regional water supply schemes are based on reliable sources like tube-wells (Underground sources) or Surface water sources (Dam or Narmada water). Water is fed up to village level by transmitting water from bulk water transmission lines by the GWSSB. FHTC coverage is 100 % for households' in relevant talukas (Dholka, Bavla, Detroj, Daskroi, Sanand and Dhanuka for downstream villages of Sabarmati and for Fatehwadi canal)of Ahmedabad district are covered in Jal Jeevan Mission for drinking water supply. Based on the JJM data available37, at taluka level coverage is 100 %. See table below.

		Total	Non	With	FHTC Co	verage	With F	HTC Cov	/erage	With FHTC Coverage		
		Habitat	PW		>=50 an	d	>	>=75 and		>=100 %		
S.N o.	Block	ions as on 01/04/ 2021	S Hab itati ons	Hab s	Hous e Holds	Hous e Conn ectio ns	Habs	Hou se Hold s	Hous e Conn ectio ns	Hab s	House Holds	House Conne ctions
1	BAVLA	54	0	0	0	0	1	2800	2503	53	37878	37878
2	DASKROI	116	0	0	0	0	0	0	0	116	84016	84016
3	DETROJ	68	0	0	0	0	0	0	0	68	28845	28845
4	DHANDHUKA	43	0	0	0	0	1	519	517	42	17220	17220
5	DHOLERA	41	0	0	0	0	2	2650	2432	39	12347	12347
6	DHOLKA	80	0	0	0	0	1	260	258	79	54201	54201
7	MANDAL	46	0	0	0	0	0	0	0	46	23333	23333
8	SANAND	99	0	0	0	0	0	0	0	99	60741	60741
9	VIRAMGAM	97	0	1	1650	1236	0	0	0	96	43133	43133
	Total	644	0	1	1650	1236	5	6229	5710	638	361714	36171 4

 Table 26: Habitation wise FHTC Coverage( Reported Till 06/03/2022) Financial Year: 2021-2022,

 Ahmedabad District<sup>38</sup>

Based on the consultations and assessment carried out downstream villages rely on borewell/tube well or Narmada canal water for source of drinking water. Due to issues with water pollution, Sabarmati river water is usually avoided for irrigation or drinking. The implementation of the proposed sub project will improve water quality being released into the river and meet requirements as per the NGT standards. Task Force set up by the High Court of Gujarat has disconnected around 400 connections from industrial units into the sewers and drains in the city, now from Eastern part of the Sabarmati river and the units are asked to resume operations only after connecting their effluents to CETPs/ETPs to reduce Sabarmati river pollution. Consultations conducted for the above mentioned communities and groups are presented in section 8.3, Table 53 for outcome of consultation during

<sup>&</sup>lt;sup>37</sup> https://ejalshakti.gov.in/IMISReports/Reports/WaterQuality/rpt\_WQM\_GPwiseTesting\_P.aspx?Rep=0

<sup>&</sup>lt;sup>38</sup> https://ejalshakti.gov.in/imisreports/



preparation of ESIA and post disclosure. Additional consultations will be undertaken after design finalization by DBOT Contractor.



Figure 26 Population Density of Wards in AMC<sup>39</sup>

## 3.6.3.5 Demographic Profile: Sarkhej Ward

One km area around the existing STP is within the Sarkhej ward. Estimates of population provided for the Sarkhej ward by the Master Planning consultants for 2021, 2031, 2041 and 2051 is 144523, 306568, 475732 and 644415 respectively, while the population densities for the same years 4899 pers/sq.km, 10391 pers/sq.km, 16125 pers/sq.km and 21843 pers/sq.km respectively. The increase in estimated population indicates potential sewage generation and addressing the future requirements through current sub project planning and implementation.

The total population for sewerage catchment for Vasna 126+48+35 (Jalvihar 60 MLD) covers an area of 82.9 Sq.km and contributing population estimated in 2021 is 1,550,041 and in 2039 is estimated to be 2,334,479 and expected contributing flow are 209 MLD and 315 MLD respectively.

## 3.6.3.6 Workers and occupation

The proportion of total workers is 34.74% and main workers comprise of approximately 85% of total workers, in Sarkhej ward. More than 88.56% of the population comprises of other workers categories indicating occupation in the secondary and tertiary sectors given the presence of industries such as chemicals, petrochemicals, dairy, drugs and pharmaceuticals, power, transmission, etc in the city. Less than 0.5% is involved in household industries, 2.84% as cultivators and 5.39 as agriculture labours.

<sup>&</sup>lt;sup>39</sup> Health Dept, AMC. City Health Plan: Ahmedabad under National Urban Health Mission (NUHM). Prepared by Urban Management Centre 2013



## 3.6.3.7 Health

The data for this section was collated from the Health Officer, AMC for Ahmedabad city and Health Aspect Study and Mitigation to improve the health in Catchment area of Identified Polluted River Stretches for the city. The proportion of cases in the west, North west and south west zones was low less than 3% for AGE and fever between 2018 to 2021. For Jaundice, the proportion was higher at more than 15% for YR 2018-2021. Almost all ailments had an increase in YR 2019 before decreasing significantly in 2020.

Table 27: Disease/	Ailments	from 2018-	2020 for	Ahmedabad	Citv
	,	,			,

Disease/	Year	West	N. West	S. West	Total cases for	% of cases in the			
Ailment		Zone	Zone	Zone	Ahmedabad	Sewerage			
					city	Zone			
Acute	2018	75	10	26	6767	1 77			
Gastroenteritis	2010	75	15	20	0/0/	1.77			
(AGE)	2019	67	13	83	6004	2.71			
	2020	25	4	16	1779	2.53			
	2021	22	7	34	2407	2.62			
Jaundice	2018	161	162	238	3154	17.79			
	2019	135	123	273	2610	20.34			
	2020	31	13	45	580	15.34			
	2021	60	12	57	129	1.77			
Typhoid	2018	224	141	103	3286	14.24			
	2019	267	104	154	4291	12.23			
	2020	39	14	14	1137	5.89			
	2021	66	13	32	1477	7.52			
Cholera	2018	9	3	4	77	20.78			
	2019	1	0	2	86	3.49			
	2021	2	0	0	64	3.13			
Fever	2018	75	19	26	6767	1.77			
	2019	67	13	83	6004	2.71			
	2020	25	4	16	1779	2.53			
	2021	22	7	34	2407	2.62			
Source: Health O	Source: Health Officer, AMC for Ahmedabad city, 2021								

## 3.6.3.8 Gender issues/ concerns

Women in the nearby settlement are working, mainly in the unorganized sector as semi-skilled and unskilled labour, domestic workers, construction/ masonry work. Safety and security concerns for women/ children were raised due to the labour influx for construction activities, open defecation, lack of street lights and similar issues as the settlement is informal. This has been addressed in the mitigation measures through community health and safety measures, employment of labour, both men and women from the informal settlement, setting up labour camp at suitable site to prevent any disturbance to the settlement, SEA/SH measures and provision of services such as drinking water supply and sanitation for the settlement through



government schemes and programs. For issues and concerns mitigation measures have been addressed in the ESMP.

The Labour Force Participation rate according to the current weekly status from July 2019 to September 2020 for urban areas of Gujarat is presented below and data indicates that LFPR for males were significantly lower for females in Gujarat.

State	Gujarat		India		
	Male	Female	Male	Female	
Jul-Sep 2019	77.7	16.7	73.9	20.3	
Oct-Dec 2019	78.8	18.5	73.8	21.1	
Jan-Mar 2020	79.1	19.2	73.7	21.9	
Apr-Jun 2020	74.4	17.7	71.7	19.6	
Jun-Jul 2020	77.3	18.3	73.5	20.3	

Table 28: Labour Force Participation Rate (CWS) July 19 to Sept 20

Source: Gol, Aug 2021, National Statistical Office, Periodic Labour force Survey (PLFS) July-September 2020, Ministry of statistics and Programme Implementation.

## 3.6.4 Institutional Set ups

Stakeholder groups identified during site assessment was STP staff, contractors and migrants living in squatter settlements in the vicinity of the STP.

## 3.6.5 Stakeholder consultations & Identified Groups

Consultations were carried out for the preparation of the draft ESIA report and the draft ESMF and SEP. Stakeholder consultation is a dynamic process and consultations will be carried out during the life cycle of the G-ACRP project. Consultations were also carried out for disclosure of ESIA and ESMP.

Due to Covid -19 pandemic and restrictions, consultations were carried out, from August to November 2021, online and as well as in person and due precautions were followed for site activities. After draft disclosure consultations were carried out in Feb, March and June 2022.

## 3.7 Governance & administrative context

For administrative purposes, the city is at present divided into 7 zones - Central, East, West, North, South, southwest zone, and northwest zone. Each zone is further split into wards. The area comes under the Ahmedabad Municipal Corporation, ward no 52 Sarkhej as mentioned above. In AMC, Drainage Department manages all sewerage and drainage (stormwater) related works and services. The Department applies for Consent to Establish and Operate from GPCB ad consent conditions are to be followed by all STPs. Under the Water (Prevention and Control of Pollution) Act, 1974 and Air (Prevention and Control of Pollution) Act, 1981 it is the responsibility of GPCB to inspect sewage or trade effluents, works, and plants for the treatment of sewage or trade effluent.

Operation and Maintenance of STPs and Pumping Stations are contracted out to various private agencies. In 1996, the Hon'ble High Court of Gujarat in their verdict directed the GPCB for the implementation of an Environmental Audit Scheme for the industries in the State of Gujarat. The scheme classified the industries which are required to submit periodical audit reports and the timetable thereof. It provides for submission of the audit reports to the GPCB first and subsequent action to be taken on. The scheme also envisages actions for failure to submit a report for industries and furnishing incorrect information on the part of auditors. Audit of STPs is carried out as per schedule and details submitted to GPCB.



## 3.8 Other developments in the Project Area and Sabarmati Riverfront

Gyaspur metro depot of Ahmedabad metro at the northern side of 126 MLD STP is the latest development in the project area. At present, the metro depot work in ongoing and may continue during the construction phase of the 240 MLD STP. The metro depot is across the highway and potential impacts identified are related to cumulative impacts on air quality and traffic management during the transportation of goods, material and equipment during the construction phase.

Upcoming projects on the Sabarmati Riverfront by AMC, includes road between Subhash Bridge and railway bridge on western side, sports complex on eastern side, sports complex behind National Institute of Design, Park between Nehru Bridge and Ellis Bridge, Multi-level parking on western side and foot bridge between Ellis bridge and Sardar bridge.

A list of upcoming projects in Ahmedabad and their important with respect to various identified subprojects is provided in *Annexure VI*.



## 4 ANALYSIS OF ALTERNATIVES

As per ESF, "The assessment [ESIA] will evaluate the project's potential environmental and social risks and impacts; examine project alternatives; identify ways of improving project selection, siting, planning, design and implementation in order to apply the mitigation hierarchy for adverse environmental and social impacts and seek opportunities to enhance the positive impacts of the project."

Analysis of Alternatives involves the following:

- Systematically compares feasible alternatives to the proposed project site, technology, design, and operation—including the "without project" situation—in terms of their potential environmental and social impacts.
- Assesses the alternatives' feasibility of mitigating the environmental and social impacts; the capital and recurrent costs of alternative mitigation measures, and their suitability under local conditions; and the institutional, training, and monitoring requirements for the alternative mitigation measures.
- For each of the alternatives, quantifies the environmental and social impacts to the extent possible, and attaches economic values where feasible.

The Analysis of Alternatives described in this chapter is structured to follow a 'narrowing approach' involving a series of logical steps, starting with the high-level strategy alternatives followed by description of more detailed technology alternatives considered. Using this commonly adopted narrowing approach, the Analysis of Alternatives considers alternatives in the following sequence:

- Strategy Alternative: Abandoning the Existing Centralised Treatment to follow decentralised 'on site' treatment 'on site'
   Here, a scenario where existing STP would be abandoned, and residents will be using onsite decentralised treatment in septic tanks is considered against the proposed subproject
- 'Zero' or 'No Project' alternative, Here, without project scenario i.e., continuing the existing situation compared with the scenario where the proposed project rehabilitation is implemented
- Construct 375 MLD STP in two sections (initial 120 MLD section, demolition of existing STP and then construction of remaining 255 MLD STP
- Design/ Technology Alternatives Technologies to achieve the stringent discharge standards suggested by NGT are compared with the current one. During Detailed design, this will be subject to further scrutiny and the best environmentally suitable alternative will be adopted.





## Figure 27 Analysis of Alternatives

# 4.1 Strategy Change: Abandoning Centralised Treatment in STP, to follow decentralised treatment 'on site'

Another option is the proposed development of onsite treatment in the catchment of Vasna 126 MLD STP, 35 MLD STP & 48 MLD STP, without centralised STPs. This involves onsite treatment in around 1.4 million units, for 375 MLD sewage.

- This is not viewed as an option by the residents of Ahmedabad, where centralised treatment was being provided by AMC since past two decades, and infrastructure including sewer networks and sewage pumping stations have been built for this. This would mean abandoning the infrastructure built for this.
- On site system may not be appropriate also in existing small plot sizes, which have been developed considering that centralised treatment will be the norm.
- The soil of the region is alluvium with faster permeability, unsuited for large scale decentralised options. This would further add to the soil pollution in this high dense industrial city.



## 4.2 Zero or NO project Alternative

## 4.2.1 Without Project Scenario

The existing STP was designed with ASP technology to achieve following norms:

Sl. No.	Parameter	Unit	Designed Discharge Quality of Treated Sewage	Actual Inlet Quality, 2021	Actual quality of treated sewage at Outlet, 2021	Prevailing MoEFCC 2017 <sup>40</sup>	NGT suggested Discharge quality, 2017
1.	BOD	mg/l	20	48	13	20	<10
2.	COD	mg/l	100	171.2	44.8		<50
3.	SS	mg/l	30	18	316	<50	<10
4.	рН	-	6.5 - 8.0	7.56	7.56	6.5 -9.0	5.5-9.0
5.	Residual Chlorine	mg/l	0.5	BDL	2.4		
6.	Fecal Coliform	MPN/100ml	1000-10000	59	48	<1000	<230
7.	Oil&Grease	mg/l	<10	BDL	BDL		
8	Total Nitrogen	mg/l		48	7.2		< 10
9	Total Phosphorous	mg/l		1.83	1.96		< 2

## Table 29: STP Inlet Outlet Quality viz a viz Standards/ Norms

There is no provision for removal of faecal coliform and bio nutrients in the existing STP. With existing treatment facility, it may not be possible to achieve the NGT suggested discharge quality. This may affect the surface water quality at Sabarmati and ground water quality and heath of the city and downstream of Sabarmati or Fatehwadi canal, in case of reuse for irrigation.

Due to the age of the STP, equipment's are not functioning as per design requirement. If the treatment plant is not upgraded, there may be impacts on the water quality of Sabarmati River downstream which will affect any fauna, flora in the river, and also result in degradation of soil quality. High chlorine content for disinfection may impact plant growth and soils. In addition, treatment costs are also high, and machinery need upgradation. Since the proposed rehabilitation is minimal, rerouting of sewage during phased rehabilitation can be easily achieved and impacts of works near sewage can be minimised by good construction scheduling and rerouting to existing STPs in the Vasna STP agglomerate/ cluster, taking advantage of agglomerated treatment units.

STP Upgradation will result in achieving the NGT suggested standards and help in improved health of the people and environment without abandoning the existing STP area.

## 4.3 Complete reconstruction of existing STP (in two sections)

As against proposed rehabilitation, the alternative, namely complete reconstruction of existing STP was examined. This involves demolition of all structures on the existing STP after construction of initial section of 120 MLD STP and diverting current wastewater flow into it. The average flow based on SCADA records is 75 MLD (Year July 2020 till June 2021). The existing system was built for an average design flow of 126 MLD. The proposed four no. of SBR tanks with all Preliminary and other units required to operate the plant could be accommodated in the empty space available.

<sup>&</sup>lt;sup>40</sup> These Standards shall apply to all STPs to be commissioned on or after the 1st June, 2019 and the old/existing STPs shall achieve these standards within a period of five years from date of publication of this notification in the Official Gazette.



This four SBR tanks could be adequate to cater an average flow of approximately 94.0 MLD. Once this four SBR tanks and related units are commissioned, the existing flows could be redirected to the new units and all the existing units could be demolished. The remaining units could be constructed in the area as presented in the layout drawing. Once the plant is constructed, an overall commissioning shall be carried out for its completeness.

The Design Consultant has submitted the "Need Assessment Report" for the nominated works as per RFP. The existing Plant is based on UASB technology. Based on our detailed analysis and to achieve the NGT standards with TSS<10 mg/l and considering the age of the plant (18 years old once the new plant is commissioned), it is proposed to demolish the plant totally. The M&E equipment's are severely corroded.

Considering that the sewage received at STP is less than its capacity and currently the treatment of sewage is meagre in this STP due to age, and issues with machinery, the demolition of existing units and construction of new units can be planned.

No bypass shall be allowed from WB funder facility, as per the directions of National Green Tribunal (NGT)<sup>41</sup> and WB EHS. AMC is updating sewer system (as part of G-ACRP). STP once upgraded and obsolete equipment are upgraded, it will be able to take the additional 10% load which comes into the STPs during heavy rains. AMC also takes the opportunity offered by agglomeration of STPs at Pirana and Vasna to divert and treat peak flows.

## 4.4 Technology Alternatives

## 4.4.1 Screening of Technologies for STP

At present, following sewage treatment technologies are the best available to arrive at NGT suggested discharge standards:

- Sequencing Batch Reactor (SBR).
- Anaerobic-Anoxic-Oxic (A2O) Process (Biological Nitrogen and Phosphorous Removal Process)
- Membrane Bio Reactor (MBR)- Due to the high Capital and Operation & Maintenance costs for the huge flows of 375 MLD, this process is not considered. Detailed description and comparison will be provided in the DPR stage as World Bank is preferred for Open Technology for the DBOT tender.
- Moving Bed Biofilm Reactor (MBBR) -is an attached growth process and will not remove phosphorous biologically and limited experience in India for such higher capacity plants. Thus, this process has not been considered further in FR.

SI. No	Treatment process	Advantages	Disadvantages
1	Anaerobic/	<ul> <li>Both nitrogen and phosphorus are</li> </ul>	<ul> <li>Generally, this process needs a larger</li> </ul>
	Anoxic/ Aerobic	removed simultaneously in this process	volume of reaction tank than that used in the standard activated sludge process.

Table 30: Comparison o	f Various Bioloaica	l Treatment Options
Tubic 30. companson o	j vanous biologica	i incutincint options

Accessed on: November 2021

<sup>&</sup>lt;sup>41</sup> Page 20. 3 nd QUARTERLY REPORT OF THE CENTRAL MONITORING COMMITTEE (CMC) IN COMPLIANCE OF THE ORDER DATED 21.09.2020 (UPLOADED ON 26.09.2020) IN THE MATTER OA No. 673 of 2018 (on critically polluted river stretches (such as Sabarmati – see pages 20, 23); bypass of sewage is critically viewed by NGT in http://www.indiaenvironmentportal.org.in/files/file/Kharicut-canal-pollution-NGT-order.pdf) Available at:

https://greentribunal.gov.in/sites/default/files/news\_updates/Status%20Report%20filed%20by%20CPCB%20in%20OA%20 No%2082%20of%202021(SZ).pdf;



SI.	Treatment	Advantages	Disadvantages
No	process		
	(Oxic) A2O	• A portion of alkalinity consumed in	• The process operating parameters of nitrogon removal such as SPT conflict
	process	<ul> <li>denitrification reaction in the anaerobic reaction tank by recycling nitrified liquor from the aerobic tank to the anoxic tank</li> <li>Well-proven technology worldwide</li> </ul>	with that of phosphorus removal; therefore, the optimum SRT condition needs to be set to remove both nitrogen and phosphorus.
2	Sequential	<ul> <li>Smaller footprint</li> </ul>	High automation
	Batch	<ul> <li>High-quality effluent</li> </ul>	<ul> <li>No energy production</li> </ul>
	Reactor	<ul> <li>Similar to extended aeration</li> </ul>	<ul> <li>Skilled manpower required</li> </ul>
	(SBR)	<ul> <li>Ability to handle shock loads.</li> </ul>	<ul> <li>Decantation mechanisms are patented</li> </ul>
		<ul> <li>Efficient use of aeration system</li> </ul>	
		• The successful functioning of plants in India and worldwide	
3	Moving Bed	<ul> <li>Less space requirement</li> </ul>	<ul> <li>High media quantity requirement</li> </ul>
	Biofilm Reactor		<ul> <li>Long shut down period for plant maintenance</li> </ul>
	(MBBR)		<ul> <li>will not remove phosphorous biologically</li> </ul>
			<ul> <li>limited experience in India for much higher capacity plants.</li> </ul>
4	Membrane	Separate biological process	• Low sludge production
	Bio-reactor	<ul> <li>No tertiary treatment required</li> </ul>	<ul> <li>High capital &amp; maintenance cost</li> </ul>

Source. FR- Constr. of New 375 MLD STP and upgradation of ass. Infra. January 2022. Prepared by Royal Haskoning DHV Consulting Pvt. Ltd. For AMC

## 4.4.2 Factors for Selection of Treatment Technology

## 4.4.2.1 Compliance to the NGT standards

Treatment of the sewage to the quality prescribed by NGT which includes biological nutrient removal. Hence, there shall be improvement of the water quality of River Sabarmati. Also, proposed upgradation shall avoid nuisance to the public due to the potential odor from the STP. It is intended to adopt a treatment technology that should be sustainable and be capable of overcoming the above-mentioned constraints and requirements. In order to achieve the above, it has been decided to consider Suspended Growth systems such as A2O Process, and SBR.

## 4.4.2.2 Capital Cost

The second most important criterion for selection of appropriate treatment technology is "Not entailing excessive cost" which implies that the financial cost should not be excessive in relation to the financial capability of the Sector concerned and to the discharge standards or environmental protection envisaged.

## 4.4.2.3 Less Footprint Requirement

The third important criterion for selection of appropriate treatment technology is the minimum possible footprint requirement considering scarce land resources available in the city.

## 4.4.2.4 Ease in Operation & Maintenance and Lower Associated Cost

The fourth important criterion for selection of appropriate treatment technology is the ease of operation and maintenance and lower associated cost. To operate and maintain a STP, appropriate technical and managerial expertise must be available. Due to the scarcity of qualified personnel in the field of wastewater treatment, operation and maintenance of the



technology should be trouble free. In addition, the operation and maintenance cost should be least possible to avoid excessive burden on the urban bodies.

## 4.4.2.5 Proven Track Record of Operation in Indian climate

The selected treatment technology should have very good track record of operation, availability of expertise and spare parts in India.

## 4.5 Alternatives for pipeline from TSPS to 375 MLD STP

A rising main of 2000 mm diameter is required to be laid from Vasna Terminal TSPS till proposed 375 MLD STP. The proposed alignment is required to cross Fathewadi canal. An over ground crossing is proposed at the Canal using a truss arrangement. An approval is required to be taken from Irrigation department. There are two existing rising mains which are crossing the canal using similar arrangement. Hence, no major difficulty in obtaining permissions, or civil works is envisaged. The proposed alignment is required to cross metro alignment. Though metro is over ground in this stretch and pipe shall be laid underground. AMC needs to take up approval process with metro department, as any project/ activity within 5m of metro lines shall apply for permit from metro.

Three alignments were considered for this pipeline assessment of the same is as follows,

Route No.	Distance (Km)	Salient features of the route	Remarks	
Route 1	1.86Km	Sand storage area	Though the alignment, to the extent possible passes underground, along the road and boundary wall and does not go through any private land some resistance is expected by locals.	
Route 2	1.98 km	Issues due to traffic diversion	Due to length passing under road, traffic diversion will be required which will pressure on air quality and noise levels.	
Route 3	3.14 km	Involves resettlement	Has R&R issues and the alignment is much longer than other two options.	

#### Table 31 Alignment options for rising main from TSPS to 375 MLD STP



Figure 28 Option1 for rising main alignment



## 4.6 Recommendation

- As the SBR process is fully aerobic and will work as a perfect reactor which ensures 100% treatment, thereby there is no odor nuisance. It also gives excellent Treated Quality by Biological process alone to BOD₅<10, TSS<10, Total Nitrogen (TN) <10, Total Phosphorus (TP)≤1for municipal sewage of medium to high strength without adding Chemicals. SBR with efficient sludge collection and management can be provided to achieve the desired NGT Discharge Norms.</li>
- MBBR with Tertiary Treatment can be provided to achieve the desired NGT Discharge Norms (but difficult in case of P) consideration of disadvantages mentioned in *Table 30* shall be made at design stage.
- MBR technology is good and generates high quality of effluent (5-7m years) but the capital cost and O & M cost is very high. Membrane life is also short, and membranes needs to be replaced after certain interval of time which has high periodic cost.
- Existing UASB can be upgraded by modifying its variants such as SAF, SBR, MBBR etc.; but the civil structural condition of the existing plant is poor
- Inlet chamber should be equipped with online sensor for managing the high variability in the inlet water quality.
- Piping and pump material should be of non-corrosive material.
- High Court of Gujarat has constituted a task force which is disconnecting all illegal industrial connections to sewers. To avoid the issue of such mixing, a holding tank is recommended with online monitoring of inlet sewage to avoid the failure of pump and treatment system.

Since the proposed subproject will be built on a DBOT model, the contractor will finalise the design and update the ESIA and ESMP after assessment of final technology to ensure the desired standards.

Though Feasibility Report suggests SBR as the best alternative, considering its high costs, it is suggested that DBOT Procurement be Technology Agnostic to explore all possible options as well – to focus on the Best Available Technology Option, taking into account environmental, social and economic considerations. SBR can be considered concerning the benefits regarding odour control, efficient sludge collection and biological process. This will help improve environmental quality of surrounding areas by reducing odour.

5



# ASSESSMENT OF ENVIRONMENTAL AND SOCIAL RISKS AND IMPACTS

## 5.1 Proposed Subproject details as per Feasibility Report

The existing 126 MLD capacity at Vasna (UASB based) is proposed for upgradation to 375 MLD capacity (including the flow from 35 MLD STP as well) under the G-ACRP project. This STP was built in the year 2002 and over the years, its functioning is deteriorated as evident from the quality of treated sewage, and many of the infrastructure is dilapidated. Details of the sub-project are provided in the section 1.3 of this report.

FR has suggested 4 alternatives, (refer to section 4.4) for the proposed STP rehabilitation of which Sequential Batch Reactor (SBR) technology has key advantages such as:

- Complete treatment in a single basin: Separate chambers are not required.
- Very Robust and Consistent performance for changing Influent Loads
- Excellent Treated Quality by Biological process alone to BOD<sub>5</sub><10, TSS<10, Total Nitrogen (TN) <10, Total Phosphorus (TP)≤1for municipal sewage of medium to high strength without adding Chemicals.
- Lowest Footprint/ Land required
- Power savings at rated capacity and at lower organic and hydraulic loads with the help of DO control in SBR basin.
- Easy to operate the plant as the design provides for advancing the cycles for storm/heavy monsoon conditions too.
- Separation of Mixing and Aeration equipment for providing separate time zones for Aerobic and Anoxic Process to achieve Denitrification / Phosphorus reduction and BOD reduction and Nitrification respectively.
- As the SBR process is fully aerobic and will work as a perfect reactor which ensures 100% treatment, thereby there is no odor nuisance.

Though Feasibility Report suggests SBR as the best alternative, considering its exorbitantly high costs, it is suggested that the DBOT Procurement be Technology Agnostic – to focus on the Best Available Technology Option to explore all possible options and in consideration of the environmental, social and economic considerations.

## 5.2 Environmental and Social Risks and Impacts of the Subproject

The following list is an outline of the environmental and social impacts that are expected to occur:

- Risks and Impacts on water quality of the river
- Risks and Impacts on air quality
- Noise pollution
- Risks and Impacts on soil
- Risks and Impacts on Biodiversity
- Impact on socio-economic aspects of the surrounding community including impacts due to labor influx, community safety and increased GBV and SEA/SH risks
- Potential impacts on health and safety
- Impacts of discharge from STP on adjoining communities, especially during construction phase

Usually, subprojects involve several interdependent facilities and activities mentioned above. The impacts of allied facilities may become relevant and will be identified during the detailed design stage and C-ESIA / C-ESMP will be newly prepared/updated then incorporating risks and impacts on these.



This subproject is aimed at improving the environmental quality and overall quality of life of the city by improving the existing STP to ensure the latest standards/guidelines set as per regulations. Hence, the overall impact would be beneficial to the people of Ahmedabad and those downstream of the receiving waterbodies. Most of the risks will be limited and largely localized, temporary i.e., during the construction stage.

## 5.3 Impact Assessment Methodology

The methodology to assess the impacts at the subproject level is presented here. Impacts are assessed based on Magnitude, Duration, Significance, and Likelihood of the impacts and Sensitivity of the receptors.

## 5.3.1 Magnitude and Duration of Impacts

The assessment of magnitude is undertaken in two steps. Firstly, the key issues associated with the subproject are categorized as beneficial or adverse. Secondly, potential impacts shall be categorized as High, Average, Low, or negligible based on consideration of the parameters such as:

- Temporal extent (duration) and the likelihood of the potential impact;
- The spatial extent of the potential impact;
- Reversibility of the Impact;
- Likelihood of the impacts

The magnitude of the potential impacts of the subproject is identified according to the categories outlined in *Table 31*.

Aspects		N		
Duration of the potential impact	Long term (more than 20 years)	Medium Term - The lifespan of the Program (5 years)	Short Term - 1 to 2 years or less than the lifespan of the project	Temporary - with no detectable potential impact
The spatial extent of the potential impact	Regional – much beyond project boundaries	City - Beyond immediate Project components, site boundaries, or local area	Site - Within project site boundary	Micro - A specific location within the project component with no detectable potential impact
Reversibility of potential impacts	Irreversible - Potential impact (including positive impact) is effectively permanent, requiring considerable intervention to return to baseline	Largely Reversible- Potential impact requires a year or so with some interventions to return to baseline	Reversible - Baseline returns Naturally or with limited intervention within a few months	No change - Baseline remains constant
Likelihood of potential impacts occurring	Certain - Commonly occurs under typical operating or construction conditions	Likely - Usually seen occurring under most situations	Occasional - Occurs under abnormal, exceptional, or emergency conditions	Unlikely to occur

## Table 32: Aspects for Determining the Magnitude of Impacts

## 5.3.2 Sensitivity of Receptor

The sensitivity of a receptor shall be determined based on a review of the population (including proximity/numbers/vulnerability) and the presence of features on the site or the surrounding area. The criteria for determining receptor sensitivity of the program's potential impacts are outlined in Table 32.



Sensitivity Levels	Description				
High	The vulnerable receptor with little or no capacity to absorb proposed changes				
	or minimal/limited opportunities for mitigation				
Medium	The vulnerable receptor with some capacity to absorb proposed changes or				
	moderate opportunities for mitigation				
Low	The vulnerable receptor with good capacity to absorb proposed changes or/and				
	good opportunities for mitigation				
Negligible	Non-vulnerable receptor				

#### Table 33: Criteria for Determining Sensitivity

## 5.3.3 Significance of the impact

The significance of potential impacts is established using the impact significance matrix shown in *Table 33* below.

Aspects		Sensitivity/ Vulnerability/ Importance of Resource/ Receptor			
		Low	Medium	High	
e of e	Negligible	Negligible	Negligible	Minor	
itud ativ pact	Low	Negligible	Minor	Moderate	
agn Neg Im	Medium	Minor	Moderate	Major	
Ň	High	Moderate	Major	Major	
t of pact	Negligible	Negligible	Negligible	Minor	
ıgnitude itive Imp	Low	Negligible	Minor	Moderate	
	Medium	Minor	Moderate	Major	
Mc Pos	High	Moderate	Major	Major	

#### Table 34: Assessment of Significance of Negative and Positive Impacts

## 5.3.4 Environmental and Social Risks and Impacts in Local Area

## 5.3.4.1 ESS 1: ASSESSMENT AND MANAGEMENT OF E&S RISKS AND IMPACTS

As all the proposed major structural interventions are within the STP or TSPS sites or their structures, no direct adverse impacts are envisaged on physiography or land use. Laying of the proposed rising main (around 2 km) may create temporary disturbances to people and traffic during the construction and maintenances stages, which could be managed through traffic diversions, information to communities, barricading and safety precautions (for communities and workers), and watch and ward in important areas. Proposed subproject involves civil, electromechanical and paint work requiring labour intensive works in odorous area near sewage/ waste water, and their stay at site for a period of about 4.5 years, treatment of sewage, along with new construction/ modifications required for technology upgradation, discharge of treated water and disposal of sludge and other wastes including large quantities of construction and demolition (C&D) wastes, use of resources such as water and power during construction, pollution generation from storage and handling of material, use of paints and other chemicals for construction and operation, transportation of raw materials, wastes and sludge, reuse of treated water for irrigation will pose risks and impacts. Work requires very detailed and clear sequential planning, scheduling as the existing operations shall not suffer during construction works. The activities will be labour intensive with risks of accidents such as working at heights, excavations, work in enclosed areas and activities near ponded sewage in large tanks. Impacts and risks are moderate and can be managed by following regulations, adopting best practices for similar projects, training of staff/manpower; and ensuring implementation of avoidance, monitoring, and implementation of mitigation measures.

No direct adverse impacts are envisaged on communities including on the disadvantaged or vulnerable people. There may be indirect impacts on communities such as increased access to communities due to replacement of kuccha road by resurfaced pucca road, increase in labor due to



increased labor opportunities, movement of pedestrian due to road repairs and increased safety due to project related pedestrian movement, availability of lights during evening and nights, discharge from STP on adjoining communities, especially during construction phase, impacts due to labor influx including increased risk of GBV and SEA. Therefore, project will need to make extra efforts to reach out through stakeholder engagement and effective GRM, to the disadvantaged and vulnerable persons and groups to involve them in both preparation and implementation .

There may be short term, small magnitude impacts and risks on land use, erosion, sedimentation and biodiversity due to works outside the STP campus, mainly laying of rising main, and outfall structures. The river is practically dry during most period of the year, and it is modified without any native riparian cover except invasive species.

The risks and impacts of the proposed sludge management facility will also be assessed by AMC in line with WB ESF and applicable national, state regulations once the technology and location is finalised, considering it as an associated facility if applicable.

The proposed subproject involves various activities during the construction and operation phases. The process of identifying potential impacts for each environmental parameter was carried out using quantitative and qualitative methods and will be used as the basis for determining the mitigation that must be carried out to minimize and prevent impacts. The potential environmental and social risks and impacts of the proposed project in the local area on water quality and quantity, air quality, soil, noise levels, and socioeconomic aspects of the area were assessed as part of ESS 1 and are as follows.

## Construction and Operation stage impacts and risks under each of applicable ESSs

## 5.3.4.2 ESS 2: LABOUR AND WORKING CONDITIONS

AMC will contract agencies or DBOT contractor to design, undertake civil works, agencies/ firms to support core-functions; primary suppliers of material/equipment and other implementation support partners. These agencies contractors or consultants could be from anywhere in the country. Construction works will require labour force and associated goods and services. On the basis of contract sizes and the project implementation schedule, the construction workforce/ manpower has been estimated as 300 for proposed Vasna 375 MLD STP. These will be skilled and semi-skilled workforce of contractors who will stay in or near the site mostly (or in the city) for a construction period of 4.5 years These DBOT contractor (or usually subcontractors) set up their machinery and plants required at work site/ pre-determined and approved other sites in agreement with AMC. In addition, there will be suppliers, transporters of material and their labour who will float in and out of the site during the work period.

Project shall comprise the following types of workers:

- 1. **Direct workers:** Direct workers will include the project managers and supervisors, who are employees of AMC. As per the structure of PIU and AMC drainage Department, the estimated number of direct workers is not likely to exceed 10.
- 2. **Contracted workers:** Entire work force deployed by the Contractors are considered as contracted workers. The Contractor(s) might further engage multiple subcontractors, whose work force engaged will also be contracted workers. As per the current work scenario in India and in Gujarat, these may also include Migrant workers

**Migrant Workers:** The migrant workers are those who are employed for the subproject but does not belong to the Project region and are not normally expected to return to their places of residence after work hours. The number of migrant workers in any contract package, would depend on multiple reasons including preference of contractors/ subcontractors to source labour, worker unavailability in the area for the purpose, and lack of technical skills and capacity. The migrant workers could be at all levels and include



unskilled and semiskilled construction labour and may include male and women labour force. The migrant workers are either directly engaged by the contractor or through labour contractors, who supply the work force to as per the needs of the contractors.

- 3. **Primary Supply Workers:** No primary supplier or primary supply workers are anticipated as all goods and services essential to the core functions of the project shall be provided by the contractor as per the DBOT contract which will be agreed with AMC.
- 4. **Community Workers:** Community workers are not envisaged. Implementation of Emergency Action Plans (EAPs) for Disaster Management, will be supported by broader community involvement.

For the existing STP operation, there are 54 total staff/ workers working in four shifts in the STP. There is no accommodation or arrangements of residing in the STP for STP staff and workers. Health and safety impacts on workers is expected during the construction period as STP will be in operation and construction of the new STP will be undertaken within the STP premises. There may be environment, occupational health and safety concerns. AMC/Design consultant have proposed a 3 months period for handholding and taking over and DBOT staff will do both STP operations and construction activities to reduce risks and integrating and streamlining the operations and construction activities within the premises simultaneously.

## Expected Negative Risks and Impacts

With the high population density and the metropolitan nature of the city, it has many vehicles, industrial and commercial activities which results in various sources of urban air pollution in the city. The proposed subproject activities may potentially impact the air quality during construction, operations, and maintenance of sub-projects with the addition of construction vehicles, construction activities, use of machinery, and fuel combustion. In addition, the odor may emanate from STP processes/ release of gases, use of chemicals, sludge, and treated sewage and may impact the communities near STPs, pumping stations, and discharge points.

The most significant Occupational Health and Safety (OHS) hazards associated with Construction of new STPs occur during the construction phase and include activities with moderate risk for workers if not managed adequately are listed below. These are applicable to workers/labors engaged in implementation of the subproject. Expected negative impacts and risks due to various components of the proposed subproject are as follows:

## Operation of Existing STP, Demolition of existing 126 MLD STP and Construction of new STP

Safety issues like injuries/ accidents leading to injuries and or fatalities due to lack of PPEs, adequate safety precautions and non-compliance with SoPs.

- Working at heights on the top of STP (esp. when railing is absent (as in the Vasna 126 STP) or removed), falls from elevation associated with working with ladders, scaffolding, and partially built or demolished structures
- Removal of any large built structures, machinery or equipment and resultant over exertions and manual handling, potential fall of materials or tools, as well as ejection of solid particles from abrasive or other types of power tools which can result in injury to the head, eyes, and extremities.
- Use of heavy machinery, cranes, JCB, electrical equipment with non-compliance to safety procedure and SoPs for hazards like physical contact, spills, dust, emissions, and noise. Heavy equipment operators have limited fields of view close to their equipment and may not see pedestrians close to the vehicle. Center-articulated vehicles create a significant impact or crush hazard zone on the outboard side of a turn while moving.



- Slip and fall associated with poor housekeeping, such as excessive waste debris, loose construction materials, tools, liquid spills, and uncontrolled use of electrical cords and ropes on the ground
- Exposure to sludge, waste screenings, dust, during dismantling, fumes / burns from any chemicals, etc utilized in any of the structures/machinery.
- Safety issues like injuries/ accidents leading to injuries and or fatalities due to lack of PPEs, adequate safety precautions and noncompliance with SoPs. This includes health hazards of manual handling and masculo/skeletan disorders, hearing loss, heat stress, dermatitis etc.
- Working near impounded sewage and sludge/slurry as in STP tanks and biogas units with risk of fall/drown, odor nuisance, gaseous emissions (toxic gas inhalation), pathogenic agents
- Operation and maintenance of chlorine dosing system and chemicals and material storage
- Working in confined spaces, for example, during deepening of tanks; especially when water table is low. Confined spaces include: sewers, pipes, and access shafts, ditches and trenches
- Working with heavy machinery, including Thickener cum Dewatering machine (COTDM) feed sump, transformer, UV channel, Belt filter press, Construct MC3 (1 no.) consists of Transformer, Blower room, MCC Room etc.
- Working with electricity/ electrical installations, appurtenances
- Signages for proposed construction areas and operation areas to prevent access of restricted area by untrained labor/ workers.
- Addressing workers health and safety during removal of existing USAB reactors and sludge beds for construction of the new plant and maintenance activities.
- Mechanical cleaning of USAB reactors and any other place where sludge is accumulated will be recommended strongly and any manual cleaning should be strictly avoided to prevent health and safety issues for workers.

## **Repair works at TSPS**

- Safety issues like injuries/ accidents leading to injuries and or fatalities due to lack of PPEs, adequate safety precautions and non-compliance with SoPs.
- Working with heavy machinery, including Thickener cum Dewatering machine (COTDM) feed sump, transformer, UV channel, Belt filter press, Construct MC3 (1 no.) consists of Transformer, Blower room, MCC Room etc.
- Working with electricity/ electrical installations, appurtenances
- Working near Sewage/ Wastewater

## Solar Rooftop, Biogas plant

- Safety issues like injuries/ accidents leading to injuries and or fatalities due to lack of PPEs, adequate safety precautions and non-compliance with SoPs.
- Working near sludge tanks with risk of fall/ drown, odor nuisance, gaseous emissions (toxic gas inhalation), pathogenic agents
- Works near hazardous/ electronic/ electrical constituents, chords, appliances
- Multiple handling while collecting, transporting sludge which may have pathogens/ coliforms and working in biogas and sludge management facility with high moisture, temperature, pathogens



- Generation, Storage and Disposal of end-of-life solar panels which contains hazardous constituents
- Handling of broken solar panels during repairs
- Lack of use of PPEs/ protection measures

## **Construction of Rising main**

- Safety issues like injuries/ accidents leading to injuries and or fatalities due to lack of PPEs, adequate safety precautions and non-compliance with SoPs.
- Working on elevated metro crossing, access road and canal crossing in the absence of permissions, approvals and procedure to be followed from concerned depts.
- All other common OHS hazards applicable to Construction as above.

## **Construction of Outfall facility**

- Safety issues like injuries/ accidents leading to injuries and or fatalities due to lack of PPEs, adequate safety precautions and non-compliance with SoPs.
- Working in confined spaces, for example, during deepening of tanks; especially when water table is low
- Use of heavy machinery/ heavy vehicles for filing, excavation etc. with requisite permissions and implementing SoPs for specific activity.
- Existing outfall to Sabarmati River will become insufficient with respect to 375 MLD capacity and therefore shall have to be abandoned. Outfall towards Fatehwadi canal is already closed by AMC and same shall continue unless there is consent for such disposal from GPCB.

## Labour camp

- Inadequate or lack of facilities and amenities at worker camp, including drinking water, sanitation, fuel, proper ventilation, crowding, lighting, etc.
- Safety and Security issues
- Lack of medical facilities for injuries, accidents, ill health and pandemic related facilities such as treatment, isolation, testing, medical care, sanitizing quarters, etc.
- Stray animals, snake and scorpion bites related aspects for health and safety.

## **Common Risks & Impacts**

- inadvertent or intentional trespassing, including potential contact with hazardous materials, contaminated soils and other environmental media, buildings that are vacant or under construction, or excavations and structures which may pose falling and entrapment hazards
- Using vehicles on public and project roads, resultant accidents/injuries
- Exposure to dust, noise (resulting in disturbances and hearing loss), the sun, heat and wet weather
- Working with hazardous materials such as chemicals (if in excess quantity), fuels, cement.
- Long term effects on life due to exposure to chemical /hazardous wastes
- Exposure to illnesses, communicable diseases, COVID-19
- Exposure to mental or physical harassment, SEA/SH, and injury from interpersonal conflicts.
- Exposure to floods, earthquakes, and other natural and manmade disasters
- Considering the vegetation growth, snake or scorpion bite may occur during construction or operations. Presence of any other wildlife during any construction or demolition activities.
- Inadequate accommodation facilities and amenities at labour camps, including inadequate sanitation and health facilities at work site.
- Non-payment of wages and lack of compliance to mandatory labour related requirements



- Discrimination in Employment (e.g., abrupt termination of the employment, working conditions, wages or benefits etc.)
- Sexual harassment at work
- Security of women work force
- Absence or inadequate or inaccessible emergency response system for rescue of labour/ workforce in situations of natural calamities.
- Health risks of labour relating to HIV/ AIDS and other sexually transmitted diseases

## Other risks that would be applicable for all types of workers would be as follows:

- Unclear terms and conditions of employment
- Discrimination and denial of equal opportunity in hiring and promotions/incentives/training opportunities
- Denial for workers' rights to form worker's organizations
- Absence of a grievance mechanism for labour to seek redressal of their grievances/ issues

Wastewater treatment facility operators may be exposed to physical, chemical, and biological hazards depending on the design of the facilities and the types of wastewater effluents managed. Examples of these hazards include the potential for trips and falls into tanks, confined space entries for maintenance operations, and inhalation of VOCs, bioaerosols, and methane, contact with pathogens and vectors, and use of potentially hazardous chemicals, including chlorine, sodium and calcium hypochlorite, and ammonia.

Project workers are likely to be exposed to the above identified risks over the estimated 4.5 years of construction. Workers with low experience of working on large scale construction project are expected to be more vulnerable as their skillsets, experience and understanding of health and safety will probably be limited compared to the skilled workers who will have worked on similar projects and have sufficient training. However, the project site in the city of Ahmedabad with many health care facilities near the site. Here, services from emergency first-aid response to Quaternary care are available within 2 km distance.

All engagement of laborers will follow the project level Labor Management Procedure (LMP). Child labor and forced labor will be prohibited. All workers will have access to project's worker's grievance redress mechanism (GRM).

Area and site under AMC for labor camp within accessible distance from STP to be identified by DBOT contractor and necessary permission/ approval to be taken from AMC. Workers in the labor camp will need sanitary facilities such as toilets, washing areas, and sanitary waste disposal areas. Adequate and safe accommodation with proper ventilation, comfortable stay, sanitation, first aid facilities, water, fire safety, protection from weather conditions and extreme events, facilities including cooking and lighting is essential. Covid- 19 precautions for such camps to be planned and implemented.

Each Contractor for each package will be expected to conduct a hazard and risk identification and create a risk register using the Hazard Identification, Risk Analysis, and Risk Control (HIRARC) method. The Risk Register will identify controls such as elimination, substitution, modification, and preventive and protective measures.

OHS Risks of common construction activities during various work stages is presented in *Annexure V*.

## Positive Impacts

The subproject will provide opportunities for workers and improve their economic and overall development. It will also give fillip to economy through its upstream - downstream linkages, especially, material procurement, job opportunities in the surround area by triggering the establishment of many small local shops, and service providers during construction period, some of which may continue after this period. Unskilled and semi-skilled labor work can be sourced from the squatter settlement as per



availability and willingness of labor. Women can also be hired for specific tasks from the squatter settlement. Since the settlement is nearby some women may be willing to work on-site as labor.

It will also trigger improvement in working conditions (Use of safe work practices, Fire Safety and Disaster Management, awareness on the need to follow safe practices, health camps/ check-ups, covid appropriate behaviour, labour camp management and facilities), overall odor and air quality of the local area, thus influencing the work culture of the area positively and improving health of workers in this site and neighbouring STPs, and metro depot and other facilities.

#### **OHS Risk management strategies**

- Training of workers in lifting and materials handling techniques including the placement of weight limits above which mechanical assists or two-person lifts are necessary
- Planning work site layout to minimize the need for manual transfer of heavy loads
- Selecting tools and designing workstations that reduce force requirements and holding times, and which promote improved postures, including, where applicable, user adjustable workstations
- Implementing administrative controls into work processes such as job rotations and rest or stretch breaks Implementing good house-keeping practices, such as the sorting and placing loose construction materials or demolition debris in established areas away from foot paths
- Cleaning up excessive waste debris and liquid spills regularly
- Locating electrical cords and ropes in common areas and marked corridors
- Use of slip retardant footwear If fall hazards exist, a fall protection plan should be in place
- Training and use of temporary fall prevention devices, such as rails or other barriers able to support a weight of 100 Kg, when working at heights equal or greater than two meters or at any height if the risk includes falling into operating machinery, into water or other liquid, into hazardous substances, or through an opening in a work surface
- Training and use of personal fall arrest systems, such as full body harnesses and energy absorbing lanyards able to support 2250 kg as well as fall rescue procedures to deal with workers whose fall has been successfully arrested. The tie in point of the fall arresting system should also be able to support 2250 kg
- Use of control zones and safety monitoring systems to warn workers of their proximity to fall hazard zones, as well as securing, marking, and labeling covers for openings in floors, roofs, or walking surfaces
- Using a designated and restricted waste drop or discharge zones, and/or a demarcated lift / chute for safe movement of wastes from upper to lower levels
- Conducting sawing, cutting, grinding, sanding, chipping or chiseling with proper guards and anchoring as applicable
- Maintaining clear traffic ways to avoid driving of heavy equipment over loose scrap
- Use of temporary fall protection measures in scaffolds and out edges of elevated work surfaces, such as handrails and toe boards to prevent materials from being dislodged
- Evacuating work areas during blasting operations, and using blast mats or other means of deflection to minimize fly rock or ejection of demolition debris if work is conducted in proximity to people or structures
- Wearing appropriate PPE, such as safety glasses with side shields, face shields, hard hats, and safety shoes
- Planning and segregating the location of vehicle traffic, machine operation, and walking areas, and controlling vehicle traffic through the use of one-way traffic routes, establishment of speed limits, planning traffic movement with Local traffic Police Department, and on-site trained flag-people wearing high-visibility vests or outer clothing covering to direct traffic



- Ensuring the visibility of personnel through their use of high visibility vests when working in or walking through heavy equipment operating areas, and training of workers to verify eye contact with equipment operators before approaching the operating vehicle
- Ensuring moving equipment is outfitted with audible back-up alarms
- Using inspected and well-maintained lifting devices that are appropriate for the load, such as cranes, and securing loads when lifting them to higher job-site elevations.
- Dust suppression techniques should be implemented, such as applying water or nontoxic chemicals to minimize dust from vehicle movements
- PPE, such as dusk masks, should be used where dust levels are excessive the use of excavation dewatering, sidewalls support, and slope gradient adjustments that eliminate or minimize the risk of collapse, entrapment, or drowning
- Providing safe means of access and egress from excavations, such as graded slopes, graded access route, or stairs and ladders
- Avoiding the operation of combustion equipment for prolonged periods inside excavations areas where other workers are required to enter unless the area is actively ventilated
- Use of specially trained personnel to identify and remove waste materials from tanks, vessels, processing equipment or contaminated materials (as in STP tanks, pumps)
- Use of specially trained personnel to identify and selectively remove potentially hazardous materials in building elements Prior to dismantling or demolition for example, insulation or structural elements containing asbestos and Polychlorinated Biphenyls (PCBs), electrical components containing mercury
- Use of waste-specific PPE based on the results of an occupational health and safety assessment, including respirators, clothing/protective suits, gloves and eye protection
- Awareness and Use of PPEs while working with Solar panels
- Storage of end-of-life solar panels, without impact on communities
- Description of response activities for life and fire safety, in the event of a spill, release, emergencies, disasters especially floods
- Definition and implementation of permitted maintenance activities, such as hot work or confined space entries
- Provision of suitable personal protection equipment (PPE) (footwear, masks, protective clothing and goggles in appropriate areas), emergency eyewash and shower stations, ventilation systems, and sanitary facilities
- Monitoring and record-keeping activities, including audit procedures designed to verify and record the effectiveness of prevention and control of exposure to occupational hazards, and maintaining accident and incident investigation reports on file
- Fire resistant, noise-absorbing materials should be used for cladding on ceilings and walls of offices, rest areas on site
- Create safe refuges on site for people to gather safety in case of emergencies, shut down construction activities during heavy floods / disasters and wait for authority's advice
- Provide required facilities on site and ensure livable conditions in labour camp if any: lighting, ventilation, safe structures, water, sanitation (with water supply), first aid, food/potable water, awareness and workers shall be well trained, and emergency contacts/support, and health checkups shall be arranged
- Proper design measures to prevent OHS impacts (example: on rotating moving, oscillating, other equipment)
- Leachate management from sludge, ventilation of Greenhouse facility and health checkup for workers
- L&FS Master Plan to be prepared, implemented



#### 5.3.4.3 ESS 3: RESOURCE EFFICIENCY AND POLLUTION PREVENTION AND MANAGEMENT

#### Impact on Physiography

#### Expected Negative Risks and Impacts

As per current Feasibility Report the construction work will be minor, mainly within existing footprint and hence impacts are not expected on physiography. During detailed design stage, considering the lack of available space on site, it is important to see if any nearby site would be required/ used for material storage, demolition waste or setting up of labour camp. Site for material storage and labour camp shall be identified by DBOT contractor and get approval from AMC based on the quantum, duration and type of material required to be stored. Impacts will be accordingly analysed for such sites. Temperature increase and impacts on Micro-climate due to spread of solar panels for solar roof top on site is also a concern.

#### **Positive Impacts**

There will be no significant impact on physiography of the region due to the proposed subproject which is construction of new STP in the existing STP site. This is important considering the proximity of the site to River Sabarmati.

#### Impact on Land/Geology

#### Expected Negative Risks and Impacts

Risks and impacts on land and geology will be limited to sourcing of construction material or related to disposal of demolition and construction waste, sludge and other wastes only. The civil works will require different materials such as earth, aggregate, boulders, and sand, in specified quantities and will be sourced from already operational and approved quarries and suppliers. There may be impacts on ground cover, and chances of contamination due to leachate/slurry/sludge in case of improper handling or spill if not properly collected and treated.

#### Positive Impacts

Overall positive impacts of the subproject include better resource efficiency in material sourcing; with less need for quarrying or sourcing materials as against the situation where entire STP is reconstructed. The various 'resource efficacy' considerations during design stage will include recycling and optimize usage of material, use of alternate energy, construction and other waste generated from rehabilitation activities and thereby reduce potential impact due to dumping (example: recycling and reuse of demolished materials in the C&D waste management facility of AMC, use of recycled products from the C&D waste management facility for proposed works). These will ensure overall minimal land impacts. In addition, all wastes will be managed in line with applicable regulations and best practices.

#### **Impact on Soil**

## Expected Negative Risks and Impacts

There will be minor impacts on soil due to rehabilitation and demolition works especially spillage of sewage, materials, oil, chemicals, and wastes generated including contaminated parts. There is also possibility of contamination of soil from leakage and spillage during handling and storage of fuels and chemicals. Existing components such as UASB reactors and sludge drying beds should be emptied and disinfected before demolition to prevent contamination and pollution of the soil. Existing sewage and sludge should be treated before disposal as per guidelines. During monitoring, if hazardous content is detected, sludge will be sent to TSDF. Contractor shall discuss with AMC the monitoring results & manage sludge as per Sludge & Waste Management plan. Sludge will be transferred to the biogas generation facility and gas will be generated following which the digested slurry, along with surplus sludge from any other part of STP will be transferred to the proposed Proposed Sludge management facility of AMC where it will be treated and disposed following the consent conditions.

## **Demolition of STP**



- Spillage of sewage, materials, oil, chemicals, and wastes generated due to ongoing STP operations, and proposed construction works
- Storing of debris, excavated material and dismantled machinery and equipment, in inappropriate manner, leading to soil contamination and pollution
- Contamination of soil due to C&D waste
- Contaminated land due to current use, to be de-contaminated for any other future use
- Existing components such as UASB reactors and sludge drying beds should be emptied and sewage treated, disinfected before demolition to prevent contamination and pollution of the soil

## Construction and operation of STP with biogas plant

- Spillage of sewage, materials, oil, chemicals, and wastes generated
- Contamination of soil due to solid waste disposal inappropriately, improper storage of construction materials, and goods.
- Excess chlorination may affect aquatic biota.
- Discharge of slurry or sludge from the facility and spillage into drainage channels or river Sabarmati may harm water and soil quality and thus biodiversity.

## **Repair works at TSPS**

- Spillage of sewage, materials, oil, chemicals, and wastes generated
- Contamination of soil due to solid waste disposal inappropriately, improper storage of construction materials and goods.

## Solar rooftop, Biogas

- Contractor should undertake the activity of maintenance of sludge drying beds during construction and operations.
- Leaching of sludge in soil
- Land/Soil contamination during maintenance and cleaning of panels, and storage of damaged solar panels used in solar roof top

## Construction of Rising main

- Underground nature of rising main will result in excavation and generation of top soil as waste.
- Works related to crossing of elevated metro line, Fatehwadi canal and access road may disturb soil
- Improper storage of materials and equipment required for construction leading resulting in soil contamination.

## **Construction of Outfall facility**

- C&D waste generated will affect the river sediment.
- Improper filing leading to disturbed flow in the river.

## Labour camp

 Contamination of soil due to inadequate facilities/amenities and unhygienic practices in labour camp

## **Common Risks & Impacts**

• Leakage/ leachate from storage of raw material and chemicals

## Positive Impacts

Wastes generated from works will be sludge (around 24-25 TPD), screenings, dust, wastes (biodegradable and non-biodegradables, hazardous, e-wastes etc), nevertheless, all the construction debris needs to be stored well not to contaminate the soil and disposed of in a planned manner to



avoid adverse impacts on soil. Waste storage, storage area for construction material and labour camp shall be identified by DBOT contractor and get approval from AMC. In the current Feasibility Report, details on storage areas for various wastes are not available. Hence, during detailed design stage, considering the limited space on site, it is important to see if any nearby site would be used for material or waste storage or setting up of labour camp. Impacts will be accordingly analysed for such sites by DBOT contractor and updated in ESIA & ESMP.

#### Impact of Material Handling and Waste Generation

During construction and maintenance, it is important to manage construction and demolition wastes, e-wastes (as in electrical parts), hazardous wastes (as in asbestos of old pipes, sheets used), or chemicals.

#### Expected Negative Risks and Impacts

#### **Demolition of STP**

- Demolition activities for existing STP will be carried out and construction & demolition waste will be generated. Much of the waste will be contaminated, as it is part of an existing STP, which holds sewage. Quantities shall be estimated during detailed design by DBOT contractor; and decontamination and disposal shall be arranged as per Construction and Demolition Waste Rules, 2016. UASB reactors and sludge drying beds should be emptied and disinfected before new construction activities are undertaken in the area.
- Project interventions include substantial amount of electro-mechanical work such as providing standby generators, upgrading, removal and installing new electrical connections, machineries, decommissioning and commissioning of pump sets and other appurtenances, etc. These activities will generate significant amount of waste in terms of e-wastes, batteries, replaced metal and plastics parts and fixtures, packaging materials, empty containers, use and disposal of oil & grease, iron scrap, etc. some of which may be hazardous. There may be asbestos used in STP, or associated parts, as the STP was constructed more than a decade back. It is important to segregate and store all these materials on site in proper receptacles or demarcated areas, and collect, transport, recycle, and dispose as per Plastic/ E-waste/ Hazardous Waste Management Rules.

#### **Construction of STP**

 During construction phase, construction materials will be stockpiled within the existing campus. This might leach into nearby environment through storm water, or wind and pollute the air, nearby buildings (as dust), water bodies or land.

## **Operation of STP with biogas plant**

- Waste screenings, bio and non-biodegradable wastes, sludge are the wastes generated during operation phase. This will also be pertinent during construction phase, as existing STP will be operating in one part of the site
- There can be chances of spillage while working on parts of STP proposed for demolition

## **Repair works at TSPS**

- During construction phase, construction materials will be stockpiled within the existing campus. This might leach into nearby environment through storm water, or wind and pollute the air, nearby buildings (as dust), water bodies or land.
- There is possibility of accidental flow of sewage while working in TSPS

## Construction of Rising main

 During construction phase, construction materials will be stockpiled within the existing campus. This might leach into nearby environment through storm water, or wind and pollute the air, nearby buildings (as dust), water bodies or land.



There is possibility of accidental flow of sewage while connecting the rising main

## **Biogas plant and Solar Rooftop**

- Leachate and slurry
- Land/ Soil contamination during maintenance and cleaning of panels, and storage of damaged solar panels
- Damaged and End-of-life solar panels which contains hazardous constituents

## Labour camp

- Workers, especially migrants may reside in the area during peak construction period. It is important that the camp is not set up in Vasna STP premises. It is suggested that stay arrangements are made at least at a distance of 20m from existing STPs complex and 150m from river edge. Camp, from where it is easier to access the site preferably without crossing the road or using vehicular transport. It is recommended to arrange sanitary and solid waste management facilities at the labour colonies to avoid water and land pollution, odor issues and health impacts. There will also be an influx of labourers and other service providers into the project area.
- One of the areas which need close attention in this regard is the squatter settlement next door. It is essential that from the planning stage, sewage management and solid waste disposal facilities should be conceptualized to maintain the health of the people and the environment.
- Solid waste generated from the colonies during construction phase will be segregated and properly stored, collected, transited, treated and disposed as per Solid Wastes Management Rules, 2016, in AMCs existing facilities for bio and non-biodegradable wastes.
- Contractor shall arrange first aid box at site and shall arrange medical facilities, medical check-up/ camps to labour at site especially during accident/ emergency which is likely to generate bio-medical waste. Though the quantity is not expected to be significant, this needs to be channelised to Biomedical waste management facility at appropriate intervals to avoid indiscriminate dumping.

## Positive Impacts

The project would also need to address the management of materials (such as construction materials, chemicals used for STP operations, fuels, paints etc.) solid (screenings, wastes, sludge, construction and demolition (C&D) wastes, e-waste from electro-mechanical equipment) and liquid waste (from construction activities, run-offs, waste water/ sewage from labour camp, leachate from sludge, treated sewage, accidental leakage of untreated sewage) generated during the construction and operation phases. Contractor will prepare management plans (OHS, CHS, Waste Management etc) and implement the same.

Waste generation will be tremendous as the subproject is construction of a new STP under section I of 120 MLD, demolition of existing STP, and construction of remaining capacity, repairs at TSPS, construction of rising main etc. All wastes will be managed following National regulations and WB EHS: C&D wastes will be sent to the AMC C&D waste management facility where it is converted into useful products for recycling back for construction purposes; some of those will be used in the construction purposes and site development for this subproject thus ensuring resource efficiency. Screenings, plastics and wastes will be treated and disposed at AMCs solid waste management facility. Machines/equipment's will be auctioned to authorised recyclers. E-waste including Solar panels will be sent to GPCB approved e-waste recyclers and all these requirements will be made part of DBOT contract. Site and material storage areas will be provided with cut off drains to collect and treat liquid wastes. Standards suggested by national guidelines for sludge quality and WB EHS will be followed. Sludge will be handled by AMC as per regulations. Sludge quality will be monitored and sent to AMC's Sludge Management facility If it is non-hazardous, where it will be treated and disposed. Or else it



shall be used for permitted uses or landfilled / used as landfill cover as per National Regulations. If tested hazardous it shall be sent to the nearest appropriate Hazardous Waste TSDF for disposal following the Hazardous Waste Management Rules of Govt of India, 2016.

Contractor will have the responsibility to store, test, transfer sludge for disposal appropriately based on the monitoring results & existing regulations, as agreed in writing with AMC.

#### Impacts on Water Resources and Quality

The proposed subproject is not expected to impact drainage pattern or water resources (ground or surface) largely. However, the proposed rising main will cross the Fatehwadi Canal through the top. The water for construction will be sourced from existing supply by AMC and as such requirement will be limited. However, use of water resources will be optimised before start of work through application of Resource Efficiency and Pollution Prevention techniques which will include optimal use planning, recycle and reuse option. Possible reuse of treated wastewater for construction after chlorination will be explored.

The DBOT contractor will prepare project specific water use and water balance analysis based on detailed design and prepare an action plan for water conservation, recycling/ reuse, and management and submit to PIU for approval.

No construction activity will be carried out on the river and hence physical changes on the river are not expected. Minimal disturbance to river is expected due to outfall construction. No water will be sourced from river or wells for construction as the site already has piped water supply from AMC which or through tankers will be sourced for construction works.

#### Expected Negative Risks and Impacts

#### **Demolition of STP**

- Bypass of untreated sewage during construction activities or emergencies
- Sediment (fine) in stormwater run-off into the river from in and around open/exposed work areas, roads

## Construction and operation of STP

- Possible flow of improperly stacked construction materials and its packaging into river
- Sediment (fine) in stormwater run-off from in and around open/exposed work areas, roads into the river.
- Sediment (fine and coarse) from soil disposal and stockpiles (in areas selected for stock piling & soil disposal) carried by stormwater run-off
- High pH suspended solids from cement storage and concrete batching areas
- Hydrocarbons, heavy metals, and nutrients, from spills, deliberate discharge, and poor storage, handling and disposal of hazardous materials, fuels, and waste oils, including those that may induce pH changes.
- Mixing of sewage with flood waters

## **Repair works at TSPS**

- Possible flow of improperly stacked construction materials and packaging into river
- Sediment (fine) in stormwater run-off from in and around open/exposed work areas, roads into the river.
- High pH suspended solids from cement storage and concrete batching areas
- Hydrocarbons, heavy metals, and nutrients, from spills, deliberate discharge, and poor storage, handling and disposal of hazardous materials, fuels, and waste oils, including those that may induce pH changes.
- Mixing of sewage with flood waters
- contamination from construction machinery in use near water bodies



## **Biogas plant**

Mixing of sludge with flood waters

## **Construction of Rising main**

- Sediment (fine) in stormwater run-off from in and around open/exposed work areas, roads into the river
- Contamination from construction machinery in use near water bodies

## **Construction of Outfall facility**

- works on outfalls or river edge strengthening, if any, may lead to erosion due to inappropriate implementation.
- Mixing of sewage with flood waters
- discharges and disturbance of soil and sediment that drain into surface waters
- Contamination from construction machinery in use near water bodies

## Labour camp

- Solid waste from littering and poor handling of waste in workplace, labour camps
  - Organic material, pathogenic bacteria and nutrients from poor siting and management of the Contractor's sewage treatment facilities, including siting of septic tanks that could lead to seepage to rivers, ground water
  - Organic material, pathogenic bacteria and nutrients from untreated sewage from informal settlements, camp followers and open defecation affecting host villagers Common Property Resources

## Positive Impacts

Positive Impacts on water quality include:

- Minimal bypass of sewage without treatment
- Better quality of treated sewage discharged into the river
- Better ground water quality downstream for irrigation
- No impact of mixing of sewage during floods
- Proposed rehabilitation would improve the quality of treated sewage, by making it
  more suitable for recycling. Already, Irrigation Department was using treated sewage
  from Vasna 240 STPs through Fatehwadi Canal for irrigation purposes. Thus, good
  quality treated sewage will be available for irrigation and recycling for other uses on
  site after disinfection and improves water availability in the water scarce region, after
  GPCB amends the consent condition and agrees to dispose treated sewage in
  Fatehwadi Canal.

The existing plant 126 MLD Plant was constructed based on UASB technology. The existing plant will be demolished entirely. Before dismantling the new plant, units will be constructed in empty project land in the existing boundary and sewage will be diverted to this newly constructed units to avoid diversion of untreated sewage directly into the river. Also, it is suggested that facility should have provision of secondary containment wherever required to avoid any spill to nearby areas.

## Reduction in Pollution Load on River Sabarmati due to Vasna 126 MLD STP upgradation

Currently, the quality of treated effluent is suboptimal. AMC aims to achieve the stringent quality of treated effluent in its new STPs and those proposed under G-ACRP, and at the same time recycle and reuse of treated effluent would reduce the burden on fresh water resources ensuring their long-term sustainability <sup>42</sup> to ensure resource efficiency and reduce BOD load on receiving water bodies.

Three scenarios are considered for evaluating the cumulative impacts on the water bodies:

<sup>&</sup>lt;sup>42</sup> FR, section on Provision of Sustainable Green Interventions



- Scenario 1: Strategy towards Decentralized Sewage Management No STP Scenario: when there are no STPs to treat sewage generated in the zone, with all sewage going to toilets with/ without appropriate septic tanks. In this case, total diffused pollution load ultimately reaching Sabarmati, would be high mainly as the soil is alluvium. With increased draining through open disposal, disposal into canals, septic tanks, and soak pits leaching of polluted water to the river will be high and from multiple areas. This also increases chance of leaching of pollutants from land disposed pollutants.
- Scenario 2: 'As is' scenario No Project Alternative: If the existing STP continue to maintain same performance levels and standards. In this case pollutant levels will be high in Sabarmati. This will continue to impact agricultural users downstream, near riverside.
- Scenario 3: STPs follows stringent discharge norms Technology/ Capacity Upgradation of existing STPs: If the STP follows NGT norms and are well upgraded and maintained, as envisaged by G-ACRP the pollution load in Sabarmati will reduce. Better quality of treated water will be available for agriculture, and this will improve overall health of the region.



Figure 29 Pollution Impact of the modelled Scenarios on Sabarmati River

A graphical representation of the comparison of these three scenarios above is presented here in *Figure 30*. This graph shows that the subproject with increase in capacity to 375 MLD (from 126 + 35 MLD) can ensure around 70-80 percent reduction in BOD, SS, and TP pollution load due to this facility if implemented.

## Impact on Ambient Air Quality

With the high population density and the metropolitan nature of the city, it has many vehicles, industrial and commercial activities which results in various sources of urban air pollution in the city. The proposed subproject activities may potentially impact the air quality during construction, operations, maintenance and decommissioning of units with the addition of construction vehicles, construction/decommissioning activities, use of machinery, and fuel combustion. In addition, the odor may emanate from STP processes/release of gases, use of chemicals, sludge, and treated sewage and may impact the communities near STPs, pumping stations, and discharge points.

## Expected Negative Risks and Impacts

Air quality may be affected in the form of dust, particulate matter and gas emissions from exhausts. <u>Dust emissions</u>: Construction activities can give rise to dust emissions if not effectively managed and have the potential to affect receptors near to the main construction sites due to dust generated from demolition, excavation, operation of construction equipment and machinery, increased movement of



vehicles, on unpaved access roads. Since the proposal is for rehabilitation of existing STP, large scale earth works are not expected, and hence possible impacts of wind during night or inactive construction periods is not an issue.

Dust mainly comes from the use of roads, cleared land in the work area, material stockpiling. Particulates (other than dust) and gas are emitted from vehicles, heavy machinery, diesel generators and asphalt processing sites for access road. The impact of air contaminants, such as dust, can disrupt local communities (deposition in water supplies and on buildings and other facilities), while it can also affect public health. The communities most at risk are those close to the main access road as this is most exposed to dust and vehicle emissions. The main mitigation measures are covered by the Environmental Management Plan and associated sub-plans and include the management of dust, exposed soil and material emissions; maintenance of vehicles and equipment to control emissions; avoid burning vegetation and trash; and managing a complaint and resolution service system. Average wind is 6-8 km/hr, but the dust impact due to demolition or on-site construction is less severe as the predominant wind direction is away from the settlements nearby.

Gaseous emission during construction and operation of STP will be from machinery, equipment and vehicles used for material transportation. The operation of vehicles and equipment mostly with diesel fuel will result in emissions of carbon monoxide, sulphur dioxide, and oxides of nitrogen. The impact on air quality due to emissions from vehicles and plant will be in the areas immediate to the work area. There are multiple sources of pollution near around existing STP site. Generally, additional vehicle movements generated during the construction and operations will have the potential to influence local air quality at sensitive receptors located at close proximity to road and pollutant concentration is likely to reduce with increase distance from road. The impacts will therefore apply mostly to the squatter settlements next to the site boundary and access roads. Air emissions from wastewater treatment operations may include hydrogen sulfide, methane, ozone (in the case of ozone disinfection), volatile organic compounds (e.g., chloroform generated from chlorination activities and other volatile organic compounds (VOCs) from industrial wastewater), gaseous or volatile chemicals used for disinfection processes (e.g., chlorine and ammonia), and bioaerosols. Odors from treatment facilities can also be a nuisance to workers and the surrounding community Impacts due to operational stage gaseous emissions and odor including H2S and SO4, CH4 etc. also would continue during construction stage. However, due to better facilities and performance such impacts ware expected to reduce when operations of the rehabilitated STP commences. Fugitive VOC emissions are associated with VOC-containing liquids or gases where the material is under pressure, exposed to a lower vapor pressure, or displaced from an enclosed space, tanks. Equipment leaks include valves, fittings, and elbows which are subject to leaks under pressure.

Determination of the amount of exhaust emissions generated by heavy vehicles is calculated using the basis of emissions generated by trucks. Transportation during the operation phase is estimated to be carried out by 30 heavy diesel vehicles i.e., trucks per day. Emission coefficients for trucks from CPCB<sup>43</sup>.

- CO = 1.5 g/km,
- NOx = 3.5 g/km,
- HC = 0.96 g/km
- PM = 0.02 g/km

Based on the emission coefficient and traffic density mentioned above, the number of emissions by transport vehicles, for each air quality parameter, is as follows:

- CO = 0.045kg/day/km
- NOx = 0.105kg/day/km
- HC = 0.029kg/day/km
- PM= 0.0006kg/day/km

<sup>&</sup>lt;sup>43</sup> https://cpcb.nic.in/vehicular-exhaust/



The main access roads and construction sites had a moderate impact significance. Mitigation to reduce the risk of negative impacts from reducing air quality is described in ESMP.

#### **Demolition of STP**

Decommissioning activities may generate emission of fugitive dust caused by a combination of on-site excavation and movement of earth materials, contact of construction machinery with bare soil, and exposure of bare soil and soil piles to wind. A secondary source of emissions may include exhaust from diesel engines of earth moving equipment, as well as from open burning of cut vegetation and solid waste on-site.

- Dust & gaseous emission due to transportation
- Dust emission during demolition
- Release of noxious gases/chemicals during dismantling and demolition of machinery, equipment and structures of existing STP.

#### **Construction of STP**

- Dust & gaseous emission due to transportation & machinery
- Issues and concerns to release of noxious gases/ chemicals during storage and commissioning of new units.
- Release of untreated sewage during construction activities

#### **Repair works at TSPS**

Dust & gaseous emission due to transportation & machinery

#### **Biogas plant**

Gaseous emission from sludge/slurry

#### Construction of Rising main

Dust & gaseous emission due to transportation & construction activities.

#### Labour camp

- Dust & gaseous emission due to unhygienic practices in labour camp
- Improper ventilation and lack of separate and proper cooking facilities in the labour camp.

#### **Positive Impacts**

Access road improvement will help in reducing dust emissions. Odor emissions are expected to reduce considerably during operations with improvement in STP process and adoption of modern technology and replacement of existing machinery, which will reduce stagnation, wastes and sludge.

#### **Ambient Noise and Vibration**

Noise is a common problem in urban areas as compared to the villages because of the mechanization and more vehicles on the road. All types of noise altogether affect the same irrespective of the sources and cause headache to the high blood pressure and other heart diseases.

#### Expected Negative Risks and Impacts

The site is bounded on both north and south by STP sites; west by Gyaspur metro depot and south by the river. The area to the south of Vasna 126 STP to the south of the site is mixed use has a dense road network, and several sensitivities such as residential areas, hospitals, schools, religious buildings, etc. However, this area may not be significantly affected by rehabilitation works in the site. Most important receptor is the squatter settlements next to STP site and access roads.



Sources of noise will be the demolition activities, ongoing operations of the STP, vehicles and equipment for construction at the project site. Noise levels will increase during the period of construction, and cumulative noise levels will tend to be higher especially due to nearby operations of the Metro Depot. Additionally, noise levels will increase on approach roads due to increased traffic.

Noise can impact officials and workers on site and others who reach the site for supply of materials or equipment's or other services; and those residing and working nearby. Such impacts can become significant if they are exposed to high noise for long hours continuously.

The ambient air quality standards in respect of noise in different areas/ zones have been notified by the Ministry of Environment & Forests, Government of India vide 'The Noise Pollution (Regulation and Control) Rules, 2000. The Schedule of ambient air quality standards in respect of noise notified in the above 'Rules' is reproduced below:

Area Code	Category of Area/Zone	Limits in dB(A) Leq	
		Day time	Night-time
(A)	Industrial area	75	70
(B)	Commercial area	65	55
(C)	Residential area	55	45
(D)	Silence Zone	50	40

## Table 35: Ambient Air Quality Standards in respect of Noise

The subproject noise sources consist of; land clearances, earthworks, demolition of some existing facilities, construction new structures, and vehicle movements along the access roads.

## Note:

1. Day time shall mean 6.00 a.m. to 10.00 p.m.

2. Night-time shall mean from 10.00 p.m. to 6.00.a.m.

3. Silence zone is defined as an area comprising not less than 100 meters around hospitals,

educational institutions and courts. The silent zones are zones which are declared as such by the competent authority.

4. Mixed categories of areas may be declared as one of the four above-mentioned categories by the competent authority.

5. dB(A) Leq denotes the time weighted average of the level of sound in decibels on scale A, Leq being energy mean of the noise level over a specific period.

Current noise levels at Vasna STP site are 60.63 dBA and 52.55 dBA respectively during day and night times. The operation of a motor vehicle/ truck that transports materials will contribute to a noise increase of ±70 dBA. The estimated noise in a residential area (squatter settlements along access/ boundary/ or in between STP boundary and Canal) within ±10 m from the main road through calculations with a single point spread is as follows: Ts1-Ts2 = 10 log r2/r1. Allowable further noise levels exposure for existing noise exposure of near around 60 dBA (rounded to nearest decibel) as per FTA manual is 57 dBA, which will produce combined level of 62 dBA. This is within the permissible noise levels for a mixed-use area with Metro depot, STPs etc. (if considered industrial limit is 75dBA, if considered commercial, it is 65dBA, considering squatter residences, this is 55dBA). Upto <61 dBA of combined noise impact exposure is considered no impact, while 61 to 66 is moderate impact and >66dBA is severe impact.

Work activities which may generate continuous noise need to be curtailed. Impulsive or impact noise is not expected from proposed works. Permissible exposure in cases of continuous noise is presented in below.


Total time of exposure (continuous short-term exposures)	Sound pressure level in or a number of dBA per day, in hours
6	87
4	90
3	92
1 ½	97
1	100
3⁄4	102
1/2	105
1/4	110

1. No exposure in excess of 110 dBA is to be permitted.

2. For any period of exposure falling in between any figure and the next higher or lower figure as indicated in column 1, the permissible sound pressure level is to be determined by extrapolation on a proportionate basis.

Amount of Noise Level at 10 m from access road is 60 dBA, and from 30m is 55 dBA. Already truck carrying materials ply through this road, for operations and maintenance of STPs in the area, and to nearby mixed land uses. All machines operating in an area should produce noise within the acceptable level to maintain the well-being of people around. Adequate awareness / information shall be provided to all nearby communities and users on possible increase in noise levels. Tools and mechanisms which generate less noise shall be preferred, night-time restrictions on construction, Mufflers, screens and site buffers shall be engaged. Mitigation measures are presented in next Chapter on ESMP.

#### **Demolition of STP**

- Noise emission due to use of heavy vehicles, demolition activities & machinery.
- Noise due to use of cutting and drilling equipment.

#### **Construction of STP**

• Noise emission due to use of heavy vehicles, construction activities & machinery.

#### **Repair works at TSPS**

Noise emission due to use of heavy vehicles & machinery

#### **Construction of Rising main**

Noise emission due to use of heavy vehicles, excavation activities & machinery

## **Construction of Outfall facility**

Noise emission due to use of heavy vehicles & machinery.

#### Positive Impacts

Replacement of old machinery and pumps as part of proposed activities will reduce noise emanating from STP operations.

#### Vibration

#### Expected Negative Risks and Impacts

As per the Feasibility Report the subproject does not involve quarrying or blasting and hence, vibration impacts are limited:

- to operation of vehicles along accesses only during work hours of the day
- demolition & dismantling activities



- Installation of machinery (Thickener cum Dewatering machine (COTDM) feed sump, transformer, UV channel, Belt filter press, Construct MC3 (1 no.) consists of Transformer, Blower room, MCC Room etc.)
- Vibration impacts of proposed rising main crossing under the Elevated metro track

Demolition activities should not be using technical which might induce large vibrations, and Impact of Vibrations shall be studied as an essential part of Detailed design phase, due to proximity to Vasna Barrage and river edge. Vibrations will be monitored during construction activities, and the contractor will execute the complaint management service. The contractor is expected to develop a construction method or schedule for activities that generate noise in accordance with the results of monitoring the vibration level (exceeding the noise standard limit in residential areas) or complaints from the public.

At this stage, quantity of material which need to be transported is unknown as design will be finalised aby design consultant. The contractor can estimate vibration impact based on quantity of material to be transported to arrive at impact magnitude. vibration generated by the dump truck operation on the main road is relatively small for the receptor distance of more than 7.62m. So, this will cause impacts on immediate row of houses along the access road. Feasibility reports presents the reconstruction and demolition activities expected at aerators, which are within 10m from the nearest sensitive receptor - the squatter settlement. The magnitude of the impact of the noise will decrease as the distance of the receptors gets further.

Sensitive receptors (squatter settlement) are present immediate to the access road, but the impact is categorized as a minor negative impact with a low intensity because it is estimated that there will be a mobility of trucks of only 6 rotations/day considering the type of upgradation proposed. Vibration generated from the project activities will be very negligible and will not travel through the substratum as the soil is alluvial in nature.

#### Positive Impacts

Proposed surfacing of the access road will reduce road irregularities which in turn reduces vibrations due to all vehicle movements. Further, as the proposed rehabilitation would ensure stronger STP parts resistant to disasters like earthquake, vibrations in those elements will be further reduced.

## GHG Emissions and Climate Benefits of the Proposed Rehabilitation of Vasna 126 MLD STP<sup>44</sup>:

Baseline emissions have been estimated for present year 2021. Further, two situations are examined. Situation A, which is Business as usual scenario for 2039, with no intervention for process and capacity augmentation at the STP, and Situation B, where the proposed Project Intervention has been implemented for the year 2039.

#### Table 36 Carbon emissions from conveyance of sewage from TSPS

Scenario	G1 tCO2e/yr
Baseline Scenario 2021	6108
Business-as-usual 2039	8164
Project intervention 2039 SBR	9159
Project intervention 2039 A2O	9159

## Table 37 Carbon emissions from operation of STP

Scenario	G <sub>E2</sub> tCO <sub>2e</sub> e/yr	G <sub>CH41</sub> tCO <sub>2e</sub> e/yr	G <sub>N201</sub> tCO <sub>2e</sub> e/yr	G <sub>2</sub> tCO <sub>2e</sub> e/yr
Baseline Scenario 2021	1661	10803	21244	33708
Business-as-usual 2039	1715	43583	30739	76037

<sup>&</sup>lt;sup>44</sup> AMC, 10 Jan 2022. Feasibility Report for Rehabilitation of Vasna 126 MLD STP (Draft), prepared by RH-DHV, unpublished



Project intervention 2039	18594	8895	4477	31967
Project intervention 2039	28102	8895	4477	41475
A2O				

Table 38 Carbon emissions from handling and disposal of sludge

Scenario	G <sub>D</sub> tCO <sub>2e</sub> e/yr	G <sub>CH42</sub> tCO <sub>2e</sub> e/yr	G <sub>N2O2</sub> tCO <sub>2e</sub> e/yr	G <sub>3</sub> tCO <sub>2e</sub> e/yr
Baseline Scenario 2021	2	119	105	226
Business-as-usual 2039	4	312	276	593
Project intervention	23	276	0	299
2039 SBR/A2O				

## Table 39 Comparative Analysis of GHG emissions

Scenario		G <sub>1</sub> tCO <sub>2</sub> e/yr	G <sub>2</sub> tCO <sub>2</sub> e/yr	G <sub>3</sub> tCO <sub>2e</sub> e/yr	G tCO <sub>2e</sub> e/yr
Baseline Scenario 2021		6108	33708	226	40042
Business-as-usual 2039		8164	76037	593	84794
Project 2039 SBR	intervention	9159	31967	299	41426
Project 2039 A2O	intervention	9159	41475	299	50933

In a business-as-usual scenario, where the plant is not upgraded, the carbon emissions due to methane from treated and untreated wastewater alone would be 43,583tCO2e/yr. With the proposed technologies, carbon emissions would reduce to 8,895 tCO2e/yr from the biological treatment alone. The carbon emissions due nitrous oxide would also reduce from 30,739 tCO2e/yr to 4,477tCO2e/yr through the biological treatment process.

In a project intervention scenario, Although the quantum of wastewater treated would increase in the design year, 2039, it would only result in increased GHG emissions from use of electricity at TSPS as well as STP, and increased sludge quantum and subsequent transport of dried sludge to BARC plant. However, the methane and nitrous emissions from treatment of wastewater and disposal of sludge would significantly be reduced due to improved methane correction factors in the proposed technologies. Furthermore, project intervention would ensure that there is no discharge of untreated sewage into the water bodies, thus reducing emissions from untreated wastewater discharged into the water bodies. Through the project intervention, 41,449 tCO2e/yr of GHG emissions can be saved on an average.

Increased plantation will aid in carbon sequestrations. The proposed STP has a green belt around the plant with minimum of 30% - 33% of area devoted to tree plantations. The internal roads shall have plantation. With this increased tree cover, 2783 tCO2e/yr of emissions can be reduced.

## Pollution Risk management strategies and encourage Resource Efficiency

- Follow the discharge standards based on NGT suggested and additional parameters and limits suggested in this ESIA, which is more stringent than the existing (EP Rules, 1986) standards which is suggested by WB EHS and considering the intended use of receiving water body
- To minimise pollution issues due to suboptimally treated sewage (at site, discharge points, Fatehwadi Canal), existing STP functions to be improved to treat sewage minimum as per current consent norms during construction period
- For reuse for agriculture, consent shall be sought from GPCB, and standards shall be finetuned based on additional study through Agricultural University based on the CPCB guidance on reuse of treated water for irrigation (and preparation of irrigation



Management Plan) considering the stakeholders views, requirements, and quality, quantity aspects

- The construction and related activities should be done in phase wise manner to enable the sewage to be treated in existing or upcoming units and prevent release of untreated sewage in the Sabarmati river.
- Demolished STP will have contaminated C&D and other wastes (due to sewage), and the contaminated area shall be well restored, after testing for contaminants and pathogens. Cost for this shall be included in FR/Detailed estimate
- Store materials wastes and chemicals away from flood prone areas, or elevate such areas, and provide cut off drains
- Various wastewater streams are segregated; and it is suggested to install sensors to be alert on industrial pollution ingress
- Prevent or reduce wastewater pollution through such measures as recycle/reuse within their facility, process modification
- Open burning of solid wastes, whether hazardous or non-hazardous should be avoided, as the generation of polluting emissions from this type of source cannot be controlled effectively
- Reduce, Recycle, Reuse C&D and other wastes
- Pollution impacts of Solar panels is important, and storage, handling and disposal shall be clearly agreed. No panel shall be found stacked on site without adequate protection to prevent pollution
- Get permits for plants from GPCB under Air Act, and follow consent conditions
- Implementing a leak detection and repair (LDAR) program that controls fugitive emissions by regularly monitoring to detect leaks, and implementing repairs within a predefined time period
- Use of dust control methods, such as covers, water suppression, or increased moisture content for open materials storage piles, or controls, including air extraction and treatment through a baghouse or cyclone for material handling sources, such as conveyors and bins
- Use of water suppression for control of loose materials on paved or unpaved road surfaces
- Implement recommended engine maintenance programs
- Drivers should be provided awareness on the benefits of driving practices that reduce both the risk of accidents and fuel consumption, including measured acceleration and driving within safe speed limits
- Vibration impacts of proposed trunk main crossing the elevated metro track shall be studied, and mitigation measures shall be included in design
- Enhancement of energy efficiency measures
- Protection and enhancement of sinks and reservoirs of greenhouse gases (such a green belts)
- Limitation and/ or reduction of methane emissions through recovery and use in waste management, using better technology such as SBR
- Implement air, water, soil, biodiversity Monitoring program during construction (including project roads, and on site) and operations
- Replace old equipment, machines, pumps and electrical installations
- Use LED bulbs, fans/ star rated pumps/ equipment
- Use Solar energy as Solar lighting/ use of solar energy as much as feasible (provided disposal of panels at TSDF is arranged, proper storage and use of PPEs while working with damaged panels are ensured)
- Energy saving fitting (LED lighting) and equipment, motors are fitted with variable frequency drive (VFD)



- Ensure sewer system capacity
- Contaminated water, leachate, rejects shall be channelled back to the treatment units
- NO reuse to be permitted before chlorination
- Sludge to be stored, disposed in hazardous facility and in compliance with local regulatory requirements, if tested so; else to be sent to BARC facility
- Use or handling of hazardous material, including asbestos to be avoided
- Training of operators on release prevention, including drills specific to hazardous materials as part of emergency preparedness response training
- Implementation of inspection programs to maintain the mechanical integrity and operability of pressure vessels, tanks, piping systems, relief and vent valve systems, containment infrastructure, emergency shutdown systems, controls and pumps, and associated process equipment
- Preparation of written Standard Operating Procedures for safe transfer and filling of the hazardous material, and in spill prevention and response
- SOPs for the management of secondary containment structures, specifically the removal of any accumulated fluid, such as rainfall
- Identification of locations of hazardous materials and associated activities on an emergency plan site map
- Documentation of availability of specific personal protective equipment and training needed to respond to an emergency
- Documentation of availability of spill response equipment sufficient to handle at least initial stages of a spill and a list of external resources for equipment and personnel, if necessary, to supplement internal resources
- Description of response activities for life and fire safety, in the event of a spill, release, emergencies, disasters especially floods
- Select equipment with lower sound power levels, use silencers, mufflers on engine exhausts and compressor components, acoustic enclosures (minimum surface density of 10 kg/m2) to prevent noise impacts from sensitive receptors
- Re-locating noise sources to less-sensitive areas to take advantage of distance and shielding and Siting permanent facilities away from community areas if possible, or taking advantage of the natural topography as a noise buffer during facility design · Reducing project traffic routing through community areas wherever possible
- Green belts to reduce air/ odor pollution impacts

## 5.3.4.4 ESS 4: COMMUNITY HEALTH AND SAFETY

Health safety and security risks and impacts on project affected communities especially on vulnerable people are important.

## Expected Negative Risks and Impacts

Though work activities would happen on existing STP site; squatters are settled near the site boundary and access roads. The subproject construction works would involve labour, transportation through access roads and handling of material, civil construction and machinery replacement and installation works, and such activities may directly or indirectly impact the community.

Engagement of labour for project work and their stay near the site for a period of about 4.5 years, will increase the risks of crimes including gender-based violence. Waste generation from labour camps/colony if not handled properly, will pollute the water resources used by community for drinking leading to health impacts. Migratory workforce may bring in infectious diseases not known to area. There can be risks due to COVID 19 in the present circumstances.



Traffic in nearby roads may be affected by increased movement of traffic which in turn places the community at the risk of increased noise, air emissions, and accidents. Traffic and Transport: Increased traffic inconvenience (emissions, congestions, longer travel times, blockage of access), especially the approach road connecting the STP also is a connecting road from NH 64 to the nearby areas.

Similarly, civil construction and other works will lead to pollution especially possible emergency situation to bypass sewage, air emissions and noise generation. Contaminated Construction debris, sludge and other contaminated wastes from operations, hazardous and e-wastes if not disposed properly have the potential of impacting the communities.

Initially the current STP site was demarcated as sewage farm, and as the city grew nearby communities have come up long after the establishment of the STPs at Vasna. Vasna has thus become a mixed-use hub to south of the city, where many public infrastructures such as STPs and Metro Depot also exist near to formal residential estates, commercial areas, hospitals, schools and squatter settlements. This STP is surrounded by other STPs, and access roads, with minimal impact on communities in formal residential areas, but the squatter settlement near the STP will face health and safety impacts. Possible impacts on health and safety of the nearby communities include:

## **During Demolition of STP**

- Odor nuisance, gaseous and particulate emissions, pathogenic agents
- Noise and vibration due to movement of heavy machinery and construction materials
- Possible spill of chemicals, sludge as they are taken through nearby roads or from the sites
- Exposure to dust, noise (vehicular movement on Kuccha access road, construction works, machinery during construction, operations, generators), the sun, heat and wet weather

## **During Construction of STP**

- Odor nuisance, gaseous and particulate emissions, pathogenic agents
- Noise and vibration due to movement of heavy machinery and construction materials
- Possible spill of chemicals, sludge as they are taken through nearby roads or from the sites
- Working with electricity/ electrical installations, appurtenances
- Exposure to dust, noise (vehicular movement on Kuccha access road, construction works, machinery during construction, operations, generators), the sun, heat and wet weather
- Impacts of discharge from STP on adjoining communities, especially during construction phase.
- Adverse social impacts on adjacent communities and squatters (e.g. security of women and girls due to labor influx)
- Improper storage of construction material and demolition waste: This will be a cumulative effect of poorly managed construction material and construction activities which will affect working areas and managing of materials and waste on site.
- Unanticipated risks to the downstream communities in case of release of untreated sewage from STPs during construction or disruption of bypass.
- Traffic disruption or congestion due to movement of heavy vehicles for project related activities.

## Repair works at TSPS

- Noise and vibration due to movement of heavy machinery and construction materials
- Working with electricity/ electrical installations, appurtenances

## **Biogas plant**



- Odor nuisance, gaseous and particulate emissions, pathogenic agents
- Exposure to sludge, waste screenings if not managed properly
- Fire hazard due to any emergency

# **Construction of Rising main**

- Noise and vibration due to movement of heavy machinery and construction materials
- Exposure to dust, noise (access road repairs and upgradation, vehicular movement, construction works, machinery during construction, operations, generators), the sun, heat and wet weather.
- Pedestrian-vehicular conflict, restriction of use of right of way along the Juhapura road, and approach road to STPs during rising main construction
- Flooding issues while the crossing is under construction

## Labour camp

- Odor nuisance, pathogenic agents
- Improper sanitation and washing facilities leading to odor nuisance and unhygienic conditions.
- Lack of facilities at work site and worker camp, pushing workers to use common areas / facilities and resources

## **Operation of STP**

• Working with electricity/ electrical installations, appurtenances

# **Common Risks & Impacts**

- Using vehicles on public and project roads, accident risks
- Possible exposure to illnesses, communicable diseases, COVID-19
- Exposure to mental or physical harassment, SEA/SH, and injury from interpersonal conflicts with workers/ operators
- Impacts of flooding in subproject premises or earthquakes, and other natural and manmade disasters

## Positive Impacts

Proposed improvements to STP will ensure safer and disaster resilient infrastructure which will have overall positive impacts on community health and safety especially during disasters. Proposed surfacing of access road to site will also reduce long term dust emissions, vibrations and accidents.

## Disasters (including Fire), Flooding and Dam Safety

Temporary flooding may happen during monsoons in the site. As water table is high along the river edge, excavations may be difficult and safety precautions shall be adopted. It is important to have Disaster Management Plan and Emergency Preparedness Action Plan to deal with disasters, emergencies in case of natural or man-made disasters including Fire, and Dam Safety Considerations given the presence of Vasna Barrage 3 km upstream of the site. These impacts are also applicable to TSPS, rising mains, outfalls etc. Hydrological and flood assessment including a study on Dam Break Analysis & Flooding Stimulation, preparation of inundation maps and emergency action plan for Vasna Barrage has been carried out and its results have to be considered in design of the facility, construction and operations, and emergency response plans appropriately considering community and worker health and safety and pollution impacts specifically during emergencies and climate events. The output of the study will be incorporated in the final design of the project and for updaring CESIA, CESMP. DMP with essential actions and organisational structure is presented in Chapter 6 on ESMP.



#### CHS Risk management strategies

- Assess flood risks and incorporate management/ mitigation mechanisms in designs, prepare Emergency Preparedness Action Plan
- Work scheduling taking into considerate floods (STP site, rising main across Fatehwadi canal, TSPSs), improvement to access road proposed as part of Vasna 240 MLD plant rehabilitation etc, to reduce health and safety impacts
- Include TSPSs, outfalls and allied infrastructure in the proposed flood risk assessment study and include EAP and mitigation measures in design. To be assessed in C-ESIA & mitigation measures if required and included in C-ESMP.
- Restricting access to the site, through a combination of institutional and administrative controls, with a focus on high-risk structures or areas depending on site-specific situations, including fencing, signage, and communication of risks to the local community
- Removing hazardous conditions on construction sites that cannot be controlled affectively with site access restrictions such as covering openings to small, confined spaces, ensuring means of escape for larger openings such as trenches or excavations, or locked storage of hazardous materials
- Education and awareness-raising on CHS, and the adoption of procedures for safe use roads
- Use of specially trained personnel to identify and remove waste materials from tanks, vessels, processing equipment or contaminated land as a first step in decommissioning activities to allow for safe excavation, construction, dismantling or demolition
- Use of specially trained personnel to identify and selectively remove potentially hazardous materials in building elements
- Prior to dismantling or demolition including, for example, insulation or structural elements containing asbestos and
- Polychlorinated Biphenyls (PCBs), electrical components containing mercury
- Recommendations for the prevention and control of communicable and vector-borne diseases
- Use of waste-specific PPE respirators, dust masks, clothing/protective suits, gloves and eye protection, information and awareness to communities adopt safe practices such as closure of windows and doors in case of dust emissions
- Surfacing of roads used for transport to site, and dust suppression techniques should be implemented, such as applying water or non-toxic chemicals to minimize dust from vehicle movements.
- Include SEA/SH GRM in the project GRM.

## 5.3.4.5 ESS 5: LAND ACQUISITION, RESTRICTIONS ON LAND USE AND INVOLUNTARY RESETTLEMENT

There are few STPs in the Vasna within 100 to 250 m, such as the 35 MLD, 48 MLD, 126 MLD etc. At the time of development of these STPs, there were no settlements, adjoining or near STPs. Since then, some temporary squatter settlements have come up alongside the Fatehwadi canal and kuccha access road near 126 MLD STP and 240 MLD STP. The squatters' settlement is not a notified slum and consists of kuccha or makeshift arrangements. The inhabitants are migrants (seasonal and permanent). Based on google images and site visit it is estimated that 600 to 700 structures are locate in the squatter settlement.

There is also residential area near 126 STP comprising largely of informal and formal families living in Juhapura area which is marked by lack of public infrastructure facilities and amenities such as roads, street lighting, drainage, etc. The area is accessed by a separate kuccha access road from the Fatehwadi canal road, which is proposed to be repaired and upgraded.



The proposed capacity augmentation and up-gradation of technology is proposed to be carried out within the existing STP boundary. The land belongs to the Ahmedabad Municipality as per the land records. Land acquisition is not envisaged for the proposed project. Displacement and resettlement issues are not envisaged for the subproject development as all activities will be carried out within the project boundary. There are no families living within the STP premises.

There will be no restriction of access for squatters during construction or operation. Kuccha access road repair and upgradation is proposed to be included in sub project implementation to enable smooth movements of vehicle, reduce dust and air emissions and reduce community health and safety risks. Squatter settlement will not be impacted as existing kuccha road width will be maintained and no additional land will be acquired. There will be no impact on the access to burial grounds or the church as access road from Fatehwadi canal road to STPs (150 m length and 8 m width) will only be repaired and upgraded. Public infrastructure services shall be provided through government schemes and programs.

Loss of livelihood is also not anticipated as there are no livelihood related activities currently being undertaken within project boundary. Labour currently employed by contractors may be accommodated in the construction activities as per local labour requirement. Local labour will be hired and will be given preference during construction activities by the contractors.

After DPR finalization, the ESIA and screening to be reviewed to include any such impacts, if additional land requirements is envisaged, AMC will prepare and implement RAP following the methodologies and principles described in the RPF.

# 5.3.4.6 ESS6: BIODIVERSITY CONSERVATION AND SUSTAINABLE MANAGEMENT OF LIVING NATURAL RESOURCES

As explained in section 3.4.5 Ecology and Biodiversity, it was observed that the entire stretch of Sabarmati is infested with the Pistia sp. and Eichhornia crassipes which has altered the natural habitat. Sabarmati River stretch is a modified habitat as the water is being sourced from Narmada canal and stored at the river front stretch using the shutters of the Vasna Barrage. The riparian zone of the Sabarmati is converted into the riverfront in the Ahmedabad city. The region around is heavily industrialised, and fast converting into urban land uses, with pollutants reaching the already dry river. However, Hon'ble NGT has constituted River Rejuvenation Committee which has initiated the process of river rejuvenation, but curtailing pollution, monitoring e-flow, undertaking plantations etc, through various stakeholder departments. No tree cutting is envisaged on STP site, as per FR as construction occurs within footprint and site of existing STP. Trees majorly include Peltophorum pterocarpum and Azadirecta indica which is planted at the periphery of the site and along the internal roads. There are around 200 trees of various ages. Periphery of the plant area is planned as green belt in the proposed layout as provided in the FR. List of Flora and Fauna in and near the site are attached as Annexure III. No RET species were observed in the study area. However, The subproject intends interventions to improve the discharge quality and will thereby improve the biodiversity in or near the site and in the river and the region downstream of the discharge point., thus supporting overall biodiversity improvement.

## Expected Negative Risks and Impacts

## During Demolition of STP & During Construction and operation of STP including biogas plant

 In case of increased level of noise and vibration, faunal species will leave site. Noise above 60 dB has been reported to interfere with songbird mating call. Dust may settle on the leaves of the surrounding flora and may interfere with biological processes. The dust will also disturb the faunal species. Air Pollutants may interfere with biological processes of plants. It may also irritate the faunal species. Dumping of waste into the waterbodies may impact the biological process of macrophytes and aquatic fauna. It may alter the composition of macrophyte by interfering in nutrient cycle.



- For the proposed sub-project of upgradation of existing STP, tree cutting may be required based on the design. There are a large number of trees within the premises of the existing plant.
- Excess chlorination may affect aquatic biota, and downstream water users.
- Discharge of slurry from the facility and spillage into drainage channels or river Sabarmati may harm water quality and thus biodiversity.

# **Repair works at TSPS**

• In case of increased level of noise and vibration, faunal species will leave site. Noise above 60 dB has been reported to interfere with songbird mating call. Dust may settle on the leaves of the surrounding flora and may interfere with biological processes. The dust will also disturb the faunal species. Air Pollutants may interfere with biological processes of plants. It may also irritate the faunal species. Dumping of waste into the waterbodies may impact the biological process of macrophytes and aquatic fauna. It may alter the composition of macrophyte by interfering in nutrient cycle.

# **Construction of Rising main**

- In case of increased level of noise and vibration, faunal species will leave site. Noise above 60 dB has been reported to interfere with songbird mating call. Dust may settle on the leaves of the surrounding flora and may interfere with biological processes. The dust will also disturb the faunal species. Air Pollutants may interfere with biological processes of plants. It may also irritate the faunal species. Dumping of waste into the waterbodies may impact the biological process of macrophytes and aquatic fauna. It may alter the composition of macrophyte by interfering in nutrient cycle.
- Tree cutting may/may not be required for the final alignment. DBOT contractor shall ensure that the minimum trees shall be felled during the construction.

## Biogas plant & Solar rooftop

• Impacts on Micro-climate due to solar panels on roofs, especially in relation to reflectance and disturbance to fauna / flora.

## **Construction of Outfall facility**

• Temporary discomfort to the aquatic biodiversity due to construction activities

The Design Build Operate Transfer (DBOT) model is proposed to be implemented and Based on the finalization of the design and components, at a later stage, it may be required to cut some trees and clearing of the shrubs. Tree counting will be done after finalization of DPR for estimation of trees required to be cut. Tree cutting will be done as per The Saurashtra Tree Felling Act, 1951 and permission from AMC/ and/ or Forest Department (as applicable) shall be obtained for the same<sup>45</sup>. Measures to protect old trees will be considered during designing of the project. Clearing of shrubs will not have any impact on natural vegetation of the region. The proposed project may also require tree planting based on the number of trees cut.

## Positive Impacts

It is expected that improvement of Vasna 126 STP to match the discharge quality standards suggested by NGT will reduce prevailing BOD, COD, N, P, load from the river which will have overall cumulative positive impacts on the water quality, biodiversity (if discharged into Sabarmati) and downstream users.

<sup>&</sup>lt;sup>45</sup> <u>https://forests.gujarat.gov.in/writereaddata/images/pdf/ease-of-doing-business.pdf</u>



Since the proposed subproject involves construction, rehabilitation and demolition of existing STP which will be carried out within the site, impacts on flora and fauna of the site will be minimal and mainly during construction period.

# 5.3.4.7 ESS 8: CULTURAL HERITAGE

Proposes activities take place in existing STP premises, surrounded mainly by other STPs, Gyaspur Metro Station and the river. There are no cultural heritage assets (tangible or intangible) in nearby areas. Local congregation areas, party plots, parks, open spaces outside the boundary will not be used for any related activity including material storage, labour camp or parking. This will be further confirmed during Detailed Design Stage and impacts shall be discussed, while updating the ESIA. Chance find procedures shall be included in ESMP.

## 5.3.4.8 ESS9: FINANCIAL INTERMEDIARIES

Not Applicable

#### 5.3.4.9 ESS10: STAKEHOLDER ENGAGEMENT AND INFORMATION DISCLOSURE

Socio-economic: The existing STP site is surrounded by other STPs at Vasna, Gyaspur Metro Depot. And Sabarmati. Proposed infrastructure developments may have an impact on the immediate residents near STP Vasna – squatters along the approach road mainly during construction stage.

Consultations were carried out for the preparation of the draft ESIA report and the draft ESMF and SEP. Stakeholder consultation is a dynamic process and consultations will be carried out during the life cycle of the G-ACRP project. Public Consultation was carried out in June 2022 for disclosure of ESIA and ESMP.

Consultations have been carried out with various stakeholders including squatter settlement inhabitants, STP operators, AMC officials during preparation of ESIA for sub project and SEP for G-ACRP project. Consultations will also be carried out during the project cycle.

The summary of consultations is given below:

- Squatter households do not have access to municipal services. Mostly practice open defecation near highway or forest areas and other areas which are accessible to them.
- Squatter settlement did not have any specific issues related to upgradation and have experienced odor issues maybe a couple of times. They have informed the security personnel at the STP gate to report the issue to the STP officials.
- Issues related safety and security of workers are neglected by contractors at field level due to absence of monitoring mechanism.
- Construction workers need to be provided with better civic amenities at construction sites to prevent open defecation, prevent unsanitary and unhygienic conditions in the project site and labour camp and avoid potential conflict due to open defecation.
- There could be several settlements which are on encroached land or houses are on the sewerage drains. These will not be impacted due to sub project activities as the drains are located towards the middle of the roads and hutments are located on the pavements. Some of the slums in the city have issue of mixing of drinking water with drain water.
- In periphery slums individual connection of sewer lines is a problem. They have mostly soak pits.
- Solid waste is collected but not recycled.



- Vulnerable groups do not have access to the GRM of AMC as they are not conversant with online GRM of AMC. During sub project implementation, GRM details will be displayed at site and consultations will be carried out regularly.
- Bare minimum space requirements necessary for undertaking works are difficult to arrange and management especially if there are no alternatives.
- There is non-cooperation from localities where rehabilitation of sewer lines or MT works are undertaken and workspace is constantly challenged.
- Health issues in some workers working in STP. Issues related to odor.
- All policies and compliances are included in RPF and tender document
- Women are not very willing to work at the STP due to travel time, remoteness of site etc.
- Issues related to STP include, old equipment, weathering of machinery and equipment. Need to assess if modification to existing features and equipment can result in better performance of the machinery and equipment.
- There are instances of influx of heavy chemical water into the sewage which may impact the durability of the structure and equipment.
- The water is received from Fatehwadi canal and Sabarmati River is not of good quality as its not properly treated in the STP. Villagers do not prefer to use Sabarmati water as it is not good for any use.
- The villagers use borewell and tube well water for drinking and farming.
- They expect to receive the water from NMC.
- There were health issues in some villages and other villages there were no health issues with respect to water.
- Many industries have adopted reverse boring practices and it has completely deteriorated the ground water quality. Even borewell water colour is red many times. This caused skin diseases. Even the crops are damaged
- Agricultural land is 100m-150m away from banks of Sabarmati River and has started hardening and non-productive. RWH is option that seems to feasible in now-a-days.

The sub-project will implement the project level SEP to engage with relevant stakeholders, including the poor and vulnerable groups. Any grievances regarding the sub-project activities will be processed through the project level GRM as specified in the SEP. AMC will conduct awareness campaign to inform the settlement dwellers about the GRM.

# 5.4 Cumulative Impacts

The cumulative impacts in the region will be mainly due to the discharge of treated sewage into the river and canal. People of downstream villages of Sabarmati depend indirectly on the river and Fatehwadi Canal for irrigation (if AMC gets consent from GPCB for discharge into the canal). Cumulative Pollution levels due to the discharge of various STPs, CETP discharge through Megaline, other ETP, and stormwater discharges in the river are high currently. Vasna barrage across Sabarmati to the South of the city regulates water flow downstream of Sabarmati.

Screening and analysis were undertaken following the IFC Good Practice Handbook for Cumulative Impact Assessment and Management. The Handbook defines this as the process of (a) analyzing the potential impacts and risks of proposed developments in the context of the potential effects of other human activities and natural environmental and social external drivers on the chosen VECs over time, and (b) proposing concrete measures to avoid, reduce, or mitigate such impacts and risk to the extent possible.

The objectives of the study were to understand the impacts on the Sabarmati River or any other valued ecosystem component due to the project, other developments in AMC and its region, and proposed subproject activities.



Step 1 – VEC's, spatial and temporal boundaries.

VEC's were identified from the baseline environmental and social study work within the project area of influence and using literature review and field visits for the region. Screening questions considered included the following:

Will the construction of new STP and demolition of Vasna 126 MLD STP affect this VEC?

Would other identified projects/stressors in the area potentially affect this VEC cumulatively within the spatial boundary?

Would the impacts be potentially significant?

CIA was performed through expert opinions, checklists, and spatial analysis.

## **Discussion on VECs**

The subproject activities include rehabilitation of an existing STP at Vasna, in the urban area of AMC and all works are confined to an existing STP site, to improve the treatment of sewage. The regional linkage is provided by River Sabarmati, which is dry for most of the year, and is a modified habitat as it receives water not from its source Dharoi Dam, but an irrigation canal – the Narmada Main Canal – intended to carry water from Sardar Sarovar Project to drought-prone areas of Gujarat. Water channelled from Narmada Canal to Sabarmati at Ahmedabad Riverfront is held there for most of the year for the ambiance of the riverfront and released through Fatehwadi canal or Sabarmati River (mainly during floods). None of the subproject works are carried out in the river or Fatehwadi Canal, except disposal of treated sewage. The river and the canal had been receiving sub-optimally treated sewage and bypasses, effluents, and stormwater for the past decade from Vasna STP, and other STPs, and CETP (through Mega Line) since past two decades.

This project which would improve treatment quality to comply with stringent NGT suggested standards are expected to bring in positive impacts on water quality, availability of treated water downstream of the city, through Sabarmati and Fatehwadi Canal, and hence overall the subproject presents positive regional impacts. As the subproject activities are restricted to the existing STP site, access road immediate to it, and TSPS site (for minor repairs), no heritage feature of the city is considered as an important component for examination.

None of the floral or faunal species are identified as VECs as they are not dependent on the existing STP site, Sabarmati, or the canal to which treated water is discharged. So, there is no impact of the subproject on existing rates of habitat conversion and degradation in the area. No fish or aquatic species met the conditions for VEC because those identified through fieldwork and desk-based screening were not RET species of endemic species and the locations fall under the urbanized area and the habitats are already modified. Sabarmati River in the vicinity of the STP plant is already polluted and the riparian zone is converted into the riverfront. There are no protected habitats or forests in the immediate region which may be impacted by the subproject. Other VECs do not apply to this subproject considering the distance to these natural areas and intervening urban land use.

## **Identified VEC**

Only one social/economic VEC was confirmed: the Fatehwadi Irrigation Scheme. The scheme is sensitive to water availability, through the Narmada Canal (diverted by Vasna barrage) or availability of treated water from STP.

## **Spatial Extent**

The spatial boundary has been established based on the Sabarmati, Fatehwadi Canal, and downstream areas which may be impacted. The length of the river and villages supplied by the canal, till Vautha where the river gets tidally influenced and meets another major inflow from Vatrak is considered as the spatial limit.

## **Temporal Extent**



The Feasibility Report states that as per the CPHEEO manual, Pumping Station (Civil Works) and Rising Mains are designed for 30 years however Pumping machinery is designed for 15 years from the base year. The temporal boundary was set at 15 years, as STP may need to be upgraded in response to regional/ city growth within this time. The feasibility report also adopted this as the timeframe.

# Step 2: Scoping Phase 2 – Other Activities and Environmental Drivers

The other activities and environmental drivers that are relevant were assessed as part of the iterative process of identifying VECs and spatial boundaries. Other activities which impact the river include (i) all discharges from the city and the region into the canal including all other existing and proposed STP discharges into Sabarmati, industrial effluents, treated effluents carried by Mega Line, stormwater drains; (ii) new Sabarmati Riverfront project and newly proposed barrage upstream of Vasna at the beginning of new Riverfront project, (iii) intensive industrialization of downstream areas of Sabarmati, to the South of Ahmedabad city which is given impetus by the nationally significant freight corridor – the Western Dedicated Freight Corridor (DFC); the mega rail transport project for freight connecting industrial areas to the west of India.

There is a significant reduction in rainfall and water availability in the catchment of Sabarmati, multiple barrages, and increased agriculture and urban uses to the north of the city, which has also resulted in less water availability in this non-perennial river. These already have a pronounced impact on in-river habitat and rendered it modified.



Table 40: Environmental Impacts on VECs (at Regional Level)

VECs that may be affected by the development	VEC Threshold(s)	Spatial boundaries	Temporal boundary	Impacted by project	Impacted by activities and environmental drivers	Impacts on thresholds and Project Mitigation/monitoring measures
River Sabarmati users	Improved water quality and better biodiversity due to better-treated sewage discharged	Till Vautha around 50 km from where it is tidally influenced	15 years is the planning period considered after which STP upgradation would be necessary	Positively impacts, as the dry river will get a well-treated discharge Quality ensured by the ongoing hon'ble high court and task force's action to disconnect all industrial connections from the sewer network	Less rainfall and the proposed (in early stages) new barrage upstream of Vasna, will have no impact on discharged treated water as it depends on the population served	<ul> <li>Positive Impacts due to better discharge quality of treated sewage</li> <li>Monitoring of quality of treated water and measuring quantity of treated water discharged and bypasses if any during construction and operation phases.</li> <li>Periodic measurement of Trophic Status of the River to understand the improved quality due to the project</li> </ul>
Fatehwadi Canal irrigation scheme users serve around 5000 ha in the command area (not part of Narmada Command area, but now receiving waters from the Narmada Main Canal)	Water available for irrigation as announced by GoG, and requested by Irrigation Department for the water-scarce region	Agricultural areas of villages of Daskroi, Sanand, Bavla, and Dholka – villages around 20 km aerial from Vasna.	15 years, within which the land use conversion can be expected, considering the pace of industrialization of the region, as it is in the influence region of DMIC	Positively impacts, as canal which gets less supply now from NMC and poor- quality treated water from STPs, will get a well-treated discharge for irrigation due to the project	Less demand for agriculture in the future, as the downstream region is fast getting industrialized with many industrial areas, also due to Western Dedicated Freight Corridor. Ahmedabad District is the largest inland industrial center in western India. Provides a manufacturing base for industries like chemical, textiles, agriculture, and food processing. The GDP of Ahmedabad and Gujarat depends heavily on the output and capacity of these industries.	<ul> <li>Positive Impacts due to better discharge quality of treated sewage</li> <li>Ensure Consent to Discharge from GPCB for discharge of treated sewage through the canal</li> <li>A detailed study with stakeholder consultation through Agricultural University, in line with CPCB (2019) Guidelines for Discharge of Treated effluents for Irrigation to determine and manage discharge for better irrigation practices</li> <li>Monitoring of quality and measuring quantity of treated water discharged during construction and operation phases</li> </ul>

A summary of risks and impacts and their significance are presented in *Table 40* below:

Table 41: Cumulative Environmental Risks and Impacts of proposed STP improvements at the Local/near Site Level and Mitigation measures

Aspects	Potential Impacts	Mitigation	Significance Geographic Spatial Duration before Scale Mitigation		tial Duration	Status after Mitigation	
Development in the city							
Improvement in Sewerage and Drainage (S&D) infrastructure and increase in population in the serving area	Increase in incoming flow to STP	Mitigation Possible, through long term master planning and planning additional STPs (ongoing)	High (negative)	Site/ Local	Long-term	Major Positive	
New area development and increase in sewage flow	Increase in incoming flow to STP	Mitigation is Possible through Master plan (ongoing) and upgradation activities under G- ACRP	High (negative)	Site/ Local	Long-term	Major Positive	
Increase coverage of vulnerable sections especially the urban poor, migrants, slum dwellers with no access in the serving area	Increase in incoming flow to STP	Improvement in the Sewerage network and capacity augmentation with improved technology; full coverage planned through G- ACRP	High (negative)	Site/Local	Long Term	Major Positive	
Reduction in untreated sewage flow into stormwater, river or canals	Increase in incoming flow to STP	Improvement in the Sewerage network and capacity augmentation with improved technology – full coverage and Lake/canal improvement through G-ACRP, Master Plan (ongoing)	High (negative)	Site/Local	Long Term	Major Positive	
Construction Phase							
Cumulative Air Quality Impacts	The subprojects (esp. two Vasna subprojects) can collectively generate construction and O&M-related air emissions. Emission from nearby Metro Depot construction will contribute to the emission levels.	See mitigation measures in the ESMP. Mitigation Possible, through use of buffers, screens, PPEs, awareness, time restrictions/staggering of large noise/vibration generating activities at sites as detailed in ESMP	Low (negative)	Site/ Local	Short-term	Minor Positive (as mitigation measures will help reduce baseline impacts as well)	



Aspects	Potential Impacts	Mitigation	Significance before Mitigation	Geographic Spatial Du Scale	uration	Status after Mitigation
Cumulative Community Health & Health impacts	Health and Safety impacts due to cumulative air quality and noise impacts from dust, air emissions, movement of vehicles, etc. during the construction period. Odor during the construction period is also a major health concern for the settlement and workers of the surrounding.	See mitigation measures in the ESMP. Mitigation Possible through following ESMP, better STP design with ensured aeration, good green belt, PPEs, awareness	Low (negative)	Site/ Local S	Short-term	Moderate Positive as access roads, STPs improved
Labour and working conditions	Cumulative impacts due to labor/workers on-site affecting movement of local traffic and pedestrian traffic conflicts with the local population, sanitation, and use of public amenities	See mitigation measures in the ESMP. Worker facilities, safety to be ensured, trained & monitored. Construction-related activities shall be planned to minimize large influx or movement of labor in line with Covid-19 restrictions.	Medium (negative)	Site/Local t	Medium term	Positive
Cumulative Noise Impacts	Noise is a localized issue that diminishes in intensity with distance from the source. Up-gradation and construction of in the subproject area can potentially increase construction-related noise impacts on land uses directly adjacent to the construction sites, which is in industrial/mixed-use areas. However, though in an urban area, the expanse of the river on one side reduces noise accumulation from here	Such cumulative noise impacts will be temporary and will not likely occur during sensitive nighttime hours. See mitigation measures in the ESMP	Low (negative)	Site/ Local S	Short-term	Positive (as existing operational noise levels also gets reduced due to planned measures)
Impacts due to noise & vibrations: Movement of vehicles Machinery such as boring machine, Concrete mixtures,	Increased level of noise and vibration. Faunal species like birds (Red vented bulbul, Tailor bird, Laughing dove, Purple sunbird, etc.), reptiles (Garden lizard), mammals (Five striped palm squirrel) will temporarily leave the site.	The impact will be site-specific and temporary. Revisits of faunal species are expected after the completion of the project. Buffers shall be planned and arranged as required.	Low (negative)	Site/ Local S	Short-term	Minor negative during the construction period



Aspects	Potential Impacts	Mitigation Significance Ge before Sca Mitigation		Geographic Spatial Duration Scale		ignificance Geographic Spatial Duration St before Scale M Vitigation		Status after Mitigation
Trucks, Excavators, Dumpers, etc.	Noise above 60 dB has been reported to interfere with songbird mating calls.	The 152ygienient of a green belt with native herbs, shrubs, and trees is recommended. Partial mitigation possible						
Impact due to Generation of dust & debris Dust generation due to heavy vehicular movement & excavation Construction & Demolition debris generated due to excavation	Dust may settle on the leaves of the surrounding flora and may interfere with biological processes. The dust will also disturb the faunal species.	Dust emission measures like water sprinkling, using prefabricated material are suggested. Buffers shall be planned and arranged as required. Partial mitigation possible	Low (negative)	Site/ Local	Medium- term	Moderate negative during the construction & demolition period		
Impact due to Air Pollution Emissions from vehicles and machinery Air pollution due to site preparation, infrastructure development, building construction, and other related activities.	Air Pollutants may interfere with the biological processes of plants. It may also irritate the faunal species.	Dust suppression measures are to be implemented. All the vehicles shall comply with the PUC certification requirements and the vehicles shall be maintained in good condition. Buffers shall be planned and arranged as required.	Low (negative)	Site/ Local	Short-term	Negligible negative during construction period		
Dumping of waste into the waterbodies	Dumping waste into the water bodies may impact the biological process of macrophytes and aquatic fauna. It may alter the composition of macrophyte by interfering with the nutrient cycle	No dumping of any waste generated during the construction in the natural water bodies i.e., lakes, rivers, and streams; as in ESMP. All wastes including during O&M of the existing facility to be managed well.	Low (negative)	Site/ Local	Short-term	Positive		
Impact on water birds due to Construction Activities and Water quality improvement	Noise generated during the construction activities may deter water birds that may use Sabarmati banks near the STP site as feeding habitat. Water quality improvement of discharge due to technology upgradation will help improve the	Acoustic enclosures are recommended for high noise-generating instruments.	Low Negative due to construction activities	Site/ Local	Short-term Long term	Positive		



Aspects	Potential Impacts	Mitigation	Significance before Mitigation	Geographic Spatial Durat Scale	tion	Status after Mitigation
	overall ecology and in turn, will attract the water birds.		Positive due to water quality improvement			
Impacts due to invasive species	The site already has exotic species like Lantana camara, Eucalyptus sp., Eichhornia crassipes, etc.	Removal of invasive species. Using native species for plantation. Removal of any new growth of	Low (negative)	Site/ Local Shor	rt-term	Positive
Landscaping and tree plantation	Transfer of topsoil/ manure for landscaping may carry seeds of exotic species. Transfer of sapling bags for plantation may carry seeds of exotic species which can later spread in the area.	invasive species. ESMP to be followed				
Operation Phase						
Cumulative Air Quality Impacts	The subprojects can collectively result in air emissions, which will be less than baseline emissions due to technology up-gradation.	See mitigation measures in the ESMP	Low (negative)	Site/Local Long	g-term	Minor Positive
Cumulative Noise Impacts	Noise is a localized issue that diminishes in intensity with distance from the source. Very minimum noise will be generated during the operation of the STP	Cumulative noise impacts will be minimum also due to upgraded equipment, machinery, green belt. See mitigation measures in the ESMP	Low (negative)	Site/ Local Long	g-term	Minor Positive
Community Health and Safety impacts	During operation, cumulative air and noise impacts will be confined to the STP site. Additional measures to reduce noise and air impacts by way of mitigation measures will be undertaken to keep the air and noise impacts to a minimum. Better emergency preparedness plan and facilities reduce impacts	See mitigation measures in the ESMP	Low (negative)	Site/ Local Shor	rt-term	Positive



Aspects	Potential Impacts	Mitigation	Significance before Mitigation	Geographic Spatial Scale	Duration	Status after Mitigation
Cumulative Odor Nuisance	During the operation of STP, Odor nuisance is expected. It will be cumulative from all the STPs in the vicinity, near STP premises, and the water body to which treated sewage is discharged.	Improved technology and prescribed discharge standards will minimize odor emissions. Odor control system/ unit has been planned which will address odor issues after upgradation. Collection, treatment and disposal of sludge proposed will reduce the Odor nuisance.	Moderate	Site/ Local	Long Term	Positive (when compared to baseline)
Impacts due to eutrophication, quality of water available for downstream uses	Sabarmati, downstream of Vasna and Fatehwadi Canal will benefit from overall better discharge standards for treated sewage, which is disposed into these especially due to Nutrient Removal	Stringent discharge standards, monitoring mechanism	Major	Regional	Long term	Major Positive

A Summary of all Risks and impacts are compiled with impact significance in the following **Table 41**, for which mitigation measures are described in the subsequent Chapter.

# Table 42: Summary of Risks and Impacts and their Significance before and after Mitigation

Potential Risks and Impacts	Negative Impacts								Positive Impacts
·	Duration	Spatial Extent	Reversible or not	Likelihood	Magnitude	Sensitivity	Significance Before Mitigation of Negative impacts	Negative Impacts after Considerations in the Long-Term Plan/ Mitigation	Significance of Positive Impacts
Preconstruction/ construction	on								
Land use changes	Long term	Project extent	Irreversible	Likely	Low	Low	Negligible negative	Nil	Negligible Positive
Impact on-site and current users	Short Term	Site	Reversible	Likely	High	Low	Moderate Negative	Minor Negative	Negligible Positive



Potential Risks and Impacts					Negative Imp	acts			Positive Impacts
	Duration	Spatial Extent	Reversible or not	Likelihood	Magnitude	Sensitivity	Significance Before Mitigation of Negative impacts	Negative Impacts after Considerations in the Long-Term Plan/ Mitigation	Significance of Positive Impacts
Impacts on Air	Short Term	Regional	Largely Reversible	Likely	Medium	Medium	Moderate negative	Minor negative	Negligible Positive
Impacts on Water Bodies	Short Term	Regional	Largely Reversible	Occasional	Medium	High	Minor negative	Negligible Negative	Moderate Positive
Impacts on Soil	Short Term	Project extent	Largely Reversible	Occasional	Low	Medium	Minor negative	Negligible negative	Minor Positive
Impacts of Noise	Short Term	Project extent	Largely Reversible	Occasional	Medium	Medium	Moderate negative	Minor negative	Minor Positive
Impacts on health of Fauna, Flora (biodiversity)	Short Term	Site	Reversible	Occasional	Low	Medium	Moderate negative	Negligible negative	Moderate Positive
Occupational Health and Safety of workers involved	Short Term	Site	Reversible	Likely	High	High	Major Negative	Moderate Negative	Minor Positive
Community Health and safety	Short Term	Local	Reversible	Likely	High	High	Major Negative	Moderate Negative	Minor Positive
Disturbance to Cultural Heritage, Visual blight/ aesthetics	Short Term	Local	Reversible	Unlikely	Low	High	Negligible negative	Nil	Minor Positive
Resettlement and livelihoods impacts	Temporary	Local	Reversible	Unlikely	Low	High	Minor Negative	Nil	Minor positive
Impact on Socio-Economic, Households, communities	Long and short term	Subproject or location- specific	Irreversible and reversible	likely	Ranging from low to high	Medium	Moderate negative	Moderate to minor	Moderate to high
<b>Operations and Maintenance</b>	:e								
Impacts on Air	Short Term	Regional	reversible	Occasional	Low	High	Moderate negative	Minor Negative	Moderate Positive
Impacts on Water (bypasses in case of eventuality/ discharge	Short Term	Regional	Largely Reversible	Occasional	Medium	High	Major Negative	Moderate Negative	Moderate positive



Potential Risks and					Negative Imp	acts			Positive Impacts
impacts	Duration	Spatial Extent	Reversible or not	Likelihood	Magnitude	Sensitivity	Significance Before Mitigation of Negative impacts	Negative Impacts after Considerations in the Long-Term Plan/ Mitigation	Significance of Positive Impacts
during floods/other disasters)									
Impacts on Soil	Short Term	Project extent	reversible	Occasional	Medium	Medium	Moderate negative	Minor Negative	Major positive
Impacts on health of Fauna, Flora (biodiversity)	Temporary	Site	Reversible	Occasional	Low	Medium	Minor Negative	Negligible negative	Major positive
Occupational Health and Safety of workers involved	Medium Term	Site	Reversible	Occasional	Low	High	Moderate negative	Minor Negative	Major positive
Community Health and safety	Temporary	Local	Reversible	Occasional	Low	High	Moderate negative	Minor Negative	Major positive
Flooding and Dam Safety	Temporary	Regional	Largely Reversible	Occasional	Ranging from Low to High	Medium	Moderate Negative	Minor Negative	Nil
Resettlement and livelihoods impacts	Temporary	Local	Reversible	Occasional	Low	High	Minor Negative	NIL	Minor Positive
Impacts on Cultural Heritage, Visual blight	Temporary	Local	Reversible	Unlikely	Negligible	High	Nil	Nil	Nil
Regional Impacts									
Water Quality and Availability	Long term	Regional							Major Positive



## 5.5 Status of Incorporation of ESIA comments in the Draft FR

During ESIA preparation, there had been regular interactions of FR consultants with ESIA consultants, facilitated by AMC. FR has incorporated the suggestions of ESIA to address climate change and resilience for the sub project, to address aspects as follows:

- i) Increased rainfalls, releases from Vasna Barrage and flooding events: Incorporate the findings and recommendations of the hydrological and flood assessment including a study on Dam Break Analysis & Flooding Stimulation, preparation of inundation maps and emergency action plan for Vasna Barrage has been done and results of that has to be considered in design of the facility construction and operations and emergency response plans appropriately considering community and worker health and safety and pollution impacts specifically during climate events and prepare C-ESIA / C-ESMP
- ii) Increased temperatures: The temperature increase will raise the likelihood of sewer corrosion and odor problems especially considering the extreme heat conditions in the city. Design shall incorporate mechanisms to reduce such impacts. To tackle the issue with odor, odor control units have been proposed as part of rehabilitating the STP.
- iii) Change in flow pattern: Sewage inflow pattern may vary during various times. The Plant shall be designed following a modular approach which shall help in accommodating any changes in sewage quantity load. Equalization storage has been included in the sewage treatment plant for the flow variations to balance out the variability in the flow.
- iv) Discharge Quality: The NGT suggested norms (which is stringent than WB EHS suggested India National Standards for Discharge of treated Effluents, as per EP Rules, 1986) will be followed for treatment of wastewater. The proposed treatment train includes some flexibility to allow the system to adapt to slightly different water quality parameters.
- v) Reduction of carbon emissions: The opportunities identified under this plan include carbon sequestration through green belt development (Carbon is sequestrated by plants by way of photosynthesis and storing carbon as biomass in their boles), and probable use of Solar technology. A comparation of the GHG emissions reduced through the subproject intervention is included in the FR.
- vi) Reuse and recycle of water: With improved technology resulting in better treated sewage, opportunity to reuse treated sewage increases, also in line with the "Policy for Reuse of Treated Wastewater" announced by the Gujarat government in 2018. Furthermore, treated wastewater may be sold as a reliable source of water supply to industries, and design shall incorporate the features to ensure this.
- vii) Reduction in water pollution in the Region: Untreated or suboptimal wastewater discharged in water bodies leads to presence of bacteria, viruses and parasites which can cause a plethora of waterborne diseases. Through treatment, the pollutants in the raw sewage will be significantly removed thus increasing the quality of effluent, discharged into waterbodies.
- viii) Under the DBOT, the contractor shall provide a detailed method statement / schedule for the rehabilitation of the plant so that treatment of sewage does not get impacted by construction works on part of STP. No bypass shall be made to the river, without treatment.
- ix) The proposed work involves replacing/ overhauling various units and equipment. The project shall take into account the disposal of sewage, sludge, breakdown of STP, accidental leakages/ bursts of the sewage, sludge and related impacts on surface water quality and soil quality, noise generation and air emission due to running of DG dets, pumps and equipment, sourcing of material, and damage to artefacts/ archeologically important items during excavation, Tree cutting, if required for any additional units' construction. The construction of new of STP will incorporate technologies and take steps to make the assets created/upgraded and resilient to climate changes such as increased

rainfall and floods, increased temperatures and change in flow pattern. Since the STP and pumping station are existing at site, there will not be any displacement of utilities.

- x) Energy efficient design and components: The designs adopted for 126 MLD STP upgradation shall be energy efficient or energy saving such as Solar lighting and or Energy saving fitting (LED lighting) and equipment, motors are fitted with variable frequency drive (VFD) to reduce the energy consumption and achieve better energy efficiency. The selected equipment, installations, pumps & other machinery shall be energy efficient
- xi) Source of Raw Material: Material used for the construction of subproject components such as DI pipes, HDPE pipes, sand, coarse aggregate, fine aggregate and gravel for construction works shall be outsourced from authorised vendors and authorised quarries to ensure that appropriate procedures are followed for extraction of material and sustainable practices are involved in such process. It is also suggested to source materials from AMC's C&D facility to ensure circular economy and resource efficiency.

# Additional suggestions to be considered in Final FR:

- xii) Optimal Design: Design shall ensure minimal rehabilitation/ reconstruction requirement to ensure the suggested discharge standards. Technology suggested shall be weighed in terms of environmental, social performance as well in addition to economic and other criteria. Upgradation of existing ASP technology with mechanisms to improve nutrient removal, MBBR, shall also be considered as an option in addition to the proposed SBR technology considering the technical difficulties in undertaking large scale modifications in the existing site.
- xiii) Treated sewage is not proposed for drinking purposes. Any reuse of treated water (on or off site), will be only after Chlorination
- xiv) Need arrangements to segregate, collect, store and dispose broken and full (end-of-life, damaged, to be repaired) solar panels from Solar roof top as per applicable regulations, without an assurance on this solar roof top shall, not be encouraged.
- xv) Vibration impacts of proposed trunk main crossing the elevated metro track shall be studied, and mitigation measures shall be included in design
- xvi) Impacts due to flooding and discharge through the Vasna Barrage has been studied, hydrological and flood assessment including a study on Dam Break Analysis & Flooding Stimulation, preparation of inundation maps and emergency action plan for Vasna Barrage has been done and results of that has to be considered in design of the facility construction and operations and emergency response plans appropriately considering community and worker health and safety and pollution impacts specifically during climate events by the DBOT contractor; for main site and all allied infrastructures including proposed and existing rising mains, TSPSs etc.
- xvii) Useful by-products: Sewage sludge in significant quantity is generated from primary and secondary treatment tanks during treatment. This by-product shall be tested for hazardous components if any, and either sent to Gamma Irradiating Facility of AMC for treatment and upcycling into soil enricher for use; or in case of hazardous content, sent to Hazardous waste TSDF arranged by AMC. This shall be included in FR, as against the current mention on using this as a manure.
- xviii) Demolished STP will have contaminated C&D and other wastes (due to sewage), and the contaminated area shall be well restored, after testing for contaminants and pathogens. Cost for this shall be included in FR/Detailed estimate
- xix) Plan to utilise existing infrastructure:
  - a. FR is silent about the future of the existing outfall from Vasna 126 STP into Fatehwadi Canal. It is important to identify and plan the use / demolition of existing outfall structure to canal, if treated water is not proposed to be used.
  - b. FR mentions that existing 35 MLD STP will be abandoned, which is not a good practice. Considering the agglomeration benefits of STPs at Vasna, it is proposed



to reuse Vasna 35 STP with required repairs/ upgradation to divert excess peak flow or convert into a facility for tertiary treatment in case inflow is detected with industrial effluents, high pH etc.

- xx) Consents and Permits: FR is silent about the discharge of treated sewage through Fatehwadi Canal, as suggested by Irrigation Department. Till recently, treated sewage was disposed into the canal, which has now been stopped as the farmers downstream complains about poor quality of treated water. However, there is an existing outfall from this STP to the canal.
  - a. AMC shall renew the consent for existing and rehabilitated STP amending the Consent Condition for discharge of Treated Sewage into Fatehwadi Canal, more so because FR for Vasna 240 MLD STP has recommended such reuse in case of Vasna 240 MLD STP. In case of agreement with GPCB and receipt of Consent to discharge the treated sewage to the canal, this can be an option as it would increase the reuse of water which is scarce in the region. However, the following are important in this regard and DBOT contractors Detailed Design and AMC should work together on the following for this:
    - AMC & Irrigation Department shall discuss & decide on the quantity of water required for such discharge after obtaining permit;
    - AMC with the support of Irrigation Department shall undertake a study on reuse of treated effluent for irrigation in line with the Central Pollution Control Board's Guidelines of Reuse of Treated Water for Irrigation, 2018, through reputed Agricultural University with stakeholder consultations as per the Guidelines and after agreement with stakeholders and permit from GPCB, discharge the treated sewage so as to avoid any negative environmental and health issue on downstream communities.

xxi) Discharge Standards for treated sewage into Sabarmati:

The discharge standards which sub-project shall comply with for discharge into Sabarmati is presented in Table 42.

Parameter	Treated Effluent Discharge Quality (mg/l) -ESIA suggestion for Sabarmati Disposal only <sup>46</sup>	Remarks
Biochemical	Not to exceed 10	NGT suggested limits, an improvement over EP Rules 1986: GENERAL
Oxygen		STANDARDS FOR DISCHARGE OF ENVIRONMENTAL
Demand		POLLUTANTS PART-A : EFFLUENTS: Discharge to Surface Water (acceptable
(BOD)		as per WB EHS – limit is 30 mg/l)
Chemical	Not to exceed 50	NGT suggested limits, an improvement over EP Rules 1986: GENERAL
Oxygen		STANDARDS FOR DISCHARGE OF ENVIRONMENTAL
Demand		POLLUTANTS PART-A : EFFLUENTS: Discharge to Surface Water (acceptable
(COD)		as per WB EHS – limit is 250 mg/l)
Total	Not to exceed 10	NGT suggested limits, an improvement over EP Rules 1986: GENERAL
Suspended		STANDARDS FOR DISCHARGE OF ENVIRONMENTAL
Solids (TSS)		POLLUTANTS PART-A : EFFLUENTS: Discharge to Surface Water (acceptable
		as per WB EHS – limit is 100 mg/l)
рН	Between 6.5 to 8.5	PH 5.5 to 9 as per NGT.
		As against the FR, treated water is not proposed for drinking. Considering
		the need to improve flora/ fauna of Sabarmati, and outdoor bathing pH

## Table 43: Suggested Discharge Standards

<sup>&</sup>lt;sup>46</sup> (If discharged into Fatehwadi – Min. NGT std to be ensured. In addition, Consent from GPCB for such discharge, study to ascertain quality based on irrigation needs and stakeholders views, in line with the CPCB guidelines on Use of Treated Effluent for Irrigation)



Parameter	Treated Effluent Discharge	Remarks
	Quality (mg/l) -ESIA	
	suggestion for Sabarmati	
		chould be CE to QE irrigation C to QE (as downstroom users use for
		irrigation) – within NGT suggested limits, an improvement over EP Rules
		1986: GENERAL STANDARDS FOR DISCHARGE OF ENVIRONMENTAL
		POLLUTANTS PART-A: EFFLUENTS: Discharge to Surface Water (acceptable
		as per WB EHS – limit 5.5 to 9 (as in NGT norms))
Total	Not to exceed 10	NGT suggested (also takes care of Ammonia (for wildlife and Fisheries), for
Nitrogen		Sabarmati discharge) limits, an improvement over EP Rules 1986: GENERAL
(TN)		STANDARDS FOR DISCHARGE OF ENVIRONMENTAL POLLUTANTS PART-A:
		EFFLUENTS: Discharge to Surface Water (acceptable as per WB EHS – limit
	Not to average of 4	(as N) 50mg/l, NH3 – 100mg/l)
Deceborous	Not to exceed 1	STANDARDS FOR DISCHARGE OF ENVIRONMENTAL
(TP)		POLILITANTS PART-A · FEELUENTS: Discharge to Surface Water (accentable
()		as per WB EHS – Dissolved Phosphates – 5mg/l)
Fecal	Not to exceed 100 -	NGT suggested limits, an improvement over MoEFCC Regulations 2017 (limit
Coliform	preferred; Not to exceed 230	1000 MPN/100ml) which was a revision by the Government of India over EP
(Most	– desirable	Rules 1986: GENERAL STANDARDS FOR DISCHARGE OF ENVIRONMENTAL
Probable		POLLUTANTS PART-A : EFFLUENTS: Discharge to Surface Water (acceptable
Number per		as per WB EHS)
100 millilitors)		
Additional Pa	rameters for monitoring	
	Less than 2100 mg/l	Norms prescribed for irrigation under Environment (Protection) Rules 1986
		also, for Class E (CPCB) – Irrigation Use
DO	Min 5mg/l	To be ensured (DO is expected to be taken care of by BOD; but a standard
		for DO ensures aerators run for at least 5mg/l minimum; for reducing odor,
		necessary for preventing the production of anaerobic gases (obnoxious
		gases) from sediments, "'; for Propagation of Wildlife and Fisheries (Class D);
		and Class B: Batning; suggested by NGT as the immediate target for polluted
		Abmedabad) to Vautba)
Residual	0.1-0.2 mg/l	If chlorination is proposed
Chlorine at		
the outlet		
All other	As per EP Rules 1986, General	In case of updating of standards by regulators, the subproject shall comply
parameters	discharge standards,	with the same
	suggested by WB EHS	In case of use in irrigation, Consent Conditions of GPCB and proposed Study
Calling	May 20	on Use of Treated Sewage will inform any additional parameter limits
Soaium	iviax. 26	For Class E: Irrigation (River mostly used for drawing water for Irrigation) 4°
absorption Ratio		
Boron	Max. 2mg/l	For Class E: Irrigation (River mostly used for drawing water for Irrigation)
Boron	Max. 2mg/I	For Class E: Irrigation (River mostly used for drawing water for Irrigation)

<sup>47</sup> <u>https://cpcb.nic.in/NGTMC/T 1 a.pdf</u>: HON'BLE NGT Orders:19.12.2018, 20.09.2018, 08.04.2018 & 06.12.2019, Prepare action plans: 351 identified polluted river stretches - Target : To fit at least for bathing purposes by 31.03.2021

<sup>48</sup> WB EHS on W&S: " ... the receiving water body use (e.g., navigation, recreation, irrigation, or drinking) needs to be considered together with its assimilative capacity to establish a site-specific discharge quality that is consistent with the most sensitive use". Here the most sensitive uses are taken as bathing (Class B), propagation of wild life and fisheries, and irrigation (Class E) as AMC confirms that there is no withdrawal of water from Sabarmati for drinking.



# 6 ENVIRONMENTAL AND SOCIAL MANAGEMENT AND MONITORING PLAN

## 6.1 Scope of ESMP

Primary objective of environmental and social management and monitoring is to record environmental and social impacts and risks as a result of project activities and identify the mitigation measures.

ESMP presents the anticipated impacts and risks, its mitigation measures and responsibilities for the mitigation activities. Environmental management and monitoring activities for the subproject is divided into (a) design, (b) pre-construction, (c) construction and demolition, and (d) operation phases.

ESMP is developed to ensure the subproject is implemented in an environmentally and socially sustainable manner where all stakeholders understand the risks/ impacts of the subproject and take appropriate actions to manage the impacts adequately.

Proposed rehabilitation should be designed, constructed, and operated in full compliance with local building codes, local fire department regulations, local legal/ insurance requirements, and in accordance with an internationally accepted Life and Safety (L&FS) standard. ESMP will be incorporated in the bid documents while bidding out DBOT contracts so that the contractor allocates the required resources and mechanisms to implement these measures.

The DBOT Contractor, through his OHS person who is also a suitably qualified L&FS professional shall prepare and submit a L&FS Master Plan based on proposed design, including preliminary drawings and specifications, and certify that the design meets the requirements of WBG General EHS guidelines, AMC Building Byelaws, and National Building Codes (Part IV Fire and Life Safety) of the Bureau of Indian Standards. This professional should conduct a review of L&FS systems as part of the commissioning tests for new and renovated buildings and certifies that construction of the L&FS systems has been carried out in accordance with the accepted design.

## 6.2 Proposed Environmental and Social Management Plan

The objective of the environmental management plan is to achieve the following objectives:

- Design and Technology implementation: Best available technologies to be implemented at site with minimum environmental and social impacts such as all equipment should adhere to environmental norms of noise, air emissions etc.,
- Good engineering practices are followed during construction and operational phases and to minimize environmental impacts, e.g. barricading of construction areas, signboards for hazardous area and excavated areas etc.
- To avoid, or where avoidance is not possible, minimize, mitigate, or compensate for adverse impacts on workers, affected communities, and the surrounding,
- To ensure that rehabilitation and resettlement of the affected communities if any, due to the project shall be done properly,
- To ensure good occupational health and safety practices during construction and operation phases at the project. This can be implemented by regular training and SOPs at the site.



- The pollutant concentration in the workplace does not exceed the NAAQS at given time. Regular monitoring of workplace and surroundings to be carried out and record needs to be maintained.
- To monitor impacts on the environment and the effectiveness of mitigation measures during operation,
- To ensure that the solid waste generated by workers during project construction and operation, is handled and disposed of in an approved manner; and the construction site is maintained free of wastes, excavation debris, concrete waste, wood, litter, plastics, and metal scraps by periodically collecting, segregating, storing, transporting and disposing of them appropriately. The Construction and Demolition (C&D) waste should be utilised to the extent possible and rest of it to be sent to the C&D facility for conversion to building materials.
- Use of recycled material to be promoted at site to the extent possible.
- To ensure that all non-hazardous wastes (such as excavation debris, concrete waste, wood, plastics, and metal scraps) are segregated at source, recycled, and reused to the extent possible,
- To ensure that Hazardous wastes (such as used fuel/ paint/ chemical containers, waste oil, lubricants, oil rags, contaminated soil, used batteries, etc) are segregated at source and stored in secure and leak-proof containers before transporting and disposing of them through Gujarat State Pollution Control Board (GPCB) authorized waste management agencies,
- Quantum of waste generated across various types and categories of wastes is estimated and reported to statuary authorities as and when required.
- Energy-efficient fittings, pumps, etc; and rooftop solar may be adopted, only in case suitable maintenance and scientific disposal of end-of-life panels are ensured
- Rainwater harvesting and conservation mechanisms are integrated with the design,
- Use of fly ash bricks wherever, possible,
- Modern construction technologies are adopted such as pre-cast construction to reduce time and cost.
- Bypass arrangement during O&M period for TSPS maintenance and rehabilitation: The TSPS may require major rehauling or rehabilitation during 15 years O&M period. In such period, bypass arrangement should be made in a such a way that it doesn't impact the downstream water bodies. Such maintenance needs to be carried out in lean period and with proper alternative route for bypass water. A prior NOC should also be obtained from Pollution Control Board (PCB)

Environment, Health and Safety required for the subproject are recommended to be followed during the construction and operational phases of the project. ESMP for construction phase and operation phase of the project is given in **Table 43** below. DBOT contractor will revise ESMP based on CESIA studies post design finalization and get it approved from AMC. DBOT contractor will implement CESMP during project implementation.

The Plan specifies measures for addressing the significant negative risks and impacts and for enhancing the beneficial impacts. In addition, proposed institutional capacity and capacity building requirements, to check and ensure effectiveness of the plan throughout the lifecycle of the project have also been discussed.

Activity	Ref:	Potential Negative	Mitigation Measures	Responsibl	Source of
PLANNING, DESIGN, &	PRF-CONSTRU	CTION PHASE:		e Agency	Fullus
Activity PLANNING, DESIGN, & Design upgradation of STP	Ref: ESSs PRE-CONSTRU ESS 1, 3, 6 & 10	Potential Negative Impact/ Concern CTION PHASE: Pollution Prevention & Management Adverse social impacts on the neighbouring settlements or common access properties near STP and sludge disposal sites, Risk of exclusion of HHs from being engaged or covered by sewerage services in the design phase	<ul> <li>Mitigation Measures</li> <li>Design shall confirm to all existing national/state regulations, NGT orders and GPCB consent conditions as applicable</li> <li>The treated sewage quality for discharge into Sabarmati shall comply with the standards suggested in this ESIA (NGT prescribed standards, and TSS 10mg/l) and/ or most stringent standards prescribed by the MOEFCC/CPCB, GPCB, NGT at any point of time.</li> <li>AMC to Discuss and agree with Irrigation Department if 365 MLD or 126 MLD treated sewage is to be discharged for if required for irrigation. If disposal is to Fatehwadi Canal,AMC, GPCB to Agree/ Get Consent for disposal of treated sewage to Fatehwadi Canal, and Quantity to be discharged; based on a detailed study through Agricultural University based on the CPCB guidance on reuse of treated water for irrigation</li> <li>Incorporate the safety measures and emergency preparedness measures to protect from flooding; based on the Hydrologic and Flood Risk Assessment Study related to Vasna Barrage, which AMC conducted.</li> <li>Get all permits from GPCB based on Water act/ and all others for construction and operations</li> <li>Incorporate the findings of the STP Audit (Annexure VII) to improve existing STP till it is operated so that it complies with existing consent conditions</li> </ul>	Responsibl e Agency DBOT Contractor & to be supervised by AMC and PMC	Source of Funds DBOT Contractors Cost for Design
			during any STP breakdown/ shutoff, the untreated sewage does not flow into the water body or nearby premises as required to		
			comply with with existing regulations, orders.		
			Pumping station to ensure minimum noise generation from		
			equipment like pumps, motors, blowers and DG set by locating within a noise containing structure/arrangement or in an		

# Table 44 ESMP for Upgradation of Vasna 126 MLD STP and Allied facilities like repairs in TSPS, pipeline from TSPS to 375 MLD STP, Outfall



Activity	Ref:	Potential Negative	Mitigation Measures	Responsibl	Source of
	ESSs	Impact/ Concern		e Agency	Funds
			enclosed space (such as concrete/ brick structure).		
			<ul> <li>TSPS Pipeline shall be planned to avoid/ minimize any damage to</li> </ul>		
			natural features of the area		
			<ul> <li>Major rehauling of TSPS and maintenance to be carried out in</li> </ul>		
			lean period with alternative arrangement and prior permission		
			from PCB.		
			<ul> <li>Regular cleaning/ removal of sludge and solid waste to minimize</li> </ul>		
			odor nuisance and its disposal. Sludge will be handled by		
			Contractor and AMC as per regulations. During monitoring, if		
			hazardous content is detected in the sludge from any part of STP		
			Plant/other facilities associated with that, sludge will be sent to		
			ISDF. Contractor shall submit and discuss with AIVIC the		
			Monitoring results & manage sludge as per Sludge & Waste		
			biogram generation facility and gas and electricity will be		
			plogas generation facility and gas and electricity will be		
			surplus slurry / sludge from all parts of STP and Biogas facility will		
			be transferred by the Contractor to the proposed Sludge		
			management facility of AMC where it will be treated and		
			disposed by AMC following the consent conditions		
			national/State Regulations and applicable orders. The risks and		
			impacts of the proposed sludge management facility on Pollution		
			and health and safety will be assessed by AMC once the		
			technology and location are , considering it as an associated		
			facility if applicable.		
			<ul> <li>Plan shall be prepared by the Contractor to collect sludge at</li> </ul>		
			constant intervals, stored properly without contaminating any		
			environmental components, and disposal in AMC facility.		
			<ul> <li>Provide proper drainage arrangements and landscaping to avoid</li> </ul>		
			water stagnation on the site during and post construction.		
			<ul> <li>Equipment's to be selected shall meet the noise standards as</li> </ul>		
			prescribed by CPCB.		
			<ul> <li>Use of less noise generating equipment such as submersible</li> </ul>		
			pumps, enclosed generators, etc.		



Activity	Ref:	Potential Negative	Mitigation Measures	Responsibl	Source of
Activity	Ref: ESSs	Potential Negative Impact/ Concern	<ul> <li>Mitigation Measures</li> <li>Pumping station to ensure minimum noise generation from equipment like pumps, motors, blowers and DG set by locating within a noise containing structure or in an enclosed space (such as concrete/ brick structure).</li> <li>Proposed treatment technology shall take consideration of high phenolic compounds in the sewage water and additional treatment system to be employed if required.</li> <li>Collection, Treatment, disposal and management of Sewage sludge shall confirm to all applicable national/state regulations, NGT orders and GPCB consent conditions.</li> <li>Site layout planning before design shall clearly demarcate areas for ancillary uses such as storage and treatment of sludge from ovicting reactors and cludge bads and shore are solved.</li> </ul>	Responsibl e Agency	Source of Funds
			<ul> <li>existing reactors and sludge beds and c&amp;d waste, and others as required and construction shall be initiated in remaining lands.</li> <li>Before starting the design plan for remediation and strengthening and reuse of areas under existing STP after demolition. Required studies and measures must be finalised at design stage and pre construction stages</li> <li>Labour colony location to be identified and site demarcated.</li> <li>Site clearance.to be undertaken wherever required.</li> <li>Ready mix concrete plant layout to be prepared and clearance taken</li> <li>Special attention to include vulnerable groups in project benefits and continuous stakeholder engagement to ensure such</li> </ul>		
Design to improve resource efficiency and pollution prevention	ESS3	Inefficient use of resources, high energy consumption due to inefficient functioning of existing systems.	<ul> <li>The designs adopted for 375 MLD STP upgradation &amp; TSPS for energy efficiency and savings such as Solar lighting, Energy saving fitting (LED lighting) and equipment, motors are fitted with variable frequency drive (VFD) to reduce the energy consumption and achieve better energy efficiency. The selected pumps, equipment, appurtenances shall be energy efficient</li> <li>The design/upgradation of STP shall also consider tertiary treatment of the sewage if so required by the Project so that there is reuse of treated sewage and thus reducing the usage of</li> </ul>	DBOT Contractor & to be supervised by AMC and PMC	DBOT Contractors Cost for Design



Activity	Ref:	Potential Negative	Mitigation Measures	Responsibl	Source of
	ESSs	Impact/ Concern		e Agency	Funds
			fresh water source (also as per Gujarat government policy on reuse of treated sewage)		
			<ul> <li>The design pipeline to avoid unnecessary excavation by selecting shortest route.</li> </ul>		
			<ul> <li>Solar lighting/ use of solar energy as much as feasible (provided disposal at TSDF is arranged for end-of-life panels, management of Batteries is ensued as per regulations, and proper storage and use of PPEs while working with damaged panels are ensured)</li> </ul>		
			<ul> <li>Energy saving fitting (LED lighting) and equipment, motors are fitted with variable frequency drive (VFD)</li> </ul>		
Submission of updated ESMP, Monitoring Plan, and reporting schedule	ESS 1	Unsatisfactory monitoring of environmental and social aspects	<ul> <li>DBOT contractor shall revise ESMP (to prepare C-ESMP) based on CESIA studies post design finalization and get it approved from AMC. DBOT contractor shall implement CESMP and monitoring Plans based on detailed design, before initiating any work or preparatory activity on any of the project related sites</li> <li>Appoint environmental, health and safety (EHS) Supervisor and social specialist by Contractor to ensure ESMP implementation &amp; providing training on management and monitoring</li> <li>Prepare and implement waste and sludge management plan in coordination with AMC, L&amp;FS Plan and other SOPs</li> <li>Timely submission of monitoring reports including documentation of ESMP implementation (such as photographs, standardized formats for reporting monitoring results for each of the monitoring parameters, GR status, etc.)</li> </ul>	DBOT Contractor & to be supervised by AMC and PMC	DBOT Contractors Cost for Design
Preparatory work for fulfilling mandatory/statutory compliances	All relevant ESS	Non-compliance with essential environmental, safety, labor requirements, special laws and associated legal repercussion and cost and time overruns	<ul> <li>Permission from Metro Authorities for passing the pipeline below the car shed.</li> <li>Permission from irrigation department to pass the pipeline over the canal and for construction of new outfalls in case treated water is to be reused for irrigation</li> <li>Updating of CESMP and CESIA after finalization of design and risk prevention/mitigation plan during implementation.</li> <li>Preparation of Plans as specified in the ESMP and in line with ESMF as required by WB ESF and national regulations</li> <li>Allocation of roles and responsibilities at AMC, Contractors and</li> </ul>	DBOT Contractor & to be supervised by AMC and PMC	DBOT Contractors Cost for Design



Activity	Ref:	Potential Negative	Mitigation Measures	Responsibl	Source of
	ESSs	Impact/ Concern		e Agency	Funds
			<ul> <li>sub contractors' levels</li> <li>Legal register for subproject will be formulated and implemented</li> <li>Preparation of plans, reporting, monitoring details, licences, registers as required under Indians Laws</li> <li>Obtaining No Objection Certificates required from mandatory and statutory bodies for construction and implementation of project</li> </ul>		
			<ul> <li>Review of contractor's licenses for various purposes under various laws for mandatory and statutory compliances</li> <li>Preparation of Standard Operating Procedure (SOP) for various activities which includes training, PPEs use, templates for permissions, recording and reporting, by contractors/PIU</li> <li>IEC materials shall be planned, printed and displayed during construction, creating awareness, display of posters etc.</li> <li>Training and capacity building of the designated persons for implementing of various plans</li> </ul>		
Preparatory work at existing plant	ESS 1, 2, 3 & 4	OHS risk	<ul> <li>Rising main is corroded. Necessary repairs shall be conducted.</li> <li>Railings are corroded. Shall be replaced or repaired. Necessary signages shall be installed during preparatory work.</li> <li>No storage area for screening waste. Designated storage area shall be provided, avoiding multiple handling of wastes. Records of waste volume shall be maintained.</li> <li>New Parshall flume flow indicator shall be installed.</li> <li>Designated area for grit storage shall be provided and records shall be maintained.</li> <li>Oil leakage in blowers shall be addressed. Air supply line to the diffuser is damaged and shall be replaced.</li> <li>Gasholder tank shall be repaired.</li> <li>Laboratory instruments shall be replaced.</li> <li>MLSS and DO sensors at Aeration tank shall be replaced</li> <li>Alarm system shall be installed</li> <li>Disaster management plan shall be revised and implemented.</li> <li>AMC to ensure complete removal of sludge, Wastewater and other matarials from UASP reactors and other units of existing</li> </ul>	DBOT Contractor & to be supervised by AMC and PMC	DBOT Contractors Cost for Design



Activity	Ref:	Potential Negative	Mitigation Measures	Responsibl	Source of
	ESSs	Impact/ Concern		e Agency	Funds
Activity	Ref: ESSs	Potential Negative Impact/ Concern	<ul> <li>Mitigation Measures</li> <li>STP before its demolition. This should be clearly prepared and approved in a sludge and waste management plan during preconstruction phase, before initiation of any site activity.</li> <li>Sludge management facility has been proposed by AMC to be ready to manage sludge by commissioning of first/initial stream of this proposed STP. Contractor shall prepare CESIA and CESMP which includes sludge management plan till its disposal at the AMC's proposed sludge management facility. Contractor will be responsible for storage, testing and transfer sludge for disposal appropriately based on the monitoring results &amp; existing regulations, as agreed in writing with AMC.</li> <li>The contractor shall prepare Waste &amp; sludge Management plan in consultation with AMC and GPCB and in line with consent conditions, and all applicable national rules &amp; regulations, and NGT orders and shall be implemented</li> <li>Sludge Management facility shall be considered as an associated facility if applicable and ESIA/ESMP shall be prepared by AMC &amp; followed in line with ESF</li> <li>OHS, CHS for contractors' &amp; AMC personnel for sludge management shall be included in C-ESIA, C-ESMP</li> <li>Contractor shall handle and manage the sludge as per these documents after approval by AMC as mentioned in Chapter 5.3.1.3 section on Impact of Material Handling and Waste Generation.</li> <li>Contractor should undertake the activity of maintenance of Sludge storage, collection, transport mechanisms – including whatever is in her/his mandate during construction and operation. This shall be agreed in Sludge/Waste <anagement amc<="" li="" plan="" with=""> <li>For USAB reactors/ sludge drying beds, and maintenance: Mechanical cleaning is recommended strongly, and any manual</li> </anagement></li></ul>	Responsibl e Agency	Source of Funds
			cleaning will be avoided, to address workers' health and safety.		
			<ul> <li>Ensure that the land thus prepared, is remediated and strengthened and made safe for further construction.</li> </ul>		



Activity	Ref:	Potential Negative	Mitigation Measures	Responsibl	Source of
Sourcing of raw material	ESS 3	Degradation of natural resources	<ul> <li>For sourcing of material, contractor shall obtain construction materials only from the existing government approved quarries with prior approval of PIU</li> <li>PIU to review, and ensure that proposed quarry sources have all necessary clearances/ permissions in place prior to approval</li> <li>Use recycled material from C&amp;D facility</li> </ul>	DBOT Contractor & to be supervised by AMC and PMC	DBOT Contractors Cost for Design
Accidental leakage, breakdown or failure of unit	ESS 1, 3 & 4	Untreated flow to canal/ river	<ul> <li>Alarm system should be designed in the STP &amp; TSPS, which may indicate any sudden emergency or accident or breakdown or power failure</li> <li>Provision of emergency diversion shall be made</li> </ul>	DBOT Contractor & to be supervised by AMC and PMC	DBOT Contractors Cost for Design
Chance Find Procedure	ESS 8	Loss/ damage of valuable, historic artifacts	<ul> <li>Chance finds are not anticipated on STP or TSPS site, as the proposed work is within the boundary of existing facility; however, in case of Chance Finds (including chance find auna, flora), Chance Find procedures are to be followed. Though excavation for TSPS pipeline may lead to chance find. Prepare and implement Chance Find Procedure, create awareness among the workers, supervisors and engineers about the chance finds during excavation work. Stop work immediately to allow further investigation if any finds are suspected. Follow chance find procedures.</li> <li>Inform State Archaeological Department / Department of Culture or who ever is the custodian of the chance find if a find is suspected and taking any action, they require to ensure its removal or protection in situ.</li> <li>Contractor protects the site and reports to the Engineer/ PIU, and refers to local museums and the SPMU for advice</li> <li>Hand over artefacts to museum/cultural management agency</li> <li>Review to determine if the excavation can be continued</li> <li>Director of Culture and Information office in the locality will be responsible for managing cultural artefacts; and similarly the custodian authority of respective chance finds shall direct on required protection actions</li> </ul>	DBOT Contractor & to be supervised by AMC and PMC	DBOT Contractors Cost for Design



Activity	Ref:	Potential Negative	Mitigation Measures	Responsibl	Source of
Snake and scorpion bite	ESS 2	Accidental snake/ scorpion bite injury during site works/preparatory studies	<ul> <li>Training/ awareness programs at all the stages of the project shall be conducted</li> <li>Awareness signages at all critical points and availability of first aid on site</li> <li>Contact details of fire brigade, nearest hospital and forest department shall be provided on site</li> </ul>	DBOT Contractor & to be supervised by AMC and PMC	DBOT Contractors Cost for Design
Stakeholder engagement	ESS10	Exclusion of stakeholders in consultative process or inadequate consultations	Undertake consultations in accordance with SEP	DBOT Contractor & to be supervised by AMC and PMC	DBOT Contractors ESMP Cost
Construction impacts					
Tree cutting	ESS 1 & 6	Impact on flora and fauna	<ul> <li>After finalization of design by DBOT, number of trees required to be cut will be finalized and must be mentioned in the CESMP</li> <li>Minimize removal of trees by adapting to site conditions and with appropriate layout design/ alignment,</li> <li>Obtain prior permission for tree cutting from AMC<sup>49</sup> or other authorities / owners as applicable.</li> <li>Plant and maintain for 3 years, 10 trees (indigenous varieties) for each tree that is removed.</li> <li>Alignment of TSPS pipeline shall be planned to avoid/ minimize the tree cutting</li> </ul>	DBOT Contractor & to be supervised by AMC and PMC	DBOT Contractors Cost for Design
Water logging	ESS 1, 3 & 4	Temporary waterlogging due to poor housekeeping, uneven dumping of construction waste	<ul> <li>Waste materials to be stored on covered, raised platforms / storage areas at higher elevation with proper cut off drains.</li> <li>Avoid storing near storm water run-off channels or any low-lying areas</li> <li>It shall be made sure that excavated areas for laying of pipeline shall not result in water logging</li> </ul>	DBOT/ Construction Contractor	Contractor's cost for site preparation and waste/ construction material storage

<sup>&</sup>lt;sup>49</sup> https://forests.gujarat.gov.in/writereaddata/images/pdf/ease-of-doing-business.pdf


Activity	Ref:	Potential Negative	Mitigation Measures	Responsibl	Source of
	ESSs	Impact/ Concern		e Agency	Funds
Excavated debris, soil disposal and management	ESS 1, 3 & 4	Stockpile areas, storage areas and disposal areas	<ul> <li>The excavated soil shall be removed from construction area at the earliest for beneficial reuse such as land raising/ filling of excavated areas.</li> <li>Soil shall be covered with tarpaulin sheets during transportation and storage.</li> <li>Soil transportation shall not be done during peak hours and should avoid narrow and heavy traffic routes and important religious or tourist sites etc.</li> <li>Earthen bund, to be provided around the storage areas for excavated soil and other construction material.</li> <li>Completed earthworks to be sealed and/ or re-vegetated at the earliest with the help of landscape expert</li> </ul>	DBOT/ Construction Contractor	Contractor's cost for site preparation and waste/ construction material storage
Topsoil conservation	ESS 3	Erosion of topsoil/ stockpiles	<ul> <li>Stockpiles shall be stored (for reuse) with tarpaulins to avoid erosion.</li> <li>Stockpile areas to be bordered by berms.</li> <li>Stockpile to be done in high/elevated areas to avoid flow in storm water run-off channels and erosion.</li> </ul>	DBOT/ Construction Contractor	Contractor's cost for site preparation and waste/constr uction material storage
C&D waste management	ESS 1 & 3	Impact on solid and water quality	<ul> <li>The generated C&amp;D wastes shall be stored at a designated area inside the plant premises. In case any other area is selected for such storage, mitigation measures shall be incorporated in site specific C-ESMP</li> <li>The waste shall be covered with tarpaulin to avoid emission from the dumping and runoff from the dumping to prevent water contamination</li> <li>It shall be tried to reuse C&amp;D waste to the maximum extent within the site for other construction works which may need additional approvals based on type of materials/ purposes</li> <li>The remaining C&amp;D waste shall be disposed as per the C&amp;D waste rules 2016 and after consultation and approval of AMC; preferably in AMC C&amp;D facility (1000 TPD) if it can handle the quantity (39000 Tons during the entire construction period</li> </ul>	DBOT/ Construction Contractor	Contractor's ESMP cost



Activity	Ref:	Potential Negative	Mitigation Measures	Responsibl	Source of
	ESSs	Impact/ Concern		e Agency	Funds
			<ul> <li>estimated from three STP upgradations). Prepare C&amp;D waste management plan with clear scheduling on storage, transfer, recycling, disposal (AMC shall consider and review cumulative quantities of all three STP upgradations which would occur at near around same time)</li> <li>Check for contamination and adopt appropriate cleaning, storage and transport (C&amp;D waste of sewage tanks)</li> </ul>		
	ESS 1 & 3	Generation of debris, muck during construction	<ul> <li>Topsoil shall be stored properly and used for agricultural purpose or development of city parks</li> <li>Soil and debris may be managed for planned land filling and landscaping</li> <li>Debris may be suitably stored for backfilling the excavated areas and disposal of surplus excavated material at a lead up to 50m suitable site as per direction of Engineer for following depths, below natural ground/ Road top level. Remaining quantity after the filling will be sent to the C&amp;D waste treatment plant.</li> </ul>	DBOT/ Construction Contractor	Contractor's ESMP cost
Air quality	ESS1, 3 & 4	Dust generation and emission	<ul> <li>Prepare and implement dust and noise management plan for proposed demolitions</li> <li>Regular Water sprinkling to be done in the construction and excavation areas in dry seasons. Water sprinkling to be undertaken for kuccha access road to prevent dust and air emissions impact on squatter settlement.</li> <li>Wetting and covering of excavated material transported by trucks.</li> <li>Provide dust containment enclosures to the site and alignment of pipeline where excavation is expected, till appropriate height</li> <li>All the transportation vehicles shall be PUC checked and maintained in good condition</li> <li>Works at Gyaspur as Metro Depot is identified as a potential contributor to the cumulative impact on air quality. However, works are expected to be completed by the start of STP rehabilitation. Else, it is important to discuss with Metro Contractors to plan and stagger large noise/ vibration emitting activities.</li> </ul>	DBOT/ Construction Contractor	Contractor's cost for works, material transport



Activity	Ref:	Potential Negative	Mitigation Measures	Responsibl	Source of
	ESSs	Impact/ Concern		e Agency	Funds
Impact on biodiversity due to Generation of dust & debris	ESS 6	Dust generation due to heavy vehicular movement & excavation Construction & Demolition debris generated due to excavation Dust may settle on the leaves of the surrounding flora and may interfere with biological processes. The dust will also disturb the faunal species.	<ul> <li>Dust suppression through sprinkling of water is recommended, though no water should be sourced from the lakes/ river in the area.</li> <li>It is suggested to provide proper covers and enclosures to prevent debris and excavated material to be air borne or flow into the water bodies while working near them. Also, a suitable management plan must be provided to ensure that no debris are left about on the site so that risk of airborne dust and surface run-off into the nearby waterbodies is reduced</li> <li>No debris shall be dumped in waterbodies or any other area than designated for the purpose by AMC</li> </ul>	DBOT/ Construction Contractor	Contractor's cost for works, material transport
Impact on biodiversity due to change in air quality	ESS 6	Emissions from vehicles and machinery Air pollution due to site preparation, infrastructure development, and other related activities. Air Pollutants may interfere with biological processes of plants. It may also irritate the faunal species.	<ul> <li>All the vehicles used during the construction stage to have valid PUC certificate</li> <li>Vehicles running on cleaner fuel such as CNG are recommended</li> <li>Traffic management shall be carried out to avoid any congestion which may cause increase in pollution level</li> </ul>	Contractor	Contractor's cost for site preparation, construction works, material transport
Noise and vibration	ESS 1, 3 & 4	Impact on local people	<ul> <li>Prepare clear plan and schedule for Demolition of STPs, especially parts which will create more noise/ vibrations</li> <li>Construction activities to be done in daytime after giving prior intimation to locals, mainly the squatter settlement. Generally, majority of the inhabitants go out of the area for work in the industries</li> <li>Night work shall be avoided, wherever possible, which may create noise and vibration. Work may also be done on the riverside to avoid disturbance to the squatter settlement</li> <li>Use of low noise and low vibrating equipment and provision of enclosures for such equipment on site to be encouraged</li> </ul>	Contractor	PPE under Contractor's ESMP cost Less sound emitting equipment under Equipment cost



Activity	Ref:	Potential Negative	Mitigation Measures	Responsibl	Source of
	2335		<ul> <li>Instruments need to meet standards of CPCB</li> <li>Provision of PPEs to construction workers; like earmuffs and plug.</li> </ul>	e Agency	Funas
Community and Labor Health and Safety (GBV/SEA/SH)	ESS 2 & 4	Impact on local people	<ul> <li>Increase risk and insecurity of women and girls</li> <li>Increased risk of GBV/SEA/SH due to labor camp, influx of labor and inadequate safety and security mitigation measures.</li> <li>Night work for women labor should be avoided.</li> <li>Proper lighting should be arranged in areas where women labor are working and as far as possible women should be part of work groups as a safety measure.</li> <li>Plan and implement,</li> <li>Complaints and grievances made by women on safety and security issues and concerns should be addressed promptly.</li> <li>Implement POSH</li> <li>Implement GBV COC on contractors, workers, AMC</li> </ul>	AMC/Contrac tor	PIU Implementati on cost Contractors Cost
Impact on biodiversity due to noise and vibrations	ESS 6	Movement of vehicles, machinery such as boring machine, concrete mixtures, trucks, excavators, dumpers etc. Laying of pipeline may temporarily affect the avifauna in the vicinity. Increased level of noise and vibration. Faunal species like birds (Black Naped Ibis, Purple Rumped sunbird, Black Drongo, Cattle egret, Red vented bulbul, Indian Robin etc.) and mammals (Grey mongoose, Five- striped palm squirrel etc.) will leave site temporarily.	<ul> <li>Workers to be pre-sensitized to ensure reduction of noise and vibration to the least possible levels</li> <li>Machinery employed should have been pre-serviced to ensure no more than usual noise is generated during their operation</li> <li>All equipment must be provided with acoustic enclosures and silencers</li> <li>Provision of suitable noise barriers should be made</li> <li>Prevention of interference with songbird mating by ensuring no noise during dawn and dusk (when songbirds usually make their mating calls) and attempting to keep the noise level low</li> </ul>	Contractor	Contractors' cost



Activity	Ref:	Potential Negative	Mitigation Measures	Responsibl	Source of
		Noise above 60 dB has been reported to interfere with songbird mating call.		e Agency	runus
Water quality	ESS1, 2, 3 & 4	Flooding and stagnation of water	<ul> <li>Excavation and deep excavation are to be avoided to maximum extent during monsoon to prevent water stagnation and flooding.</li> <li>No bypass of untreated sewage shall be permitted as per reglations/NGT orders. Arrangements such as diversion of untreated sewage to other STP for treatment, storage tanks, or any other suitable measure are important to prevent any sewage or untreated sewage from polluting surface or ground water.</li> <li>Implement plan for retaining existing treatment till new stream is ready, &amp; diversion of the untreated sewage during construction period to prevent any issue and concern in the vicinity or downstream villages.</li> <li>Water stagnation can increase incidence of disease related to polluted water and spread of vector borne disease. Therefore, during construction period training of workers and, supervisors for management of such stagnation, if and regular spraying for prevention of vector borne diseases, to be conducted through AMC health dept to prevent health risk for workers and squatter's settlement.</li> </ul>	Contractor	Contractors' works cost
Impact on Biodiversity due to change in water quality	ESS 6	Dumping of waste into the waterbodies may impact the biological process of macrophytes and aquatic fauna It may alter the composition of macrophyte by interfering in nutrient cycle	<ul> <li>While working in the river area measures should be taken that no construction waste, oil etc. shall affect the rivers water</li> <li>Skimming of floating waste is recommended</li> <li>Use of oil &amp; grease absorbent pads is recommended</li> </ul>	Contractor	Contractors' works cost
Soil and water quality	ESS 1, 2, 3	Impact on soil quality and	Care to be taken to store fuel and oil (as and if required at site)	Contractor	Contractors'



Activity	Ref:	Potential Negative	Mitigation Measures	Responsibl	Source of
	ESSs	Impact/ Concern		e Agency	Funds
	& 6	fertility. Water quality degradation	<ul> <li>at a place away from any drainage channel/ nalla preferably to be stored in drums mounted on a concrete paved/ impervious platform with slightly raised edges (or suitable arrangements) so that drums do not get overturned</li> <li>There shall be proper channels for any spill to flow to a secure containment</li> <li>Prepare and maintain inventory of the hazardous material and quantity. Also mention safety risks for fire and other incidents. PPE required for handling such wastes shall be mentioned in inventory</li> <li>There shall be regular checks to determine any spillage of oil or fuel.</li> <li>Workers will be trained to handle the same and train in safety, and addressing incidents and accidents</li> <li>Mutually reactive/ hazardous material shall be kept away from each other. Material Data Sheet shall be checked and precautions to be followed</li> <li>Regular cleaning/ removal of sludge and solid waste to minimize odor nuisance and its disposal shall be ensured by AMC, in their facilities as per existing regulations.</li> </ul>		cost
Aquatic life	ESS 6,	Impact on aquatic habitat	<ul> <li>Prevent discharge of untreated sewage, leachate and chemicals into surface water bodies</li> <li>Preservation of aquatic habitats by restricting movement of people/ equipment into them and preventing entry of sediments into water bodies</li> <li>Keep noise level (e.g., from equipment) to a minimum level, as certain fauna are very sensitive to loud noise</li> <li>Keep only appropriate light levels in areas near nesting sites/ flight pathways</li> <li>It is recommended that dawn and dusk time when avifaunal movement is high shall be excluded from construction schedule</li> </ul>	Contractor	Contractors' material storage, equipment and works cost
Impact on nearby communities	ESS 1, 2 <mark>,</mark> 3 & 4	Land acquisition and involuntary resettlement is not envisaged.	<ul> <li>Air quality improvement measures to be implemented</li> <li>Phase wise development to avoid complete shut-down of the plant and diverting untreated sewage into the river</li> </ul>	Contractor & AMC	Project Cost



Activity	Ref:	Potential Negative	Mitigation Measures	Responsibl	Source of
	ESSs	Impact/ Concern		e Agency	Funds
		Community health and safety issues due to pollution caused by air pollution due to vehicle movement on kuccha road in construction phase Poor water quality in downstream villages due to poorly treated sewage Land acquisition and involuntary resettlement is not envisaged. Community health and safety issues due to pollution Poor water quality in downstream villages due to poorly treated sewage. Laying of pipeline may temporarily affect the communities in the vicinity Increased risk of insecurity as well as SEA/SH for women and girls due to labor influx	<ul> <li>Diversion of flow to other STPs/Unit during construction phase to prevent flow of untreated water into the river/ canal</li> <li>Include SEA/ SH grievance mechanism in project GRM</li> <li>Include SEA/ SH related clauses in contractor's CoC.</li> <li>Provision of community toilets and drinking water for informal/ squatter settlements to be provided through existing AMC schemes for such settlement and various other relevant schemes depts of the District Administration with nominal payment to prevent waste of water or use for commercial purposes.</li> </ul>		
Occupational health and safety	ESS 1, 2, 3 & 4	Occupational Health & Safety hazards to labors and public Labour camp management, Adopting EHS best practices	<ul> <li>Comply with the Occupational health and Safety aspects of various labour related acts of India, WB EHS guidelines and OSHA guidance.</li> <li>Ensure work permit mechanism, for specialized work; especially demolition of existing STP, gas evacuations, enclosed spaces, depths, foundations, tanks, works on rising main, TSPS etc. which may be risky</li> <li>Prepare and implement EHS plan approved by AMC/PIU which</li> </ul>	Contractor	Contractors Design, works cost PPEs under each work costs (additional



Activity	Ref:	Potential Negative	Mitigation Measures	Responsibl	Source of
	ESSs	Impact/ Concern		e Agency	Funds
			include measures as: (i) excluding the public/ unauthorized		emergency
			staff/workers from worksites; (ii) ensure all workers are provided		PPEs under
			with and required to use personal protective equipment		ESMP costs)
			(reflectorized vests, footwear, gloves, goggles and masks) at		
			working times; (iii) providing (H&S) training for construction site		
			personnel; (iv) documenting procedures to be followed for all site		
			activities; and (v) maintaining accident reports and records		
			<ul> <li>Workers working at height, confined spaces, gaseous spaces and</li> </ul>		
			closed environments need to be given appropriate training and		
			proper PPE before undertaking work. SOP shall be prepared for		
			ensuring work is carried out as per SOPs		
			<ul> <li>Adequate care and training for precautions to be taken to avoid</li> </ul>		
			and treatments in case of scorpion and snake bites during		
			construction activities. Ensure that anti venom is available for		
			treatment at site or in the nearest hospital/ health care center		
			<ul> <li>Power tools not in proper condition should be replaced or prepared</li> </ul>		
			<ul> <li>Workers should use face shield or Goggles while welding and</li> </ul>		
			cutting work		
			<ul> <li>Tagging shall be displayed in the Steel Scaffolding and shall be</li> </ul>		
			checked by safety engineer weekly, and the working platform		
			should be at least 400 mm width for working at heights		
			<ul> <li>Ensure Electrical DB are kept inside closed shed to prevent</li> </ul>		
			damage from water/dust, keep $CO_2$ fire extinguisher outside the		
			shed for electrical fire fighting		
			<ul> <li>Lifeline shall be provided at the edges of slab and worker should wear safety harness at height work</li> </ul>		
			• Proper standard ladder should be provided for access to areas		
			at a suitable/appropriate length		
			<ul> <li>Crane shall only be used to lift the materials not human being</li> </ul>		
			which is very unsafe practice		
			<ul> <li>Safety Posters must be posted at site to motivate the worker for</li> </ul>		
			safe work		
			Safety Engineer should be available at site to give daily pep talks		



Activity	Ref:	Potential Negative	Mitigation Measures	Responsibl	Source of
	ESSs	Impact/ Concern		e Agency	Funds
			and submit the report daily		
			<ul> <li>Ensure that labor colony should be periodically sanitized and kept</li> </ul>		
			clean and hygienic.		
			<ul> <li>Workers near high noise equipment to be provided with PPEs like ear plugs and earmuffs.</li> </ul>		
			<ul> <li>Handrails on both sides of walkways close to deep tanks and STPs need to be ensured:</li> </ul>		
			<ul> <li>Ensure that the contact details of the police or security company.</li> </ul>		
			fire brigade, nearest hospital, forest department and ambulance		
			services are displayed on site (in languages which are		
			comprehensible for the workers) and workers are trained to look		
			at them and reach out for help when required.		
			<ul> <li>Smaller switches at STP units to be installed with protection from</li> </ul>		
			rainwater to minimize electrical short circuit.		
			• Proper housekeeping should be done at site and all materials		
			should be properly stacked with display board. Records shall be maintained for the same.		
			<ul> <li>Floatation PPEs, lifebuoys, lighting, rail, tags and other mechanisms to be ensured for work near water/sewage</li> </ul>		
			<ul> <li>Cleaning/ maintenance, the inlet line and area of confined</li> </ul>		
			spaces like underground pumping stations shall be adequately		
			vented to ensure that no toxic or hazardous gases are present in the line.		
			• Ensure that there is no accumulation of solid/ construction or		
			hazardous wastes on site, following proper plan for each for		
			collection, treatment and disposal as per applicable rules and as		
			agreed by the local body and PCB		
			<ul> <li>Provide shaded areas for rest, mealtimes, drinking water and sanitation facilities.</li> </ul>		
			<ul> <li>Medical emergency facilities such as para medical staff. First aid</li> </ul>		
			facilities, isolation center for Covid -19/ or contagious health		
			issue, ambulance service for incidences and accidents, tie up with		
			government or private hospital for emergency services, etc.		
			<ul> <li>Maintain necessary living accommodation and ancillary facilities</li> </ul>		



Activity	Ref:	Potential Negative	Mitigation Measures	Responsibl	Source of
	ESSs	Impact/ Concern		e Agency	Funds
			<ul> <li>in functional and hygienic manner in work camps. Ensure (i) uncontaminated water for drinking, cooking and washing, (ii) clean eating areas where workers are not exposed to hazardous or noxious substances; (iii) providing fire extinguisher at construction site and camps iv) fuel and cooking facilities in a safe and appropriate area (v) sanitation facilities are available at all times and (vi) waste management and segregation of wastes at camp and site.</li> <li>Esp. from the perspective of this sub-project, segregation of labour camps from work-site and restricted entry to site of excavation and buildings to prevent entry of children, outsiders and stray animals.</li> <li>Proper health and hygiene management plan shall be prepared for laborers who will be engaged in the demolition of the sludge drying beds and UASB reactors including plan for periodic health checkup, and sanitization. This should also include safety</li> </ul>		
Storage of Chlorine and polyelectrolyte	ESS 1, 2, 3 & 4	Land & water contamination by spilling	<ul> <li>measure to be undertaken while working in these areas.</li> <li>Designated area for the storage of chlorine and polyelectrolyte shall be defined</li> <li>Log for use of these chemicals shall be maintained</li> <li>Chemical spill contingency plan shall be prepared and implemented</li> <li>Obtain consent under Explosives Act 1884 from Petroleum and Explosives Safety Organization (PESO) for storage of chlorine cylinders</li> </ul>	Contractor	Contractors' cost
Community Health and safety	ESS 4	Community Health and safety risk during construction due to air pollution (dust & air emissions), traffic movement, congestion & Safety, noise, others) apart from sludge disposal, impact of	<ul> <li>The Contractor should abide to all National, State regulations, GPCB consent Conditions, NGT recommendations, including specific guidance on no bypassing of untreated sewage, and other aspects for the critical river stretches of Sabarmati.</li> <li>Use separate storm water and wastewater systems and provide capacity sufficient to treat peak flows (Sufficient hydraulic capacity will be ensured to accommodate peak flows)</li> <li>Provide safety signage at construction sites &amp; pipeline alignment</li> </ul>	Contractor/ Sub- contractors	Contractors' cost



Ref:	Potential Negative	Mitigation Measures	Responsibl	Source of
ESSs	Impact/ Concern		e Agency	Funds
ESSs	Impact/ Concernbypassinguntreatedwater during constructionphaseonneighboringsettlementsanddependentcommunitiesdownstream of FatehwadiCanal/ SabarmatiEnvironmentandsafetyrisk during demolishing ofthe existing plant	<ul> <li>visible to public.</li> <li>Provide signages for traffic movement and traffic related aspects such as speed limit, height requirements, noise restriction, etc. Assign Traffic wardens for heavy movement of traffic.</li> <li>Advance intimation to the local communities about increased traffic movement and its duration</li> <li>Ensuring movement of vehicular traffic to and from worksite at non- peak hours.</li> <li>Provide safety barriers near any trenches, and cover trenches with planks in a safe way during non-work hours. There shall be adequate watch and ward, ligting at all work areas, open trenches. Clear, well light, awareness boards on trenches/pits/du roads and others shall be arranged at least 200m ahread of work areas on both ends. All trench/work spaces shall be well barricaded.</li> <li>Contractor's activities and movement of staff will be restricted to designated construction areas. No access to staff/workers to other sites within the premises.</li> <li>Water sprinkling on kuccha access roads and construction areas within the STP premises.</li> <li>Vehicles used for the construction activities shall have the necessary PUC certificates and regular checks for ensuring compliances as per local laws.</li> <li>Recycling and the provision of separate waste receptacles for different types of waste shall be maintained. These shall be cleared everyday and disposed at AMCs waste management facilities</li> <li>Grievance registers at gate with security. Training to be provided to, contractors, PMC &amp; AMC staff to handle grievances with respect to community.</li> <li>Training of drivers transporting material to site on safety precautions, speed restrictions, other issues.</li> </ul>	e Agency	Funds
		regarding non-tolerance of GBV and SEA. Any cases of GBV and		
	Ref: ESSs	Ref: ESSsPotential Negative Impact/ Concernbypassing water during construction 	Ref:       Potential Negative Impact/ Concern       Mitigation Measures         ESS       Impact/ Concern       visible to public.         bypassing       untreated water during construction phase on neighboring settlements and dependent communities downstream of Fatehwadi Canal/ Sabarmati       • Provide signages for traffic movement and traffic related aspects such as speed limit, height requirements, noise restriction, etc.         Advance intimation to the local communities about increased traffic movement of vehicular traffic to and from worksite at non-peak hours.       • Advance intimation to the local communities about increased traffic movement of vehicular traffic to and from worksite at non-peak hours.         Environment and safety risk during demolishing of the existing plant       • Provide safety barriers near any trenches, and cover trenches with planks in a safe way during non-work hours. There shall be adequate watch and ward, ligting at all work areas, open trenches. Clear, well light, awareness boards on trenches/pits/du roads and others shall be arranged at least 200m ahread of work areas on both ends. All trench/work spaces shall be well barricaded.         Contractor's activities and movement of staff will be restricted to designated construction areas. No access to staff/workers to other sites within the Premises.         Water sprinkling on kuccha access roads and construction areas within the STP premises.         Water sprinkling on durcha access roads and construction areas within the STP premises.         Water sprinkling on durcha access roads and construction fraces for different types of waste shall be maintained. These shall be cleared everyday and disposed at AMCs waste ma	Ref:     Potential Negative Impact/Concern     Mitigation Measures     Responsible e Agency       ESs     Impact/Concern     e Agency       bypassing     untreated water during construction phase on neighboring settlements     visible to public.     Provide signages for traffic movement and traffic related aspects such as speed limit, height requirements, noise restriction, etc.       Assign Traffic wardens for heavy movement of traffic.     Advance intimation to the local communities about increased traffic movement and its duration       Canal/Sabarmati     Environment and safety risk during demolishing of the existing plant     Provide signage at least 200m shread of work site at non-peak hours.       Provide signage at least 200m shread of work areas on both ends. All trench/work spaces shall be well barricaded.     Ontractor's activities and movement of staff will be restricted to designated construction areas. No access to staff/workers to other sites within the STP premises.       Water sprinkling on kuccha access roads and construction areas within the STP premises.     Water sprinkling on kuccha access roads and construction areas within the STP premises.       Water sprinkling on kuccha access roads and construction areas within the STP premises.     Recycling and the provision of separate waste receptacles for different types of waste shall be maintained. These shall be cleared everyday and disposed at AMCs waste management facilities       Grievance registers at gate with security. Training to be provided to, contractor's LMP and the condition will include clauses regarding non-toleres transporting material to site on safety precautions, speed restrections, other issues. </th



Activity	Ref:	Potential Negative	Mitigation Measures	Responsibl	Source of
	ESSs	Impact/ Concern		e Agency	Funds
	ESSs	Impact/ Concern	<ul> <li>SEA will be referred to the appropriate authority following the GBV Action Plan prepared for the project.</li> <li>Alternate design and/ or temporary measures, including sewage diversion plan to prevent untreated sewage from being released in the river or Fatehwadi canal during the construction period and commissioning of STP</li> <li>The contractors need to prepare diversion plan for construction and operation period to ensure smooth flow of sewage for treatment in the proposed project or adjoining STP</li> <li>Alternate traffic routing to be adopted in consultation with traffic police authorities. This shall be properly displayed well ahead of diversion areas. Commuters/ citizen shall be informed through signages, print and social media</li> <li>Construction works at busy roads must be completed earlier to minimize inconvenience</li> <li>The demolishing of the existing plant should be done in phased manner so that bypass of untreated sewage is minimized. The defunct digestors may have entrapped methane gas, the</li> </ul>	e Ágency	Funds
			<ul> <li>methane gas must be extracted, and air vent should be provided.</li> <li>The contractor must check for the presence of the volatile material and use gas analyzer as a safety protocol to avoid any accident</li> </ul>		
Land acquisition Socio economic status, Labour/ employment opportunities & procurement	ESS 4, 5 & 10	Impact due to Land Acquisition, restriction on movement or access, livelihood	<ul> <li>There are no potential involuntary resettlement issues identified, as there is no land acquisition of private land or inclusion of additional government land for the proposed upgradation</li> <li>Ensure that land within the STP compound is encumbrance free</li> <li>Ensure timebound restoration of access roads to support vehicular traffic, so as to minimize inconveniences or livelihoods related impacts on neighboring squatter settlements and others using these access roads</li> <li>Periodic consultations and information sharing with the local communities to ensure their engagement with the process and to manage all land and livelihoods related adverse impacts</li> <li>Labor and employment opportunities will be generated during</li> </ul>	Contractors' scope	Contractors' cost



Activity	Ref:	Potential Negative	Mitigation Measures	Responsibl	Source of
	ESSs	Impact/ Concern		e Agency	Funds
			<ul> <li>the construction period. Absorption of daily labor currently working in plant site for any construction activities in the proposed upgradation</li> <li>Unskilled and semi-skilled labor work can be sourced from the squatter settlement as per availability and willingness of labor. Women can also be hired for specific tasks from the squatter settlement. Since the settlement is in close proximity some women may be willing to work on site as labor</li> <li>Continued access to access road/rivers will be available. There will be no restrictions on movement of people on access road. Traffic management plan will be planned and implemented to prevent any traffic congestion due to movement of vehicles transporting materials and labor</li> <li>Ensure implementation of health and safety measures for all workers working on site given the nature of activities</li> <li>If contractors' scope for existing work is being revised, then revise or give notification well in advance to enable contractors to make alternative arrangements for staff and sub-contractors</li> <li>The contractor's LMP and the Condition will include clauses regarding non-tolerance of GBV and SEA. Any cases of GBV and SEA will be referred to the appropriate authority following the GBV Action Plan prepared for the project</li> <li>Pipeline from the TSPS shall be planned in such a way to avoid any disturbance to the private land.</li> </ul>		
Labour camp	ESS 2	Undignified living conditions of labour Improper toilet facilities/ amenities Conflict with locals	<ul> <li>Labor camps/ stay facilities shall be of acceptable living conditions and safe structures. If a camp is required, stay shall be arranged at appropriate distance from STPs. Construction of labor camp shall not be started before it is approved by the Engineer</li> <li>Required facilities shall be arranged at the laborers' accommodation facility</li> <li>Construction of separate toilets for labour at work site and labour camp</li> <li>Separation of camp from worksite is important</li> </ul>	Contractors; to be approved by Engineer, AMC PIU	Contractors' cost



Activity	Ref:	<b>Potential Negative</b>	Mitigation Measures	Responsibl	Source of
	ESSs	Impact/ Concern		e Agency	Funds
			<ul> <li>Separate toilets/ bathing/ washing facilities for women labour, and those with families</li> <li>Code of Conduct for workers</li> <li>Regular inspection and health check-ups and sanitization</li> <li>Adoption of Covid appropriate behavior, distancing norms and signages/ messages</li> <li>Regular training &amp; awareness programs to the workers</li> <li>Regulated movement of the workers to work site</li> <li>GRM awareness creation and orientation; availability of boards, registers, complaint boxes at camp</li> <li>Fire- extinguishers, first-aid kits, emergency numbers at different locations in the camp</li> </ul>		
Landscaping and tree plantation	ESS 6	ImpactduetointroductionofInvasivespeciesSitealreadyhaveexoticspecieslikePistiasp.Lantanacamara,Eucalyptussp., Eichhorniacrassipesetc.Transferoftopsoil/manureforlandscapingmay carry seedsofexoticspecies.Introductionofunwantedseeds/saplingduringtransfer oftransferofsaplingbags forplantation.bagsfor	<ul> <li>Removal of exotic species from the area to be developed shall be undertaken</li> <li>Use indigenous varieties for plantation of green belt in discussion with Garden Department of AMC</li> <li>Plantation of local species</li> <li>Topsoil/ manure required for landscaping shall be used from the local region.</li> <li>Saplings bags for plantation shall be checked for presence of any exotic species, if present shall be discarded.</li> </ul>	Contractors' scope	Contractors ESMP cost
Snake and scorpion bite	ESS 2	Accidental snake/ scorpion bite injury	<ul> <li>Training/ awareness programs at all the stages of the project shall be conducted.</li> <li>Contact details of fire brigade, nearest hospital and forest department shall be provided on site</li> </ul>	Contractors' scope	Contractor cost



Activity	Ref:	Potential Negative	Mitigation Measures	Responsibl	Source of
	ESSs	Impact/ Concern		e Agency	Funds
Post-construction clean-up	ESS 1 & 3	Damage due to debris, spoils, excess construction materials. Impact on soil and water quality	<ul> <li>Remove all spoils wreckage, debris, rubbish, or temporary structures (such as buildings, shelters, and latrines, septic tanks) which are no longer required; and</li> <li>All excavated roads shall be reinstated to original condition.</li> <li>Road repairs in case of damage during construction works</li> <li>Restoration of the surface dug for pipeline from TSPS.</li> <li>All disrupted utilities restored</li> <li>All affected structures to be rehabilitated/ compensated</li> <li>The work sites to be checked for spills of substances such as oil, paint, etc. and these shall be cleaned up</li> <li>The contractor must arrange the cancellation of all temporary services</li> <li>Request PIU to report in writing (using prepared format) that worksites and camps have been vacated and restored to preproject conditions before acceptance of work</li> <li>Seek feedback from neighboring settlements on clean up</li> </ul>	Contractor	Contractor cost
Existing sewage treatment plant (STP) operation	ESS 1 & 3	Non-compliance with government regulations – no valid consent to operate (CTO) for STP operation	<ul> <li>Obtain CTO or amendments to existing CTO from Gujarat Pollution Control Board (GPCB) immediately.</li> </ul>	AMC	Operating costs
Operation of STP	ESS 1 & 3	Release of untreated sewage into water bodies impacting water quality	<ul> <li>There shall be daily and monthly monitoring of the treated sewage/ parameters and ensuring compliance with PCB standards for effluent disposal into surface water bodies</li> <li>Periodically seek feedback from neighboring settlements on STP operation and any unidentified/ unintended impacts</li> <li>Prevent spillage of sludge/slurry into water bodies</li> </ul>	O&M Contractor/ AMC	Contractor cost
Screening waste	ESS 1 & 3	Unscientific storage & disposal of screening/ floating waste	<ul> <li>Screening/ floating waste shall be stored in the closed containers and shall be disposed through AMC with written consent</li> <li>Record of the waste generated and sent for disposal at AMC designated appropriate place shall be maintained</li> </ul>	O&M Contractor/ AMC	Contractor cost
Solid waste & E- waste, Batteries	ESS 1 & 3	Unscientific storage & disposal of wastes	<ul> <li>Wastes shall be segregated and stored in closed containers</li> <li>Disposal shall be according to the Solid Waste Management Rules</li> </ul>	O&M Contractor/ AMC	Contractor cost



Activity	Ref:	Potential Negative	Mitigation Measures	Responsibl	Source of
	ESSS	Impact/ Concern	<ul> <li>2016, E-waste Management Rules 2016, Hazardous Waste Management Rules or Batteries Rules as applicable</li> <li>Records on wastes generated and disposed shall be maintained on site</li> </ul>	e Agency	Funds
Sludge disposal	ESS 1	Disposal of sewage/sludge/slurry in improper manner Spillage during transit	<ul> <li>Contractor will prepare sludge management plan, which will be approved by AMC. Sludge quality will be monitored and sent to AMC's Sludge Management facility If it is non-hazardous, where it is to be treated and disposed as per consent conditions. If tested hazardous it shall be sent to the nearest appropriate Hazardous Waste TSDF for disposal following the Hazardous Waste Management Rules of Govt of India, 2016.</li> <li>Contractor will have the responsibility to store, test, transfer sludge for disposal appropriately based on the monitoring results &amp; existing regulations, as agreed in writing with AMC. Sludge shall be transported in covered containers to avoid any spillage during transit. Manual handling of sludge is prohibited as per regulations. WB EHS will be followed for sludge handling.</li> <li>Arrangements for management of sludge (with reduced odour, no spillage of sludge or leachate) shall be made in case of equipment break down/emergencies etc. in line with regulations and included in sludge and waste management plan.</li> </ul>	O&M Contractor, AMC	Contractor cost till it is disposed at AMC's sludge management facility
Release of unauthorized industrial effluent	ESS 1 & 3	Impacting STP operation efficiency	<ul> <li>No wastewater from industrial premises (including domestic wastewater) shall be allowed to dispose into municipal sewers</li> <li>Monitor regularly and ensure that there is no illegal discharge through manholes or inspection chambers; conduct public awareness programs; in coordination with GPCB</li> </ul>	O&M Contractor/ AMC in coordination with GPCB	Contractor cost
Accidental release or malfunctioning of units	ESS 1 & 3	Discharge of untreated water into the canal/river	<ul> <li>Alarm system should be provided in the STP, which may indicate any sudden emergency or accident or breakdown or power failure.</li> <li>Emergency diversion facility shall used</li> </ul>	O&M Contractor/ AMC in coordination with GPCB	Contractor cost
Air and noise environment	ESS 1 & 3	Odor and noise from STP including biogas facility	<ul> <li>Strictly follow standard operating procedures/ operational manual for operation and maintenance of STP and terminal Pumping station</li> </ul>	O&M Contractor/ AMC	Contractor cost



Activity	Ref:	Potential Negative	Mitigation Measures	Responsibl	Source of
	ESSs	Impact/ Concern		e Agency	Funds
			<ul> <li>Ensure that operating staff is properly trained and have clear understanding of odor issues vis a vis its relationship with operational practices.</li> <li>Ensure that pumping cycles are properly followed and there is no build-up of sewage beyond design volume in the wells.</li> <li>Proper handling and regular maintenance of operating machines including pumps, blowers, generators, air diffusers, etc.</li> <li>The STP and pumping station shall have sufficient buffer zone in form of greenbelt to reduce the odor and noise impacts.</li> <li>Seek feedback from neighboring settlements/ establishments</li> <li>Use PPEs. Cover emission points as needed to reduce odour and meet applicable national/state requirements</li> </ul>		
General safety	ESS 2 & 4	Occupational health of workers of STP and residents around STP	<ul> <li>Cleaning/ maintenance, the inlet line and area of confined spaces like underground pumping stations shall be adequately vented to ensure that no toxic or hazardous gases are present in the line.</li> <li>Ensure that there is no accumulation of solid/ construction or hazardous wastes on site, following proper plan for each for collection, treatment and disposal as per applicable rules and as agreed by the local body and PCB</li> <li>Safety Posters must be posted at site to motivate the worker for safe work</li> <li>Confined spaces permit consistant with national/internationally accepted standrads for lifeline and personal protection devices and special PPEs against hazards from gases and chemical spillages</li> <li>Licenses and permits for storage of chemicals</li> <li>Orientation shall be conducted for operators / workers involved in work with chlorine/chemicals regarding safe handling practices and emergency response procedures i.e run towards safety equipment installed at site for this purpose (safety shower, eye wash station) and call emergency number.</li> <li>Appropriate personal protective equipment (including, for example, self-contained breathing apparatus) shall be provided and training on its proper use and maintenance to be</li> </ul>	O&M Contractor/ AMC	Contractor cost



Activity	Ref: FSSs	Potential Negative	Mitigation Measures	Responsibl e Agency	Source of Funds
	2005		ensured.	e Ageney	i unus
			• Escape plans for areas where there might be a chlorine emission chemical spills, shall be prepared.		
			<ul> <li>Safety showers and eye wash stations shall be installed near the chlorine station and other areas where hazardous chemicals are stored or used</li> </ul>		
			<ul> <li>Gas detection equipment shall be ensured at site</li> </ul>		
			Air quality monitoring shall be conducted as per monitoring plan		
			in work areas for hazardous conditions (e.g. explosive atmosphere, oxygen deficiency).		
			Chlorine system safety		
			<ul> <li>a) Alarm and safety systems shall be installed, including automatic shutoff valves, that are automatically activated when</li> </ul>		
			a chlorine release is detected.		
			<ul> <li>b) Containment and scrubber systems shall be installed to capture and neutralize chlorine leak if occur.</li> </ul>		
			<ul> <li>c) Storage of chlorine shall be ensured away from all sources of organic chemicals, and protect from sunlight, moisture, and high temperatures.</li> </ul>		
			<ul> <li>d) Sodium hypochlorite shall be stored in cool, dry, and dark conditions for no more than one month, and use equipment constructed of corrosion-resistant materials.</li> </ul>		
			<ul> <li>e) Ammonia storage and feed areas shall be isolated from chlorine and hypochlorite storage and feed areas to avoid any incident.</li> </ul>		
			<ul> <li>f) Amount of chlorination chemicals storage shall be minimized on site while maintaining a sufficient inventory to cover intermittent disruptions in supply.</li> </ul>		
			<ul> <li>Recommendations for the Sabarmati critical stretch &amp; Consent conditions of SPCB shall be followed.</li> </ul>		
			<ul> <li>All National, State, regulations guidance, Consent Conditions &amp; NGT shall be followed and agreed with GPCB</li> </ul>		



Activity	Ref:	Potential Negative	Mitigation Measures	Responsibl	Source of
	ESSs	Impact/ Concern		e Agency	Funds
Not using PPE	ESS 2	Workers may get injured due to not using PPE's at workplace. Worker's eyes may get injured due to not using of safety goggles and ace shield while welding	<ul> <li>PPE's (Safety shoes, Safety helmet, Full body harness, Safety jacket, Gloves) must be provided to the workers while working at site.</li> <li>Power tools which are not under proper condition should be replaced or prepared.</li> <li>Worker should use face shield or goggles while welding and cutting work.</li> </ul>	O&M Contractor/ AMC	Contractor cost
Electrocution & Fire	ESS 2	Electrocution may occur due to using of joint electrical cable at STP & TSPS.	<ul> <li>Standard operating Procedures (SoP) for working with electric instruments and facilities shall be defined and implemented.</li> <li>Ensure Electrical DB must be kept inside closed shed to prevent from water/dust with a gate outside. Keep CO2 fire extinguisher outside shed for electrical fire fighting.</li> <li>Contact details of nearest fire brigade and hospital shall be provided on site</li> </ul>	O&M Contractor/ AMC	Contractor cost
House keeping	ESS 2 & 4	Worker may get injured due to poor housekeeping at site. Vector borne disease may occur due to lack of poor housekeeping	<ul> <li>Regular housekeeping shall be conducted. Records shall be maintained for the same.</li> <li>Storage area for raw material and waste shall be defined and appropriate signages shall be informed.</li> <li>Working area shall be periodically sanitized and kept clean and hygienic</li> </ul>	O&M Contractor/ AMC	Contractor cost
Lack of awareness	ESS 2 & 10	The incident may occur due to non-awareness of workers at danger zone, without displaying safety sign board.	<ul> <li>Safety Engineer should be available at site to give daily pep talks and submit the report daily</li> <li>Training/ awareness programs at all the stages of the project shall be conducted</li> <li>Mock drills shall be conducted frequently</li> <li>Records of training/ awareness programs/ mock drills shall be maintained</li> </ul>	O&M Contractor/ AMC	Contractor cost
Accidents due to working conditions	ESS 2	Persons fall from height, fall, slip, trip, fatality, property damage due to access and worker working	<ul> <li>SoPs for working conditions shall be defined and implemented</li> <li>All the necessary PPEs shall be used, and checklist/ permit shall be approved prior to working at dangerous areas</li> <li>Tagging should be displayed in the Steel Scaffolding and should</li> </ul>	O&M Contractor/ AMC	Contractor cost



Activity	Ref: ESSs	Potential Negative Impact/ Concern	Mitigation Measures	Responsibl e Agency	Source of Funds
		without appropriate safety harness, Floor openings. Unsafe scaffolding has the	<ul><li>check by safety engineer weekly, and the working platform should be at least 400 mm width</li><li>All the openings should be properly closed at walkway area and railing shall be provided</li></ul>		
		potential to result to death or serious injury of person.	• Lifeline should be provided at the edges of slab and worker should wear safety harness at height work		
Snake and scorpion bite	ESS 2	Accidental snake/ scorpion bite injury	<ul> <li>Training/ awareness programs at all the stages of the project shall be conducted.</li> <li>Contact details of fire brigade, nearest hospital and forest department shall be provided on site</li> </ul>	O&M Contractor/ AMC	Contractor cost

#### 6.3 Emergency/ Disaster Management Plan

The purpose of the DMP is to identify potential foreseeable accidents/ emergency situations and establish and maintain procedures to address or prevent such situations, as well as to test the effectiveness/review/revise such procedures periodically.

The proponent will insist on development and implementation of an individual emergency response plan or disaster management plan by every contractor/ stakeholder that will be involved in the project development. This will be made as a pre-requisite for engagement in the project.

The plan for emergency and disaster preparedness contains the modalities, roles, responsibilities and overall implementation of protocols and action plan in the case of emergencies and disaster. The procedure given in the DMP is also integrated for disaster preparedness.

The basic approach towards preparedness for any major disaster or emergency situation will comprise of the following activities:

- Identify the potential disasters likely to occur;
- Establish a Disaster/ Emergency Response Team (ERT) to implement emergency procedures;
- Develop a detailed Emergency/ Disaster Response Plan with details regarding the course of action to be followed in order to minimize personal injury and property damage in the event of fire, flood, loss of ground, or natural disaster;
- Train the personnel in planning and responding to an emergency;
- Carry out audits of individual establishments on a regular basis to monitor the Emergency Response Plans and the corresponding procedures. The audits will include review of the following:
  - The roles and responsibilities of the respective ERT and support organizations;
  - Adherence of individual project activities to safe practices; and
  - Resource requirements, condition of equipment's and their availability.

## 6.3.1 Identified Emergency Situations

The potential hazards identified for the project include the following:

- Natural Hazards:
  - Floods
  - Earthquakes
  - Fire hazards
  - Technological or Social Hazards
    - Transportation accidents
    - Hazardous materials releases
    - Social disorder
    - Food and water supply contamination

Disaster management plan of Ahmedabad District shows following identified vulnerabilities for Ahmedabad which also apply directly to this project.

Type of hazard	Vulnerability Ranking as per DDMP <sup>50</sup>	Vulnerable Area as per DDMP	Sub-project related risk
Earthquake	15 (High)	Entire District	Entire plant area
Flood	9 (Moderate)	Ahmedabad, Daskori, Dholka, Dholera, Dhandhuka	Entire plant area
Fire	9 (Moderate)	Ahmedabad City, Bavla, Daskroi	Plant units
Industrial Accidents i.e., Accidental gaseous emission (chlorine)	6 (Moderate)	Ahmedabad City, Bavla, Daskroi	Plant units
Droughts	6 (Moderate)	Viramgram, Detroj, Mandal	Not applicable
Food Poisoning	4 (Low)	Entire District	Construction workers & STP staff
Epidemic	4 (Low)	Entire District	Construction workers & STP staff
Building Collapse	2 (Moderate)	Mainly in city area	Plant units

#### Table 45 Disaster Vulnerability.

#### 6.3.2 Proposed Organizational Structure for Disaster Management

#### Disaster Management Committee

Client shall constitute a Disaster Management Committee (DMC) for sub-projects under G-ACRP. This committee will be headed by Commissioner, Ahmedabad Municipal Corporation and Urban Development. The DMC will be the apex planning body and will play a major role in preparedness and mitigation of any disaster. The cell will have the following key functions:

- Preparation of sub-project specific Disaster Management Plan;
- Setting up of Emergency Control Centre during emergency situations;
- Coordination with District Disaster Control Room of Ahmedabad district;
- To supervise emergency response measures in case of any emergency;
- Keep track of predictable natural hazard events such as floods etc.;
- Organize training and capacity building programs on disaster management for individual establishments in the Project Region;
- Periodic monitoring of Emergency Response Plans and the corresponding procedures of individual establishments;
- Organize post Disaster evaluation and update DMP accordingly;
- Prepare reports and document on Disaster events and submit the same to District Control Room. The documents shall include:
  - Source & cause of Disaster
  - Description of the response efforts.
  - Recommendation for preventive & mitigation measures.
  - Plan for upgrading emergency preparedness and response plan

#### The DMC will have the following members of AMC staff:

• Unit Supervisor

<sup>&</sup>lt;sup>50</sup> DDMP Ahmedabad District 2021

- Administration Department
- Disaster management/ Safety Department
- Electrical Department
- Civil Department
- Environment Department

# STP plant during construction and operation phase shall have following assets in admin building to control and communicate the disastrous conditions,

- Intercom, telephone;
- P and T telephone;
- Breathing apparatus;
- Goggles/gloves/helmets;
- Public address megaphone, hand bell, telephone directories (internal, P and T);
- Emergency lamp/torch light/ batteries;
- Emergency shut-down procedures;
- List of key personnel and list of Emergency coordinators;
- Duties of key personnel;
- Address with telephone numbers and key personnel & departments i.e., police, fire brigade, hospital etc., emergency coordinator, essential employees;
- Important address and telephone numbers including Government agencies, neighboring industries, and sources of help, outside experts, chemical fact sheets, population details.

#### 6.3.3 Emergency Response:

The following five steps are involved in an emergency response plan of the plant:

- Discovery and Notification: An event with an imminent threat of turning into an accident must first be discovered and the discoverer quickly notifies the same to the plant safety officer.
- Evaluation and Accident Control Initiation: Based on the evaluation of available information, the safety authority makes a rapid assessment of the severity of the likely accident and initiates the best course of action.
- Control Measures: Action is first taken to control the accident by eliminating the causes which may lead to the spread of accident. Measures are also taken to minimize the damage to personnel, property, and environment.
- Cleanup and Disposal: After the accident is effectively contained and controlled, the cleanup of the site of the accident and safe disposal of waste generated due to the accident are undertaken.
- Documentation: All aspects of accidents, such as its occurred sequence, control steps and the extent of the damage and injury, must be documented for subsequent analysis of accident for prevention in future, damage estimation, insurance recovery and compensation payment. It may be noted that some aspects of documentation, such as, photographs of the site of accident and main objects involved in the accident, survey for damage estimation, etc. may have to be carried out before the cleanup and disposal phase. However, the effort in all cases is to recommence the production as soon as possible.

Following are the list of identified disasters and proposed management plan:

## Table 46 Disaster Management Plan for 375 MLD STP

Type of disaster	Precautionary measure	Emergency response	Post disaster	Records to maintain
			response	
Earthquake	Earthquake compliant design. Responsibility of Design consultant Prepare SoP: Responsibility of DBOT contractor Training & mock drills: Responsibility of DBOT contractor	Gather in Common refugee area Head count Follow protocol/ SoP prepared for earthquake related situation Communicate to fire brigade Communicate to hospital in case of any injury Communicate AMC head office Provide first aid	Audit the plant for loss and damage	Add loss and damage Register Root cause analysis Submit report stating actions taken to response or rectify the issues
Flood	Design considering flooding history and impact of barrage: Responsibility of Design consultant Prepare SoP: Responsibility of DBOT contractor	Gather in Common refugee area Head count Follow protocol/ SoP prepared for flood related situation Communicate to fire brigade Communicate to hospital in case of any injury Communicate AMC head office Provide first aid	Audit the plant for loss and damage	Add loss and damage Register Root cause analysis Submit report stating actions taken to response or rectify the issues
Fire	<ul> <li>Fire compliant design: Responsibility of Design consultant</li> <li>Prepare Fire Safety Procedures SoP: Responsibility of DBOT contractor</li> <li>Provide fire management system</li> <li>Hydrant system for the entire plant area;</li> <li>Automatic water spray deluge system for the transformer area</li> <li>Manually operated water spray system for pumps and sludge press.</li> <li>Automatic sprinkler system for STP</li> </ul>	Gather in Common refugee area Head count Follow protocol/ SoP prepared for fire related situation Communicate to fire brigade Communicate to hospital in case of any injury Communicate AMC head office Provide first aid	Audit the plant for loss and damage	Add loss and damage Register Root cause analysis Submit report stating actions taken to response or rectify the issues



Type of disaster	Precautionary measure	Emergency response	Post disaster	Records to maintain
			response	
	<ul> <li>units;</li> <li>Automatic fire foam system for the fuel oil storage;</li> <li>Automatic inert gas flooding fire extinguishing system for the control rooms;</li> <li>Portable fire extinguishers for the entire plant area; and</li> <li>Fire detection and alarm system for</li> </ul>			
	the STP units			
Industrial Accidents i.e., Accidental gaseous emission (chlorine)	Leak proof design: Responsibility of Design consultant, DBOT contractor Prepare SoP: Responsibility of DBOT contractor	Gather in Common refugee area Head count Follow protocol/ SoP prepared for accident-related situation Communicate to hospital in case of any injury Provide first aid	Audit the plant for loss and damage	Add loss and damage Register Root cause analysis Submit report stating actions taken to response or rectify the issues
Accidents on Site	Implement ESMP OHS measures: Responsibility of DBOT contractor Prepare SOPs: Responsibility of DBOT contractor	Provide First Aid Move to nearest Hospital, preferably considering the type of accident and injury, inform nearest kin Provide assistance and support for treatment, hospitalisation and transport Arrange insurance claim	Root cause analysis Prepare Corrective Action Plan	Incident/ Accident Register marking all accidents – indicative, serious, severe
Food Poisoning	Prepare SoP: Responsibility of DBOT contractor	Follow protocol/ SoP prepared for accident-related situation Communicate to hospital Communicate to AMC head office Provide first aid	Audit the plant for loss and damage	Add loss and damage Register Root cause analysis Submit report stating actions taken to response or rectify the issues
Epidemic/ Pandemic	Prepare SoP, Guidelines: Responsibility of DBOT contractor	Follow protocol/ SoP prepared for accident-related situation Communicate to hospital Communicate to PIU, AMC head office Provide first aid	Audit for loss and damage	Add loss and damage Register



Type of disaster	Precautionary measure	Emergency response	Post disaster	Records to maintain
			response	
Agitation/ civil disorder	Prepare SoP: Responsibility of DBOT contractor	Follow protocol/ SoP prepared for accident-related situation Communicate to hospital Communicate to AMC head office Provide first aid	Audit the plant for loss and damage	Add loss and damage Register Root cause analysis Submit report stating actions taken to response or rectify the issues
Building Collapse	Prepare SoP: Responsibility of DBOT contractor Training & mock drills, Responsibility of DBOT contractor	Gather in Common refugee area Head count Follow protocol/ SoP prepared for accident-related situation Communicate to fire brigade Communicate to hospital in case of any injury Communicate with PIU, AMC head office Provide first aid	Audit the plant for loss and damage	Add loss and damage Register Root cause analysis Submit report stating actions taken to response or rectify the issues

DBOT contractor shall prepare the SoPs for identified disaster situations and update the DMP. DMP shall be integrated with AMCs disaster management strategies and all the concerned documents shall be submitted to AMC by DBOT contractor.



### 6.4 Proposed Monitoring Plan

Environmental monitoring during construction and O&M phase is an important step to assess the impacts of the proposed project and it will be help in suitably changing/ strengthening the mitigation measures in terms of air quality, water quality, noise quality etc. Following are the major impacts identified based on which the monitoring plan is prepared,

- 1. Air pollution due to construction activities
- 2. Noise pollution due to construction activities
- 3. Contamination of river due to diversion of untreated water & oil spill
- 4. Sourcing raw material from unauthorised sources
- 5. Chance finding of historic artefact
- 6. Disposal of C&D waste generated
- 7. Disposal of Solid waste generated
- 8. Removal of topsoil
- 9. Impact on local biodiversity due to construction activities
- 10. Tree cutting
- 11. Impact on water quality due to improvement of treatment of sewage
- 12. Soil contamination due to spill and pollutants
- 13. Occupational Health & Safety impacts during construction & operation phase
- 14. Community health & Safety
- 15. Employment opportunities
- 16. Landscaping & plantation

The project will require statuary clearance, i.e., Consent to Establish (CtE) and Operate (CtO) from, State Pollution Control Board (SPCB). The CtE and CtO conditions are to be complied and report submitted to GPCB every half yearly or as suggested in Consent Conditions.

Following **Table 46** gives the details of monitoring plan for CtE (during construction phase) and CtO (O&M phase) to be followed for the project:



Monitoring field	Monitoring location	Monitoring parameters	Frequency	Responsibility	Cost and Source of Funds
Construction disturbances, nuisances, public and worker safety	Project site, all TSPS & pipeline alignment	Implementation of construction stage EMP including dust control, noise control, traffic management, and safety measures.	Weekly during construction	Contractor's staff and environmental specialists of PIU	Staff and consultant costs are part of incremental administration costs
Ambient air quality	1 location in STP, 1 location at each TSPS, 2 locations along alignment of pipeline from TSPS	SO <sub>2</sub> , NOx, RSPM 10 $\mu$ m, PM 2.5 $\mu$ m, CO, Volatile organic compounds (VOCs), Methane, Ammonia, H <sub>2</sub> S, Hydrocarbon (HC)	Once before start of construction. Quarterly (except monsoon) during construction	Construction Contractor	Cost for implementation of monitoring measures responsibility of contractor
Ambient air quality	Biogas plant	CO, CO2methane, odour, other gases	Twice in week (for one Month) – 8 hrs monitoring refer to NAAQS	Contractor	Cost for implementation of monitoring measures responsibility of contractor
Inlet sewage and outlet treated water parameters2 locations (Intake and outfall of STP).Surface water1 Location upstream & 1 downstream to outfall in Sabarmati River, appropriate distance to be selected		<ul> <li>Physical parameters:</li> <li>Colour, Odor, Temp, pH, turbidity, Total Hardness (Mg &amp; Ca), TSS, TDS,</li> <li>Chemical parameters:</li> <li>Total alkalinity, Chloride, Total Residual Chlorine, Sulphate, Nitrate, Fluoride, Na, K, Salinity, Total Nitrogen, Total Phosphorus, DO, BOD, COD, Ammoniacal Nitrogen, Total Kjeldahl Nitrogen, Free Ammonia, Phenol, Oil &amp;Grease, Heavy metals (Copper, Nickel, Lead, Zinc, Manganese, Cadmium, Hexavalent Chromium, Total Chromium, Mercury, Cobalt, Arsenic Cyanide Iron)</li> </ul>	Once before start of construction. Quarterly (except monsoon) during construction	Construction Contractor	Cost for implementation of monitoring measures responsibility of contractor

## Table 47: Environmental and Social Monitoring Plan: Construction Phase



Monitoring field	Monitoring location	Monitoring parameters	Frequency Responsibility Cost and of Fu		Cost and Source of Funds
		<b>Biological Parameters:</b> Total Coliform, Faecal Coliform, Phytoplankton and zooplankton			
Ambient noise	1 location in STP, 1 location at each TSPS, 2 locations along alignment of pipeline from TSPS	Day time and night-time	Once before start of construction. Quarterly (except monsoon) during construction	Construction Contractor	Cost for implementation of monitoring measures responsibility of contractor
Ground water quality	2 locations (Inside plant and outfall of STP)	<ul> <li>Physical parameters:</li> <li>Colour, Odor, Temp, pH, turbidity, Total Hardness (Mg &amp; Ca), TSS, TDS,</li> <li>Chemical parameters:</li> <li>Total alkalinity, Chloride, Total Residual Chlorine, Sulphate, Nitrate, Fluoride, Na, K, Salinity, Total Nitrogen, Total Phosphorus, DO, BOD, COD, Ammoniacal Nitrogen, Total Kjeldahl Nitrogen, Free Ammonia, phenol, Oil &amp;Grease, Heavy metals (Copper, Nickel, Lead, Zinc, Manganese, Cadmium, Hexavalent Chromium, Total Chromium, Mercury, Cobalt, Arsenic, Cyanide, Iron)</li> <li>Biological Parameters:</li> <li>Total Coliform, Faecal Coliform, Phytoplankton and zooplankton.</li> </ul>	Once before start of construction. Quarterly (except monsoon) during construction	Construction Contractor	Cost for implementation of monitoring measures responsibility of contractor
Soil quality	1 location in STP, 1 location at each TSPS & 1 location along pipeline alignment	Physical parameters: Bulk density, Salinity, Porosity, Texture Class (Percentwise silt, clay & sand),	Once before start of construction.	Construction Contractor	Cost for implementation of monitoring measures



Monitoring field Monitoring location		Monitoring parameters	Frequency	Responsibility	Cost and Source of Funds	
		<b>Chemical parameters:</b> pH, Electrical conductivity, Cation exchange capacity, Sodium, Potassium, Nitrogen, Magnesium, Phosphorous, Sodium Absorption Ratio (SAR), Water holding capacity, Iron, Copper, Zinc, Manganese, Nickel, Permeability, physicochemical analysis and relevant metals.	Quarterly (except monsoon) during construction		responsibility of contractor	
Sludge analysis	1 location in STP Follow applicable national regulations and latest recommended methodologies	<ul> <li>Physical parameters:</li> <li>pH, Bulk Density, Conductivity, Moisture Content and Water Holding Capacity, Colour &amp; Texture, Odor</li> <li>Chemical parameters:</li> <li>Oil &amp; Grease, Total Volatile Solids, Total Kjeldahl Nitrogen, Total Organic Carbon, Phenolic Compounds, Calorific Value, Total Phosphorus, Total Coliform, Fecal Coliform, Arsenic (As), Nickel (Ni), Zinc (Zn), Cadmium (Cd), Copper (Cu), Chromium (Cr+6), Lead (Pb), Mercury (Hg), Toxicity Characteristics Leaching Procedure (TCLP)</li> </ul>	Once before start of construction. Once in six months during construction	Construction Contractor	Cost for implementation of monitoring measures responsibility of contractor	
Biodiversity assessment	3 locations 1 – Site area 2 – Downstream of Sabarmati River 3 – Downstream of Fatehwadi canal 4 - TSPS 5 – Pipeline alignment	General vegetation profile, floral diversity & Faunal diversity A species wise list Assessment of Flora & Fauna species with respect to dominance, density, frequency, abundance, diversity index, similarity index, importance value index [IVI], Shannon Weiner Index etc. of the species to be provided. Methodology used for calculating various diversity indices along with details of locations of quadrats, size of quadrats etc. to be reported within the study area in different ecosystems. Flora & Fauna under RET categories should be documented using International Union for the Conservation of Nature and Natural Resources (IUCN) criteria and Botanical Survey of India's	Annual	Construction Contractor	Cost for implementation of monitoring measures responsibility of contractor	



Monitoring field	g field Monitoring location Monitoring parameters		Frequency	Responsibility	Cost and Source of Funds	
		Red Data list along with economic significance. Species diversity curve for RET species. Migration information of fauna present Exotic/ Invasive species list Aquatic ecology – Fish diversity & Fisheries, Macro invertebrates, zooplankton, phytoplankton, benthic organisms, aquatic plants				
ESMF Compliance & Status report	-	ESMF Compliance, Status Report, including any issue with screening results, the status of conduct of ESIAs including required plans like CHMP, BMP; and actions taken for compliance on site	Monthly	Monitoring by Construction contractor, submission by PMC/ E&S auditor	CostofmonitoringbyConstructioncontractorandcostofsubmissionbyPMC	
Site visit report	-	Site audit	Monthly	РМС	PMC	
Compliance to the CtO	-	Compliance to the conditions stipulated in the CtO		РМС	РМС	
Community Consultations	1 location – nearest residential area, 2 location downstream of Sabarmati River, 1 location near TSPS & along pipeline	location – nearest Issues due to project construction activities sidential area, 2 location ownstream of Sabarmati ver, 1 location near TSPS along pipeline		Construction Contractor	Cost for implementation of monitoring measures responsibility of contractor	
Grievance Redressal	Project area and surrounding	Registered grievances	Monthly or as soon as grievance registered	РМС	PMC & PIU	
Areas with water stagnation	Project area and surrounding	Areas with water stagnation	Monthly	Construction Contractor	Cost for implementation of monitoring measures responsibility of contractor	



Monitoring field	Monitoring location		Monitoring parameters	Frequency	Responsibility	Cost and Source of Funds	
Health & Safety	Project area and surrounding		No: of worksite incidents in various project sites (during Construction and O&M)	Monthly	Construction Contractor	Cost for implementation of monitoring measures responsibility of contractor	
Environmental & Social Audit	Project area surrounding	and	Physical monitoring and working of all the units of STP viz., screens, grit chambers, clariflocculators, aeration tanks, secondary clarifiers, chlorine contact tank, sludge thickeners, digesters, and gas holder tanks. And units like pumps, motors, blowers etc., Any Issues due to rehabilitation works in parts of STP STP inlet – outlet and unit wise quality parameters tested Any abnormalities like leakage and spillage of oil, grease, sludge etc., Assessment of quality of implementing ESMP / environmental management practices Health and safety risks for workers and communities Complaints received from civilians/ neighboring people General work safety records of the plant Compliance to CTE (in construction phase) and CTO (in operation phase) conditions or other regulatory conditions. Compliances to ESS, National, State and Local laws and mandatory and statutory compliances including permissions, consent conditions, labour health, safety, security, welfare, etc. Implementation of OHS, GRM, various action plans at site Maintenance of documents, records and reports requisite for site LMP compliance Assessment of capacities, technology in achieving NGT/suggested standards and for design specification Environmental monitoring analysis pre and post treatment Sludge generation, quality, treatment and disposal	Annual	Construction Contractor	Cost for implementation of monitoring measures responsibility of contractor	



Monitoring field	Monitoring location	Monitoring parameters	Frequency	Responsibility	Cost and Source of Funds
		Generation of wastes, all biproduct and their reuse			
		Resource efficiency			
		Availability of staff for E&S at all levels			
		Monitoring of Corrective Action Plan implementation in case of			
		incidents if any			
		Review of Training / Capacity Building			

# Table 48: Environmental and Social Monitoring Plan: Operation Phase

Monitoring field	Monitoring location	Monitoring parameters	Frequency	Responsibility	Cost and Source of Funds
Ambient air quality	1 location in STP, 1 in Biogas unit, 1 location at each TSPS	Same as construction phase	Quarterly (except monsoon) during construction	O&M Contractor	O&M Contractors scope
Inlet and outlet parameters	2 locations (Intake and outfall of STP)	Same as construction phase	Monthly	O&M Contractor	O&M Contractors scope
Ambient noise	1 location in STP, 1 location at each TSPS, Biogas Unit	Day time and nighttime	Quarterly	O&M Contractor	O&M Contractors scope
Ground water quality	2 locations (Inside plant and outfall of STP)	Same as construction phase; including Chlorine	Quarterly (except monsoon)	O&M Contractor	O&M Contractors scope
Surface water quality including Chlorine	2 locations – upstream downstream appropriately selected		Monthly for year 1, and thereafter quarterly or as required for Consent		
Soil quality	1 location in STP	Same as construction phase	Quarterly (except monsoon)	O&M Contractor	O&M Contractors scope
Sludge analysis	locations in STP – one on Primary sludge, other before biogas unit, one after biogas unit	Same as construction phase, including soils in sludge	Monthly for year 1 of operation, then quarterly	O&M Contractor	O&M Contractors scope



Monitoring field	Monitoring location	Monitoring	Frequency	Responsibility	Cost and Source of Funds
Biodiversity assessment	3 Locations	Same as construction phase	Annual	O&M Contractor	O&M Contractors scope
ESMF Compliance & Status report	-	Same as construction phase	Monthly	Monitoring by Construction contractor, submission by PMC/ E&S auditor	Cost of monitoring by Construction contractor and cost of submission by PMC
Site visit report	-	Same as construction phase	Monthly	РМС	РМС
Compliance to the CtO	-	Same as construction phase	Monthly	РМС	РМС
Community Consultations	1 location – nearest residential area, 2 locations downstream of Sabarmati River	Same as construction phase	Yearly twice	Construction Contractor	Cost for implementation of monitoring measures responsibility of contractor
Grievance Redressal	Project area and surrounding	Same as construction phase	Monthly or as soon as grievance registered	РМС	PMC & PIU
Areas with water stagnation	Project area and surrounding	Same as construction phase	Monthly	Construction Contractor	Cost for implementation of monitoring measures responsibility of contractor
Health & Safety	Project area and surrounding	Same as construction phase	Monthly	Construction Contractor	Cost for implementation of monitoring measures responsibility of contractor
Environmental & Social Audit	Project area and surrounding	Same as construction phase	Once a year	Construction Contractor	Cost for implementation of monitoring measures responsibility of contractor



# 6.5 Estimated Budget for Implementation and Supervision of ESMP

## Table 49: Budget for ESMP Implementation

Sr. No.	Description	Stage	Unit	Quantity	Rate (Rs)	Amount (Rs)	Cost Covered by
Α	Monitoring staff & Updating of ESIA						
1	Environmental specialist (Civil/ Environmental Engineer) with minimum 5 years of experience in Operation & construction phase.	Pre-construction, Design	Per month	12	50,000	600000	Contractors Cost- annual HR
2	Social specialist with minimum 5 years of experience in Operation & construction phase.	Pre-construction, Design	Per month	12	50,000	600000	Contractors Cost- annual HR
3	C-ESIA/CESMP preparation/ updating based on detailed design, including results of Flood Risk Assessment Study, preparation of EAP, mitigation measures	Pre-construction, Design				3000000	To be included in Design Cost of DBOT contractor
	Subtotal (A)					42,00,000	
В	Monitoring measures-						
	Pre-Construction Phase						
1	Air quality monitoring during pre-construction phase at locations mentioned in Environmental Monitoring Plan of report. The parameters to be monitored are SPM, RPM, SO2, NOx and CO, Lead. Each monitoring schedule shall be over a duration of 24 hours (in 8-hour shifts), once	Pre-Construction	Nos.	5	8,000	40000	Monitoring Cost
2	Inlet and outlet parameters of STP	Pre-Construction	Nos.	3	10,000	30000	Monitoring Cost
3	Surface & Ground Water quality monitoring during pre- construction phase at locations mentioned in Environmental Monitoring Plan of report. The sampling shall be carried out once and cover all parameters as per IS10500 including heavy metals. 2 locations at site and 1 near labour camp	Pre-Construction	Nos.	4	10,000	40000	Monitoring Cost



Sr. No.	Description	Stage	Unit	Quantity	Rate (Rs)	Amount (Rs)	Cost Covered by
4	Noise quality monitoring during pre-construction phase at locations mentioned in Environmental Monitoring Plan of report. Each monitoring schedule shall be over a duration of 12 hours (6AM to 6PM), once. The monitoring shall be carried out in accordance with CPCB norms.	Pre-Construction	Nos.	5	2000	10000	Monitoring Cost
5	Biodiversity assessment – Once in preconstruction stage	Pre-construction	LS	-	-	200000	Monitoring Cost
6	Sludge analysis during pre-construction phase	Pre-Construction	Nos.	1	15000	15000	Monitoring Cost
7	Soil quality as per the list of parameters mentioned in report	Pre-Construction	Nos.	1	10000	10000	Monitoring Cost
8	Revision of ESMP, Monitoring plan & reporting schedule	Pre-construction	LS	-	-	10000	Monitoring Cost
9	Consent to Establish	Pre-Construction	Nos	1	350000	350000	Statutory fee by AMC & application by DBOT contractor cost
10	Training, capacity building of staff, Finalization of ESMP (contractors, sub-contractors). Training for 20 workers/quarter.	Pre-Construction	Nos.	4	2500	10000	ESMP residual Cost
11	IEC material (pamphlets, poster, banners, etc.)	Pre-Construction	LS	-	-	9050	ESMP residual Cost
12	GRM (display boards/banners, details of website, documentation, etc. for Construction and operation)	Pre-Construction	Nos.	50	500	25000	ESMP residual Cost
13	Material covers, sprinkling for dust suppression, preparation of cut off drains, platforms etc.	Pre-construction	LS			100000	To be included in Project Costs, but including here for extra coverage in case of an emergency
	Subtotal (B)					849050	
Construction	on Phase						


Sr. No.	Description	Stage	Unit	Quantity	Rate (Rs)	Amount (Rs)	Cost Covered by
1	Air quality monitoring during construction phase at locations mentioned in Environmental Monitoring Plan of report. The parameters to be monitored are SPM, RPM, SO <sub>2</sub> , NOx and CO, CO <sub>2</sub> , CH4 and Lead, odour m. Each monitoring schedule shall be over a duration of 24 hours (in 8-hour shifts), once	Construction	Nos.	15	10,000	150000	Monitoring Cost
2	Water sprinkling for dust mitigation	Construction	LS	-	-	500000	Monitoring Cost
3	Surface & Ground Water quality monitoring during construction phase at locations mentioned in Environmental Monitoring Plan of report. The sampling shall be carried out once and cover all parameters as per IS10500 including heavy metals.	Construction	Nos.	16	10,000	160000	Monitoring Cost
4	Noise quality monitoring during construction phase at locations mentioned in Environmental Monitoring Plan of report. Each monitoring schedule shall be over a duration of 12 hours (6AM to 6PM), once. The monitoring shall be carried out in accordance with CPCB norms.	Construction	Nos.	15	2000	30000	Monitoring Cost
5	Biodiversity Assessment	Construction	LS	-	-	800000	Monitoring Cost
6	Sludge analysis during construction phase	Construction	Nos.	2	15000	30000	Monitoring Cost
7	Soil quality as per the list of parameters mentioned in report	Construction	Nos.	12	10000	120000	Monitoring Cost
8	Consultations (quarterly basis)	Construction	Nos.	40/yearly	1000	40000	Monitoring Cost
9	Tarpaulin for covering soil, storage of raw material etc.	Construction	LS	-	-	30000	Monitoring Cost
10	Solid waste management including C&D waste, MS, Plastic waste & e-waste: Contingency Cost	Construction	LS	-	-	200000	Actual Cost To be included in Works Cost. Allocation in ESMP residual Costs is for emergency/contingencies
11	PPEs & safety instruments for workers	Construction	LS	-	-	200000	Actual Cost To be included in Works Cost. Allocation in ESMP residual Costs is for emergency/contingencies



Sr. No.	Description	Stage	Unit	Quantity	Rate (Rs)	Amount (Rs)	Cost Covered by
12	Labour Facilities and Camp	Construction	LS	-	500000	500000	To Be included in Contractors Project Work Costs. This amount here is lumpsum for any contingencies
13	Consent to Operate	End of the construction	LS	1	350000	350000	Statutory fee by AMC & application by DBOT contractor cost
	Subtotal (C)					3110000	
	Operation Phase - Per year cost						
1	CTO Renewable Fee	Operation Phase	Nos	1	5000	5000	Statutory fee by AMC to be included in Project Cost application & liaising by O&M contractor cost
2	Air quality and odour monitoring during O&M phase at locations mentioned in Environmental Monitoring Plan of report. The parameters to be monitored are SPM, RPM, SO2, NOx and CO, CO2, CH4 and Lead, any other. Each monitoring schedule shall be over a duration of 24 hours (in 8-hour shifts), once	Operation Phase	Nos.	3	10,000	30000	Monitoring Cost
3	Inlet and outlet parameters of STP	<b>Operation Phase</b>	Nos.	6	10,000	60000	Monitoring Cost
4	Water quality monitoring during O&M phase at locations mentioned in Environmental Monitoring Plan of report. The sampling shall be carried out and cover all parameters as per IS10500 including heavy metals.	Operation Phase	Nos.	24+8	10,000	320000	Monitoring Cost
5	Noise quality monitoring during O&M phase at locations mentioned in Environmental Monitoring Plan of report. Each monitoring schedule shall be over a duration of 12 hours (6AM to 6PM), once. The monitoring shall be carried out in accordance with CPCB norms.	Operation Phase	Nos.	3	2000	6000	Monitoring Cost



Sr. No.	Description	Stage	Unit	Quantity	Rate (Rs)	Amount (Rs)	Cost Covered by
6	Biodiversity Assessment	Operation- annual	LS	-	-	800000	Monitoring Cost
7	Sludge analysis during O&M phase	Operation	Nos.	3	15000	45000	Monitoring Cost
8	Soil quality as per the list of parameters mentioned in report	Operation	Nos.	3	10000	30000	Monitoring Cost
9	Green Belt Maintenance	Operation Phase	Nos	LS	-	1000000	Greenbelt is to be included in Project Cost. Here only monitoring cost & emergency support costs included
10	Solid waste management including C&D waste, MS, Plastic waste & e-waste	Construction	LS	-	-	100000	Actual Cost To be included in Works Cost. Allocation in ESMP residual Costs is for emergency/contingencies
11	PPEs & safety instruments for workers	Construction	LS	-	-	200000	Actual Cost To be included in Works Cost. This allocation in ESMP residual Costs is for emergency/ contingencies
					Subtotal (D)	2596000	
	One time cost - Preconstruction & Construction Phases (B+C)					3959050	excludes consent/ permit fees which shall be included in project cost
	O&M Cost - Annual					2496000	excludes HR cost
	Recurring cost O&M period of (2+10 years)					29952000	excludes consent/ permit fees which shall be included in project cost
TOTAL ESMP COST including all subproject phases: Monitoring Costs and ESMP Residual Costs (other than those included in <b>33911050</b> Contractors Works Costs, Permit/Licence Costs and Human Resources Cost)							

Note:

1. DB period is considered as 4.5 years (refer G56)



2. Pre-construction phase is considered as 1 year (Refer G26)

3. O&M Period is considered as 10 years (Refer G58)

4. HR cost for Environment and Social persons for Contractor is considered for 1 year (Refer G3 and G4)



## 6.6 Environmental and Social Commitment Plan (ESCP) Compliance

Key measures and timeframes required for the project to meet the requirements of the ESSs are as follows: i) AMC will establish and maintain an E&S organizational structure in PIU with qualified staff to support the management of E&S risks including Environmental, Biodiversity, Heritage, OHS/CHS, &R, Gender experts as required to prepare E&S mitigation/ management measures; ii) AMC to prepare draft ESIA; iii) Disclose Draft Environment and Social Impact Assessment (ESIA) in AMC website and WB external website; iv) Disclose Draft Stakeholder Engagement Plan; v) AMC to develop and include the project grievance mechanism in SEP and vi) disclosure of the approved ESCP, vii) prepare bid documents incorporating the approved ESMP requirements, before initiating the bidding process. These actions were completed before Project Appraisal. Final ESCP and ESIA, ESMPs were disclosed before appraisal.

- Prepare, and disclose ESIAs for Vasna 126 MLD subproject for STP rehabilitation based on the Feasibility Report to initiate DBOT Contractor procurement following ESMF procedures
- DBOT contractor to update/ prepare ESIAs based on the proposed detailed design before initiating any work-related activities
- Identify "Associated Facilities" as per ESF by screening all sub-projects during the DPR stage. Ensure that all Associated Facilities meet the requirements of the ESSs, to the extent that AMC has control or influence over such Associated Facilities. In cases where the requirements of the ESSs cannot be followed, the Bank will require AMC to demonstrate the extent to which it cannot exercise control or influence over the Associated Facilities by providing details of the relevant considerations, which may include legal, regulatory, and institutional factors. The Bank team will review each case and make a final decision based on available facts and information.
- Design should be responsive to the quality of sewage received at the inlet, and measures shall be incorporated to meet the suggested standards
- Bidding documents and contracts to include ESMP and Monitoring Plan to enable the DBOT contractor to allocate appropriate time, resources (manpower and budget) for implementing ESMP
- Update as required, get approvals, disclose and implement the Environmental and Social Management Plan (ESMP) for Proposed Rehabilitation of Vasna 240 MLD STP subproject. ESIA has been revised and redisclosed based on revised FR in August 2023
- Obtain environmental clearances, licenses/approvals, and permits under the existing legal framework that apply to the subproject and all its activities from relevant national and/or local authorities.
- Incorporate the relevant aspects of the ESCP, ESMS, ESIAs, ESMPs, including the relevant E&S documents and/or plans, and the Labour Management Procedures, into the ESHS specifications of the procurement documents with contractors. Thereafter ensure that the contractors comply with the ESHS specifications of their respective contracts
- Hydrological and flood assessment including a study on Dam Break Analysis & Flooding Stimulation, preparation of inundation maps and emergency action plan for Vasna Barrage has been completed and results of that has to be considered in design of the facility construction and operations and emergency response plans appropriately considering community and worker health and safety and pollution impacts, specifically during emergencies and climate events to prepare C-ESIA / C-ESMP
- Preparation of Contractors-ESMP will include Hazardous and non-hazardous waste management plan, Waste Management Plan (including bio-degradable/non-



biodegradable, C&S, biomedical, E-waste, Hazardous wastes, sludge from all parts of STP, biogas plant / operations, and slurry), OHS Plan, SEA/SH Action Plan, Community Health and Safety Plan, Labour Management Plan, Traffic Management Plan, Waste Management Plan, Workers' Camp Management Plan, L&FS Plan, etc. that will be acceptable to AMC, and the World Bank

- Prepare, adopt, and implement occupational, health, and safety (OHS) measures specified in the LMP.
- Monitor and Supervise OHS at all sites through supervision contractor as an integral part of construction supervision and Conduct OHS Audit and implement suggested actions to improve work safety
- Contractors EHS person shall have qualification in Life & Fire Safety, and prepare L&FS plan and implement the same
- Monitor all emissions/discharges/disposal of wastes from project facilities during construction and operation stages and ensure that the discharges from project facilities into the environment are as per the latest limits suggested by MoEFCC, GPCB, and National Green Tribunal whichever is stringent for each parameter. The technology shall be upgraded to meet the directions of GPCB in the consent orders, and any stringent standards suggested by regulators.
- Treated Effluent reuse: Treated sewage shall be disposed into Sabarmati River following the existing Consent conditions of the GPCB. This shall be informed by AMC to Irrigation Department and Department of Agriculture as currently treated sewage is being discharged into Fatehwadi Canal as requested by Irrigation Department, without permission from the regulatory authority, namely GPCB. (Infrastructure for such discharge; i.e. outflow channel to Fatehwadi Canal and the canal itself for carrying sewage for irrigation are currently existing in both 240 MLD & 375 MLD STPs). In case AMC and irrigation department decides to continue reuse of treated sewage for agriculture from the bank supported project, (i) permit for the same shall be obtained from GPCB (and that AMC has already informed irrigation department that they can continue discharge into the canal only after receiving permit for this from GPCB), (ii) AMC & Irrigation Department shall discuss & decide on the quantity of water required for such discharge after obtaining permit; and alternate arrangements if any required to be arranged for irrigation (so as to help with lesser available water for irrigation) as this discharge will be stopped starting from / during construction till permit is obtained; (iii) AMC with the support of Irrigation Department shall undertake a study on reuse of treated effluent for irrigation in line with the Central Pollution Control Board's Guidelines of Reuse of Treated Water for Irrigation, 2018, through reputed Agricultural University with stakeholder consultations as per the Guidelines and after agreement with stakeholders and permit from GPCB discharge the treated sewage so as to avoid any negative environmental and health issue on downstream communities.
- Ensure that pollution from project facilities does not negatively impact the environmental components and downstream communities. Undertake annual Pollution audit and OHS audit as part of E&S Audit and confirm this.
- Contractor to monitor and ensure continuous and as required by consent conditions or any regulation or guidance; quality of treated sewage discharged from the facility or recycled and reused
- Prepare, adopt, and implement measures and actions to assess and manage specific risks and impacts to the community arising from Project activities (including risks related to the behaviour of the project workers, labour influx, increased traffic, increased social interactions between project workers and communities, increased



construction activities, etc.). Incorporate these measures in the Community Health and Safety Plan as part of Contractors ESMP.

- Conduct disaster evaluation and extreme weather conditions assessment considering earthquake proneness, and flooding / other risks if any due to presence of Barrage or any disasters; and incorporate avoidance, mitigation, and management measures and Prepare Disaster Management Plan including Standard Operating Procedures for each STP (as part of DPR, ESIA). Operations shall also follow the latest Disaster Management Plan for Gujarat
- Prepare and implement chance finds procedure described in the ESMPs and include as a requirement in ESIA/ ESMP and also in the procurement documents for civil works
- Training Calendar in ESMF and specific training aspects in ESIAs to be followed. Additional training will be identified during the project implementation period. Provide training for Project workers on occupational health and safety including on disaster prevention and emergency preparedness and response



# CHAPTER 7. INSTITUTIONAL ARRANGEMENTS

## 7.1 Proposed Institutional Arrangement for Implementation of ESMP, Supervision, Monitoring

The implementing agency for this project will be Ahmedabad Municipal Corporation (AMC). The subproject will be implemented on DBOT mechanism. Compliance with the Environmental and Social requirements established in the ESMP will require a sustained intra and inter agency coordination efforts among key agencies, consultants and other project related stakeholder.

For G-ACRP, considering the need to manage E&S aspects for sewerage, it is recommended to create a Separate ESF Cell in AMC named the **Sustainable Urban Development Unit (SUDU)** in the PIU of AMC, to integrate environmental and social aspects well into all operations of the drainage Department, those under G-ACRP and all other activities carried out by AMC in this sector to ensure long term sustainable outcomes and health benefits to the inhabitants. For overall project support, the services of a Project Management Consultant (PMC) will be used. The proposed Institutional Framework for E&S Management under G-ACRP is presented in *Figure 31*.



#### Figure 30: Proposed Institutional Framework for E&S Management

- Planning and implementation of ESMP
- Ensuring that the social and environmental protection and mitigation measures in the ESMP are incorporated in the Contractors ESMP and Construction Environmental and Social Management Plan (CESMP);
- Ensuring dedicated staff for social and environmental managers to oversee CEMP implementation



- Supervision and monitoring of the progress of activities of the consultants and contractors for the implementation of different components of ESMP
- Provide guidance to AMC, contractors in conducting subsequent monitoring and reporting and in undertaking corrective options
- Responsible for modifications to the ESMP when unforeseen changes are observed during implementation.
- Ensure submission of periodical environmental and social management and monitoring reports to the steering committee
- Submit semi-annual monitoring reports on ESMP implementation
- Ensure the establishment and implementation of an environmental and social management system;
- Implementation of environmental monitoring measures (such as environmental quality monitoring, tree plantation, landscaping, wildlife monitoring) during the O/M stage of the Project.
- Implementation of compliances for labour related aspects such as health, safety, welfare, payments, amenities, incidents and accidents, labour camp, etc
- Implementation for community health impacts a result of the project related activities such as dust, traffic movement, noise, etc during construction and operation phase.
- Implementation of management plans prepared for various aspects Chance Find Procedure, plan for SEA/SH.
- Implement Grievance Redressal Mechanism appropriately.
- Ensure that contractors have displayed all information regarding GRM, Health and safety, SEA/SH, etc at site/labour camp and at other designated sites.
- Promote improved social and environmental performance through the effective use of management systems;
- Maintaining documentation and reporting of all implemented action/management plans.
- Conducting consultations from time to time as required under implementation.
- External communications with other government, semi-government and nongovernment organizations, universities, research institutes in the country on the matters of mutual interest related to environmental management and filming of activities to be carried out under the project development.

## **Contractor:**

The contractor will be primarily responsible for preparing implementing the CESMP. Each contractor will be recommended to have one Environmental Specialist and one Occupational & Social, Health and Safety (OHS) Specialist, who will be working in close coordination with the environmental staff of Supervision Consultant of PMU and PIU. The main functions of the contractor with regard to environmental and social management and monitoring are to:

- After detailed design and prior to the start of construction, prepare the C-ESIA and CESMP and other method statements and management plans according to requirements of this ESIA/ESMP. This shall include the requirements / findings of the Flood Risk assessment study for Vasna Barrage
- Recruit qualified environmental and social safety officers (ESO) to ensure compliance with environmental and social contractual obligations and proper implementation of CESMP;
- Provide sufficient funding and human resources for proper implementation of CESMP;
- Prepare monthly reports related to environmental and social management and monitoring for review and verification by the PIU;



• Prepare and implement an Environmental Management system according to the requirement specified in ESIA, WG EHS and ISO 14001.

The PMC will have two Environmental experts (one Environmental Engineer and EHS specialist, and another Environmental Planner/Specialist) and two (2) Social Development and Gender Experts who will coordinate and support ESF specialists of PIUs during the preparation, implementation, monitoring, and reporting of E&S aspects. Experts on Cultural Heritage, Biodiversity Conservation, Hydrology and EHS shall also be made available by the PMC as required. They will ensure that all records on E&S aspects are up to date and well maintained and easily accessible in hard and soft form.

Contractors who will implement subprojects on site will have E&S experts and EHS Site officers to prepare, update ESMPs to reflect actual site/design aspects, to monitor, ensure, report, and maintain up-to-date documentation on the implementation of E&S aspects on site regularly. DBOT contractor or the Consultant who updates E&S documents for DBOT contractor and deliver capacity building activities shall have Environmental, Biodiversity, Heritage, R&R, Gender experts as required to update ESIA, ESMP, E&S mitigation/management measures and work with design consultants on integrating E&S aspects in design ensure that ESMPs and other aspects are well updated.

Considering the Occupational and Community Health and Safety (OCHS) issues which would be important while upgrading existing STPs, PMC OCHS specialist / supervision team will monitor E&S aspects and OHS aspects on-site and report regularly to PIU as part of CSQA. Annual E&S Audit will be conducted through third party E&S auditors who will monitor compliance to ESMF, OCHS on-site (may be same consultants or separate for ESMF compliance and OHS) and report with suggestive corrective actions for non – compliance.

Three types of monitoring and reporting are envisaged here including Third Party, external, and Internal. Internal monitoring is a continuous process undertaken by contractors E&S persons, PMC (who will carry out regular monitoring on all E&S aspects and special monitoring on OHS and CHS hand in hand with Civil Work Monitoring) and PIU; and a third party will undertake an annual E&S audit. Subproject level monitoring will be as follows:



# Table 50: Subproject Monitoring Schedule

Subproject	Category	I	nternal Monitoring			External Auditin	g
Stage	Agencies	Contractor / Consultant	РМС	PIU	WB	Supervision consultant	E&S Auditor
Design Stage	Inclusion of findings of ESIA in Design, Scheduling	Include ESIA findings in Design, BoQ, Bid docs	Design, BoQ, Bid documents	Clear	Design review &	Design Review	Annual E&S Audit, submit
Implementation	ESMP updation				suggest		to PIU and
	Labour Housing /Camp	-			corrective		finalize
	ESMP, CHMP Implementation	-			actions		incorporating
	OHS Management Plan	-			during		PIU, WB
	Labour Camp	Proparo boforo the start			semi-		comments
	Traffic Management Plan	of site works	Review	Clear	missions/		
	Waste Management Plan				technical		
	Water, Air, Noise Mgmt Plans				visits as		
	Tree cutting, compensatory plantation, and Green belt			required			
	Enhancement measures	-					
	ESMP Implementation	Daily monitor; submit a weekly report to PMC	Review weekly report of the contractor, verify on-site quarterly or as required, suggest	<b>Review Monthly</b>	Review		-
	OHS & Incident Reporting (Incident Register)			report of PMC, verify on-site monthly or as required, suggest	QPR, verify &	Review fortnightly and submit a	
	Labour welfare, Labour Camp (Labour register)				suggest corrective	monthly report to PIU	
	Traffic Management	-	corrective actions,	corrective actions,	actions		
	Waste Management (Waste quantity Register)	-	prepare a monthly report with details,	compile QPRs and submit to WB	during semi-		
	Biodiversity, Tree cutting and plantation, Green belt (Green Register)	-	corrective actions		annual missions/		
	Enhancement measures	Monitor as required/as	•		technical	cal	
	Monitoring of environmental and social parameters	per plan, submit as part of the week's report			visits as required		
Construction and O&M Stage	Monitoring of environmental and social parameters	Monitor as per Plan	Verify, suggest correc	tive actions, monitor		Review fortnightly and submit monthly report to PIU	Compliance Audit Report to AMC, GPCB



Subproject	Category	In	Internal Monitoring				External Auditing	
Stage	Agencies	Contractor / Consultant	РМС	PIU	WB	Supervision consultant	E&S Auditor	



Contractors E&S Experts and EHS specialists will monitor daily ESMP compliance on-site at the subproject level, and report weekly to the site engineer. The site Engineer will submit this to PMC E&S experts who will verify every week or as required, and compile these to prepare monthly monitoring reports to PIU. PIU also undertakes site visits to monitor once a month or as appropriate, and compile E&S reports over the quarter and submit to the Bank as part of the project's Quarterly Project Monitoring Report (QPR) or as a standalone E&S quarterly monitoring report highlighting key issues, how issues were managed, and any support required on E&S.

Designated E&S Specialists/experts at various levels shall be responsible for overseeing compliance of the sub-projects to Bank ESF, GoI regulations, and applicable ESMF guidelines. They shall also regularly review the timely implementation of environment provisions as per the ESMP. PIUs and the World Bank review and clear E&S documents and hence, ESIA updated during design stage will be reviewed and cleared by these agencies. Updated ESIA documents incorporating the impacts and mitigation measures of the detailed design prepared should only be sent to WB for prior review after PIU's good quality initial review and sign off. It is also suggested that PIU share the ESF documents with WB by mentioning specific areas in which they need clear guidance. PIUs (with PMC support) also report on progress to the Bank during its six-monthly supervision missions. Corrective actions shall be initiated in a planned manner as appropriate to ensure compliance with the ESMF/ESMP measures.

#### **Reporting Formats**

Reporting formats shall be developed by PIUs to get progress and results data of the project from the field. This will also help in synchronizing and streamlining reporting requirements from the various work sites. These should be part of the Project Operations Manual.



# 7.2 Capacity Building

Proposed Capacity Building Schedule is presented in Table 50.

## Table 51: Training & Capacity Building Schedule

Target Group	Subject	Trainers	Method	Time Frame
Planning and Constructio	n Stage			
PIU Project Director/ Assistant Project Directors, other Staff, ESF/E&S Experts of PIU, PMC other project agencies / AMC project staff/ DBOT Contractor	<b>Environmental and Social Overview:</b> Environmental regulations, and national standards, process of impact assessment and identification of mitigation measures, importance of EMP & monitoring, and reporting	Reputed ES training Organizations	IA Training session	Half or One-day interactive (Year 1: At Project initiation; Year 2: Before Start of activities; Year 3: Mid Term Corrective) Location: Virtual
Engineers, field officers, contractors, supervision consultants, including inspectors of regulatory agencies	<ul> <li>Implementation of ESMPs:</li> <li>Basic features of an ESMP, planning, designing and execution of social and environmental mitigation and enhancement measures, monitoring and evaluation of environmental conditions – during construction and operation.</li> <li>ESMP implementation which includes the mitigation measures developed for the management of the social and environmental impacts identified during the impact assessment process, implementation schedule, roles and responsibilities of various parties, reporting and monitoring requirements during construction and operation phase of the subproject. During implementation of project by design build operate transfer (DBOT) model, ESIA and ESMP will also have to be assessed and updated after finalization of the design and revisions in project footprint, additional land requirements and any other E&amp;S impacts identified at a later stage.</li> <li>Module 1: Environmental Enhancement and Occupational Health and Safety</li> <li>Clearance/ permits/ regulatory aspects</li> <li>Cultural Heritage Management on site</li> <li>Biodiversity Management on site</li> <li>Occupational Health &amp; Safety Training</li> </ul>	Reputed ES training Organizations	IA Workshops and Seminars	One day interactive, Before the Construction begins, and midpoint of approved schedule, Year 2 - end, Year 4 - start and at the close of the Project (Year 5) – near implementation completion stage



Target Group	Subject	Trainers	Method	Time Frame
	<ul> <li>Staff &amp; Labour Code of Conduct</li> <li>HIV/AIDS prevention Training, Best hygiene practices</li> <li>Emergency Response System</li> <li>Behavioral Training</li> <li>Implementation of ESMP provisions</li> </ul>			
	Module 2: Review of Subproject Level Environmental Actions - Review of Environmental Actions at each sub-project - Lessons learned Course Corrections			
Environmental Engineers, field officers, contractors, supervision consultants, Supervisors, Line departments, PMC	<b>Environmentally Sound Construction Practices:</b> Waste management and minimization in construction, pollution control devices and methods for construction sites and equipment, Environmental clauses in contract documents and their implications, Environmental monitoring during construction	E&S, EHS, Heritage and Biodiversity Specialists PIUs, PMCs, Consultants	Seminars, Training session and Site visits	One day interactive, Before the Construction begins, Year 2 - end, Year 4 - start and at the close of the Project (Year 5) – near implementation completion stage
Project staff dealing in social concerns & awareness: Monitoring consultants/ organizations specializing in social management and monitoring to can provide training on social awareness social awareness concerns community social concerns & awareness including SWM, sanitation, alcoholism, violence, traffic diversion/pedestrian safety; labour (management including Health, safety, security, social, welfare, SEA/SH, etc.) interaction with communities, gender and social inclusion/ citizens engagement, as and if required, grievance redressal mechanisms and addressing grievances. <ul> <li>Stakeholder Analysis</li> <li>Participation models in various projects by CBOs, Communities, Individuals, Private parties, PIUs</li> </ul>		ULB/PIU, PMC	Training session, Workshops and Seminars	One day; Before the construction begins and Every Year during construction for refresher training.
Environmental engineers, field officers,	<b>Monitoring Environmental Performance during Construction:</b> Monitoring, Air, Water, Soil Erosion, Noise, and effect on wild life and fisheries, Evaluation and Review of results, implementing and ensuring	Reputed National ESIA training Organizations or by	Training session, Workshop and site visits	One day; Before the construction begins and Every Year during



Target Group	Subject	Trainers	Method	Time Frame
contractors, supervision consultants	compliances related to Labour (Health, safety, welfare, labor camp, payment, training, health check, PPEs etc.), Preparation of Contractors ESA, revisions of ESIA and ESMP after finalization of the design for updation and revisions if and as required, Evaluation and Review of results, Performance indicators and their applicability, possible corrective actions, reporting requirements and mechanisms	hiring adequate experts		construction for refresher training.
Contractor's staff, subcontractors	<b>Community &amp; Occupational Safety and Health:</b> Monitoring consultants/ Organizations specializing in community & occupational, health and safety issues to provide training on this issue, mandatory and statutory compliances regarding labour, licenses, permissions and information dissemination. SOP for project activities which have identified risks and require specific training, awareness and PPEs before execution.	Reputed National OHS/CHS training Organizations or by hiring adequate experts	Workshops and seminars	One day; Before the construction begins and Every Year during construction for refresher training.
Construction laborers	Occupational health, waste handling and sanitation at construction sites/ labour camps, Health, Safety and medical procedure to be followed and mandatory PPEs required for activities undertaken.	ReputedNationalESIAtrainingOrganizations or byhiringadequateexperts	Training session and Workshops	One day; Before the construction begins and Every Year during construction for refresher training.
Construction labourers	All aspects and compliances related to labour rights, health, safety, security, welfare, code of conduct, amenities and facilities at camp site, labour camp management, mandatory and statutory compliances, awareness on the labour related GRM, overall contractor obligations with respect to labour management, etc. Gender awareness, grievance redressal mechanism, safety and medical services provided, payment made and procedure followed, Gender and gender-based violence awareness during construction and operation activities.		Training session and Workshops	One day; Before the construction begins and Every Year during construction for refresher training.
Construction labourers (Camp & Site)	Safe work practices including precautions to be taken and any procedure that needs to be followed due to Covid-19 or any other health/medical emergencies, PPEs, first aid box, insurance, emergency response for accidents and incidents, EHS officers on site, traffic management and pedestrian safety etc.	Reputed National ESIA training Organizations or by hiring adequate experts	Training session and Workshops	One day; Before the construction begins and Every Year during construction for refresher training.
During Operation Phase				



Target Group	Subject	Trainers	Method	Time Frame	
Environmental engineers, field officers, contractors,	Long-term Environmental Issues in Project Management: Designing and implementing environmental surveys for ambient air, noise, biological and water quality, data storage, retrieval and analysis, contract documents and environmental clauses, risk assessment and management, contingency planning and management and value addition. Training of staff/ workers engagement in O&M on all labour related issues mentioned above	ReputedNationalESIAtrainingOrganizations or byhiringadequateexperts	Workshops And seminars	One day; Before the construction begins and Every Year during construction for refresher training.	
General public and bridge users	Wildlife protection and environmental protection awareness program, citizens engagement.	ReputedNationalESIAtrainingOrganizations or byhiringadequateexperts	Seminars, workshops	Construction and operation stage	



### 7.3 Grievance Redressal Mechanism

One of the main requirements of the ESMP is to implement an effective grievance redress mechanism in respect of the environmental and social issues of the stakeholder. The types of grievances stakeholders may raise include, but are not limited to:

- Construction related impacts cracks, damages to structures; dust damaging crops, trees
- Health and safety risks.
- Negative impacts on the environment
- Negative impacts on communities, which may include, but not be limited to financial loss, physical harm, and nuisance from construction or operational activities and GBV, SEA/SH.

AMC has a functional complaint system (CCRS, http://www.amccrs.com) which includes a web portal and a toll-free number. It records almost 40-50 thousand complaints every month. Any complaint registered in the system is forwarded to respective zones for action. Each complaint has a proper system by which it can be escalated if one is not happy with the resolution. If some complaints come directly to the zonal office (mostly from the urban poor) they are recorded in the main system. The CCRS is synced with the Gujarat Government's CM Helpline and any complaints coming there are also recorded in the system.

- There shall be separate subproject Grievance Redressal Committee (GRC) consisting of following members:
  - Project Environmental/ Social Specialist from AMC
  - Elected member from Ward/ Zone of project implementation
  - Member from PAPs/ workers of the project. Women workers will be encouraged to participate
  - Local NGO working on labour and Gender related issue.
  - Women CO/ACO from the Mission Mangalam, Urban Community Development Department of the AMC.

The main responsibilities of the GRC will be to

- (i) provide support to PAPs on problems arising from land/ property acquisition;
- (ii) record AP grievances, categorize, and prioritize grievances and resolve them;
- (iii) immediately inform the PMU of serious cases; and
- (iv) report to PAPs on developments regarding their grievances and decisions of the GRC and the PMU. Other than disputes relating to ownership rights under the court of law, GRC will review grievances involving all resettlement benefits, compensation, relocation, replacement cost, and other assistance; noise, traffic, odor, and other grievances related to the environment.

The Environmental/Social Specialist at the project level shall carry out the following as regard to redressing grievances:

- Ensure that the GRM is in place and is functional
- The GR process/procedure is inclusive and accessible to all stakeholders with project grievances
- GRM is accessible for those with grievance related any of the above-mentioned sub project level grievances.
- The GRM is effective is addressing grievances in a timely and appropriate manner.
- Grievances of PAPs will first be brought to the attention of the site office level of the PIU which shall be redressed within two weeks from the receipt of complaints. The grievances will be



received through online registration (phone/email, etc), grievance register maintained at the security gate. Grievances not redressed by the PIU staff (field level) will be brought to the Grievance Redress Committee (GRC) which shall be redressed within four weeks from the date of receiving the complaint at PIU. The chairperson of the GRC shall communicate the committee's decision to the aggrieved party in writing and maintain a record of all decisions related to each case.

Documentation and recording for grievances shall be maintained with details of resolution at the sub project/project/PMU level. Records of grievances will include contact details of the complainant, the date the complaint was received, nature of the grievance, agreed corrective actions, and the date the corrective actions were affected, and the outcome.

Consolidated reports will be submitted to GRC and for status of grievances on monthly basis during construction and quarterly basis during operation phase.

Information about Project/Sub project GRM shall be published as part of initial disclosure consultations. Brochures will be distributed during consultations and public meetings, and posters will be displayed in public places such as in government offices, project offices, at gate of the project site office, etc. Information about the GRM will also be posted online on the AMC website. The GRM details including manner of filing grievances, Grievance cell officers, Grievance officer at site, etc will be displayed in local language (Gujarati), Hindi, at STP site, in labour camps and in contractors and sub-contractor's office at site and with supervisors. Grievance register will also be maintained at the gate/security office at gate of the STP premises and labour camp in local language (Gujarati)/ Hindi.

Complainants not satisfied with the GRM process of the sub project/AMC can approach the mandatory body/authorities such as the CPCB or the Gujarat Government's CM Helpline or take recourse in the legal system and approach the civil courts.



# **CHAPTER 8. PUBLIC CONSULTATION AND INFORMATION DISCLOSURE**

## 8.1 Objectives of Public Consultation

The objectives of the public consultations for the project and for this ESIA is to:

- Inform and disclose the proposed project to the stakeholders.
- Assess the stakeholder interest and involvement with the proposed project
- Enable them to give their views and option with respect to the project.
- Ensure that appropriate project information on environmental and social risks and impacts is disclosed to stakeholders in a timely, understandable, accessible, and appropriate manner and format.
- Provide a means for effective and inclusive engagement with project affected parties throughout the project life cycle.

#### 8.2 Legal Requirements

ESS 10 recognizes the importance of open and transparent engagement between the Borrower and project stakeholders as an essential element of good international practice. Effective stakeholder engagement can improve the environmental and social sustainability of projects, enhance project acceptance, and make a significant contribution to successful project design and implementation.

Consultations also have to be conducted for any mandatory land acquisition under The Right to Fair Compensation and Transparency in Land Acquisition, Rehabilitation and Resettlement Act, 2013, and in Scheduled areas or if the displaced/affected population is largely from Scheduled Tribes.

#### 8.3 Approach to Public Consultation

Consultations have been carried out for information, participation and disclosure.

Consultations have been carried out with various stakeholders including squatter's settlement inhabitants, STP operators, AMC officials during preparation of ESIA for sub project and SEP for G-ACRP project. Due to Covid -19 pandemic and restrictions, consultations were carried out, from August to November 2021, online and as well as in person and due precautions were followed for site activities. Public disclosure and consultation was also held in February, March and June 2022. Outcome of the consultation is given below and post disclosure outcomes are included in Annexure VIII.

Group	Key points raised
Adjoiningresidentialarea/UrbanPoor/slumdwellers/migrants/squattersVillagers in Juhapura (adjoining126MLDSTP,GyaspurGyaster settlement (adjoiningVasna,approx.STP – 10m)14:2men	<ul> <li>Migrants have faced loss of income and earnings due to pandemic. Income is gradually picking up.</li> <li>Daily wage labour, mostly skilled and unskilled workers.</li> <li>Family size is between 5 to 10 people with 3 to 10 children.</li> <li>For Health and Education, they use AMC, municipal services.</li> <li>Squatter households do not have access to some municipal services such as drainage and sanitation as it is a squatter settlement. People mostly practice open defecation near highway or forest areas and other areas which are accessible to them.</li> </ul>
Post disclosure SE: 61 (Females and Males)	<ul> <li>Some squatters have approached concerned Government depts such as electricity dept for providing meters and power supply, water supply dept for providing tap water.</li> <li>Migrants are mainly working in industries and labour work, construction etc.</li> </ul>

Table 52: Outcome of Consultations



Group	Key points raised
	<ul> <li>In Juhapura, formal/informal settlement adjoining the 126 STP, there are issues with respect to lack of sanitation, infrastructure and other amenities. Odor traffic related issues were not of concern.</li> <li>For resolving grievances related to municipal services such as provision of water supply and electricity, people approach local municipal staff at field level or NGOs working in the squatter settlement.</li> <li>They draw water from the borewell and groundwater is of very poor quality.</li> <li>People were not aware of the online GRM of the AMC and were comfortable with face-to-face interactions at local level or near habitation.</li> <li>Squatter settlement did not have any specific issues related to upgradation and have experienced odor issues rarely in the past. They have informed the security personnel at the STP gate about the issue and asked them to inform the senior officials at STP for resolving the same.</li> <li>Some of them have goats which fall ill when take to the Sabarmati river for drinking and hathing</li> </ul>
Downstream users' villages and Fatehwadi canal – sarpanch/ex- sarpanch (telephonic)	<ul> <li>The government has stopped the water usage from the Sabarmati river. Irrigation and water supply are through the borewell due to release of polluted water in the river from industries. The villagers have no issue from the river water and they are not using it due to government directions. Sewage water from the village is released into the village talav.</li> <li>For drinking water, downstream villages use borewell/tube-well and also get water from Narmada canal for drinking. Water from CEPT/ STP is released in the river due to which there is some problem.</li> <li>Problem due to release of effluent into river and Pollution Control Board. STP is functioning but issue is related to industries pollution. The concerned villages have taken up the case with PCB. The matter is with PCB for resolution and River Action plan has been prepared for Sabarmati river.</li> <li>Cultivation near river is affected due to pollution related issues in the river. Land, cultivation and crop are affected due to river pollution and land has become hard. Sometimes water in dug wells and borewells is also affected due to river pollution and over extraction of groundwater.</li> <li>Factories use borewell to extract water which affects ground water quality.</li> <li>Solution for downstream villages for accessing good water quality is through water harvesting within the villages.</li> </ul>
3 NGOs with total of 4 women respondents.	<ul> <li>NGOs that are working on issue of housing for the urban poor in Ahmedabad reported that in Ahmedabad city, housing was provided to LIG/urban poor due to infrastructure development and other projects and removal of encroachments which LIG households refused and preferred staying in shanties and encroachment on roads.</li> <li>Construction workers need to be provided with better civic amenities at construction sites</li> <li>During pandemic time health and hygiene issues were neglected</li> <li>There could be several settlements which are on encroached land or houses are on the drain. Some of the slums have issue of drainage and mixing of drinking water with drain water.</li> <li>In periphery slums individual connection of sewer lines is a problem. They have mostly soak pits.</li> <li>Solid waste is collected but not recycled.</li> <li>Vulnerable groups do not have access to the GRM of AMC.</li> </ul>



Group	Key points raised
Contractors- 3 Nos.	<ul> <li>Inputs from Contractors based on their past experience with similar projects:</li> <li>to be on an equal platform and have equal bearing on both parties.</li> <li>Time and cost increase if there are constraints in implementing</li> <li>Health issues in some workers working in STP. Issues related to odor.</li> <li>All policies and compliances are included in RFP and tender document</li> <li>Lesser women work in STP in Vasna due to time duration on travel, remoteness of site etc.</li> <li>Issues related to STP include, old equipment, weathering of machinery and equipment. Need to assess if modification to existing features and equipment can result in better performance of the machinery and equipment.</li> <li>There are instances of influx of heavy chemical water into the sewage which may impact the durability of the structure and equipment.</li> <li>For addressing any issue or concern, contractors have a day-to-day contact with AMC for taking up any issues related to their work. They occasionally speak to Exe engineers or CE if required. Since they have a specific mandate and most aspects are covered in RFP, grievances are reduced.</li> <li>Solar power is not used in any of the STPs</li> </ul>
	<ul> <li>Rainwater harvesting is not implemented in any of the STPs</li> </ul>
Draft ESIA and ESMP (mitigati presented below:	on were discussed <sup>51</sup> with the identified communities and groups and outcomes are
Squatter settlement (60)	<ul> <li>Dust will be reduced and condition would be better for pedestrian. It would benefit for the settlement inhabitants.</li> <li>Provisions of drinking water, electricity and sanitation for the settlement from AMC.</li> <li>Reduction in crime if there is street lighting in the area.</li> <li>Availability of labour opportunities for people in settlement during construction or operation in the STP.</li> <li>Mechanism if there are any problems during construction, how can they complain and to whom.</li> <li>Safety and security of the inhabitants (especially women and children) if labour camp is set up in the community.</li> </ul>
Juhapura (6)	<ul> <li>Road repairs and upgradation would benefit the people. Road repairs and upgradation should be extended as public from Juhapura use the access road by walking and by two wheelers.</li> <li>Anticipate decrease in odor in Fatehwadi canal, in operation.</li> <li>Anticipate decrease in mosquitoes and insects in the locality.</li> <li>Anticipate Increase in noise and traffic issues during construction. mitigation of the same was discussed.</li> </ul>
Downstream Villages (7)	<ul> <li>Issue of pollution is with reference to industrial releases in the river which has impacted downstream villages. Matter should be addressed by GPCB. Villages have approached the GPCB and court.</li> <li>New action of AMC disconnecting industrial outlets into river and AMC drains will help reduce pollution.</li> </ul>

<sup>&</sup>lt;sup>51</sup> February and March 2022



Group	Key points raised
	<ul> <li>Water should be treated and good quality should be released so that farmers in the downstream villagers can benefit.</li> <li>Government should initiate water/sewage treatment plants for river water in the downstream villages.</li> <li>There should be more control over factory releases as sewage water is not the issue, industrial effluents is a problem.</li> <li>People want to be informed about the details of the GRM for the river pollution so that they can approach concerned authorities not necessarily AMC as issue is directly related to GPCB, not AMC.</li> <li>Want to be informed about measures taken to prevent release of sewage water in river during construction or if volume is greater than plant treatment capacity.</li> </ul>
Disclosure of the ESMF and Draft ESIA <sup>52</sup> (61)	<ul> <li>Institutional framework, Review project details, baseline, improvements of quality of water in Sabarmati by improved project technology. Monitoring of the E&amp;S aspects. All these are described in the ESIA and ESMP. All bodies involved in the process, roles and responsibilities of different organizations under this projects such as AMC, PIUDC, GUDA, etc.</li> <li>There is no land acquisition in these projects.</li> <li>Samples are collected: noise quality, sludge, air, water etc. and analysed. Details are given in the ESIA report and mitigation measures are described in the ESMP</li> <li>Findings of the project. Not ecological sensitive areas in Ahmedabad. Air pollution concerns</li> <li>CND wastes, improvement of water quality and sludge post implementation.</li> <li>water quality in Sabarmati river will improved due to technology and NGT standards.</li> </ul>
	PMC will be appointed for the project. Participants to give their comments, views and suggestion for the ESIA and ESMP uploaded.
Public consultation held on 7 <sup>th</sup> June 2022, in the Pandit Dindayal Auditorium, Bodakdev, Ahmedabad (160)	• Will other STPS be upgraded considering the total sewage received for city, Storm water and gutter connection was taken by residents after payment and the same has been removed by AMC. What is proposed to be done to rectify this issue.
	<ul> <li>How will the sewage generated and bypass be dealt with during construction period of 126 MLD STP?</li> <li>Naroda, Vatva and other areas with common ETPs there are issues with respect to the releases of effluents and it has been highlighted in various reports and studies carried out by different organizations. How will the untreated industrial be treated?</li> </ul>
	<ul> <li>Data pertaining to census 2011. Data should be updated for recent areas.</li> <li>Many workers/labour will be hired. There are violations of labour standards and non-compliance in AMC projects. Many workers have lost their lives and health and safety compliances are violated especially in storm water works.</li> </ul>

 $<sup>\</sup>label{eq:solution} {}^{52} https://ahmedabadcity.gov.in/portal/web?requestType=ApplicationRH&actionVal=viewAttachment&queryType=Select&screenId=2900003&AttachmentFileName=ESMF.pdf$ 



Group	Key points raised
Response	<ul> <li>AMC gives funds for labour welfare for workers. There is committee to raise the violation. Rehabilitation of the migrants' colonies who may be affected and who don't have drinking water, sanitation and other facilities. Whether details for use of treated water in industries is available.</li> <li>For all sub projects design and technology will adhere to NGT standards for discharge of treated water; these are two priority investment projects and rest of the sewage treatment also will be taken care further through other projects of new STPs and upgradation of old STPs. 126 MLD STP will be functioning till the time new stream of approximately 120 MLD in the adjacent land inside the 126 MLD STP premises is built and the flow of existing 126 MLD will be diverted to the new stream and then demolition will take place hence there will be no bypass from 126 MLD Campus during construction of 375 MLD STP in campus of 126 MLD STP. Storm water project will be undertaken in other funding schemes like NRCP and Amrut; CETP discharge come under the purview of the GPCB. 3500 connections from industries removed by AMC. Data from Master planning consultants has been used for the reports.</li> <li>PIU will address the issues with help of its labour management plan. Please send suggestions on the email.</li> <li>Discussion is ongoing with industries for reuse of treated sewage. Through Amrut, DPR is being prepared and will be shared after finalization.</li> <li>Industries were reluctant earlier due to easy availability of groundwater. Some industries are now willing to use treated water and discussions are being undertaken with industries</li> <li>In Fatehwadi canal, treated water was being released and studies will be undertaken for the same if we will use treated sewage from 126/375 MLD STP with help of agricultural university, subject to approvals and norms required for use of treated water for irrigation.</li> </ul>
	The ESIA for Upgradation of Vasna 375 MLD STP addresses the above suggestions of the stakeholders by including monitoring of noise, sludge, air and water and its analysis for defining the baseline and mitigation measures. The project suggests improved management of all wastes and treated water quality to confirm with latest NGT suggested standards. Labour health and Safety will be given high priority and appropriate measures to follow and monitor labour regulations have been suggested in the ESMP.

#### 8.4 Information Disclosure

The stakeholder consultations are a continuous process carried out through the project life cycle. During preparation of the ESIA, discussions were carried out in line with the SEP and disclose the key features of the project and the proposed area and components. Based on experience with similar projects, likely impacts during the implementation stage and potential impacts were also discussed. Draft ESIA will be disclosed on the website of AMC and the World Bank before Project Appraisal. After consultations and finalisation, it will be redisclosed again in the respective websites. Details of three such consultations are attached in Annexure VIII.



# Annexures



## ANNEXURE I: INITIAL ENVIRONMENTAL AND SOCIAL EXAMINATION

#### Subproject Details

Name of Subproject:	ENVIRONMENTAL AND SOCIAL IMPACT ASSESSMENT FOR CONSTRUCTION OF NEW 375 MLD STP AND UPGRADATION OF THE ASSOCIATED INFRASTRUCTURE INCLUDING EXISTING THREE TERMINAL SEWAGE PUMP STATION/S AT VASNA, AHMEDABAD
Subproject Components: (mention all subproject components including Networks, Treatment Plants, Disposal Arrangements, etc.)	<ul> <li>Construction of 375 MLD STP at Existing Vasna 126 MLD sit, repairs &amp; equipment upgrading: Vasna Barrage TSPS, Vasna AUDA 126 MLD TSPS, Vasna Terminal 76 MLD TSPS</li> <li>Demolition / Abandonment: Existing Vasna 126 MLD STP, Abandoning of Vasna 35 MLD STP and existing outfall which is insufficient</li> <li>Laying of Rising main of 2000 mm diameter and length 1.7 km shall be laid from Vasna Terminal TSPS till STP, Additional 33 kV feeders supply shall be fed by Discom from the nearest substation under their jurisdiction, as per the total connected load requirements, up to the metering unit in substation/switchgear building within STP boundary, Construction of a new outfall of 2 x 1800 mm dia pipes</li> </ul>
Associated Facilities if any (Refer ESS 1 for Associated facilities)	Nil (Will be updated at Detailed Design Stage)
Subproject Location (City/ Town/ Village with ward numbers):	Ward No 52, Sarkhej, Ahmedabad, Gujarat,

#### Stage 1: Exclusion List

#### Check the following criteria to confirm if the sub-project is excluded from consideration:

SI No:	Non-permissible Activities	Yes/ No	Description
1	Sub-projects in sites / locations which should be excluded as per	No	Ungradation in existing
	prevailing Rules/ Laws on Natural Habitats and Forests or Archeologically Protected Monuments (National, State, Local): (i) any construction in demarcated Forest areas or protected natural areas or their buffers, (ii) any subproject which would impact critical natural habitats, (iii) any subproject which shall be excluded as per AMASR Act, (iv) any subproject components or activities in the Historic Walled City of Ahmedabad – the UNESCO World Heritage Site		STP site of 126 MLD. The consolidated Consent and Authorization (CC&A) valid upto 30/06/2022
3	Sub-projects in sites/ locations which should be excluded as per applicable siting criteria prescribed by GPCB, Master Plan, Excluded Disaster Zones, or other applicable criteria set out by National, State, Local Body	No	Upgradation in existing STP site of 126 MLD.
3	Subprojects involving (i) Activities that impact the safety of Dams/Barrages, (ii) purchase, storage, and use of Banned Pesticides/ Insecticides/ chemicals/Asbestos, (iii) Construction of CETPs or any facilities to manage industrial / hazardous wastes or effluents	No	Existing STP and no activities involve (i) or (ii).
4	Sub Projects displacing more than 200 tribal households or 100 Primitive Tribal households	No	In existing STP premises of urban area of Ahmedabad City



(Do not proceed to Stage 2; if the subproject is Excluded as per Stage 1 Exclusion List)

Name & Designation of Designated Official in charge:

Signature:

Date:

Verified by: Environmental Specialist of PIU (mark whichever is applicable)

Excluded from the Project	Proceed to Stage 2

Name:

Signature:

Date:

	Project Details				
SI. No	Components	Details			
1	Sub-project components	Rehabilitation of associated existing trunk mains sewer lines and associated infrastructure including laying of new lines by Microtunnelling (Trenchless method).			
		Upgradation of existing process			
		Upgradation and augmentation of existing plant to 375 MLD			
		Laying of proposed new rising main from Vasna Terminal till proposed 375 MLDSTP			
2	Details of Alignment/ Components: (main components including construction activities, environmental infrastructures like STP/	Rehabilitation of associated existing trunk mains sewer lines and associated infrastructure including laying of new lines by Micro tunnelling (Trenchless method) catering to the existing STP. The work would be carried out in existing alignment. Upgradation of existing process			
	ETP and pipelines, disposal of treated/ untreated effluent, sludge, and other	Conversion of existing process with available technology meeting the requirement of NGT standards with corresponding qualitative and quantitative parameters.			
	by-products	As per discussions, new design has been proposed in April 2022. Section I of STP with minimum capacity of 120 MLD shall be constructed in the available 10 ha land parcel before demolition of the existing STP. After commissioning of Section I STP, the remaining land area will be utilized to construct the remaining 255 MLD capacity of STP			

# Stage 2: Environmental Screening Checklist



Project Details										
SI. No	Components	Details								
3	Location of the Project Sites &Landuse (Provide information for all sites	Purpose Cu Hi La	urrent/ istoric anduse	Survey No:	Geo ordinate	Co- es	Owners	ship	Area (Sqm)	
	involved in the project; including for Disposal/ Discharge points, Linked activities/ associated facilities) (attach map)	STP ST	ΓP	AMC	22°58'4 72°31'2	4"N 2"E	AMC		158,307.653 m²	}
4	Quantity of Water Required for Construction and Annual Operations with Details of Source/s (Ground/ Surface)	Approximately 25KLD from existing supply at STP There would be limited water requirement during operation period for admin block and lab, which is about 0.5KL/ day, i.e., about 200Kl/ year.								
5	Power Required and Source of Power	Temporary connection of 415V supply would be taken from Torrent Power during construction period. It will be upgraded to 11KV during actual operation of the plant.								
6	Any Raw material, the chemical used for treatment	<ul> <li>Considering open technology tender the expected raw material and chemicals are as below.</li> <li>1. The chemicals considered are polymer for sludge dewatering and chlorine for disinfection.</li> <li>2. Polyelectrolyte- this will be required for conditioning of sludge.</li> </ul>								
7	Estimated quantity of wastes, sludge, effluent	Quantity of Quantity of Sludge Quantity of Effluent (litres/ day Wastes (Kg/ expected (Kg/ Day)					tres/ day			
	(nealed) unnealed)	υαγι	Approx The slue may go capacit	a. <b>90 M.T</b> dge gene up as the y will incr	/day. ration plant ease.	Average	e flow D	Untro	eated	

#### **Baseline Environmental Conditions**

I.	Environmental Aspects	Yes/ No	Distance in meters	Details on its Importance
1	Is the project site located <b>on</b> or <b>adjacent to</b> any of the following (Provide Distance to these features in meters)			
(i)	Cultural Heritage site, Protected monuments - listed by ASI/ State/ Local Body	NO	1500	Existing 126 MLD STP functioning is proposed to be upgraded. There are no such structures or monuments within 500 metres. The nearest monument is the Fateh Baug Fort which is at a distance of 1.5 kms from the site.
(ii)	Culturally – socially important paths, areas/ religious occupancies, burial grounds, tourist, or pilgrim congregation areas, borders, etc.	NO	-	Not applicable. The location of the subproject does not have any



Ι.	Environmental Aspects	Yes/ No	Distance	Details on its Importance
			in meters	
				ancient monuments and/or archaeological site(s), protected area of local importance. As per the Heritage Department of AMC and data available, there are no tangible or intangible Cultural heritage or protected monuments within the STP premises or adjacent to it. The nearest monument is the Fateh Baug Fort at a distance of 1.5 kms from the STP.
				Masjid Mohuddin at 135 m from the boundary. Ibrahim Masjid at 188 m from the boundary.
				Bag E Sukun Kabrastan (Shia Isthna Ashri Kabrastan) is Iocated 1.2 km away from the STP boundary and is accessible by highway 64 and also through service road. It is Iocated 1.6 km from the gate of the STP compound.
				Marthoma Church Ahmedabad Cemetery is located 1.6 km away from boundary and from the gate it is about 1.6 kms. Therefore, impacts on the same is not anticipated due to project activities.
				Considering Ahmedabad as a Heritage city and the banks of the river Sabarmati as being significant for potential heritage sites, chance find procedure will be framed and implemented for any such discovery during excavation and construction activities within STP premises.
(iii)	Eco-sensitive Areas (ESAs) or Critically Vulnerable Coastal Areas (CVCAs)	NO	-	Not Applicable.
(iv)	Natural Forests/ Protected Areas/ Bio-Reserves Is the subproject in an eco-sensitive or adjoining an eco-sensitive area, with any schedule 1 species? If Yes, which are the area and species?	NO	-	Thol Sanctuary at a distance of around 20 km from site



I.	Environmental Aspects	Yes/ No	Distance in meters	Details on its Importance
(v)	Other Wetlands/ Mangrove/ Estuarine Region	Yes	-	Outflow of the project is connected to the Sabarmati River
(vi)	Natural Habitat areas, Ponds, Lakes, Rivers, Streams, Canals, roosting/nesting areas, spawning areas, breeding areas; areas with natural features like waterfalls, sacred groves	Yes	~40m	Located on the Banks of the River Sabarmati in Ahmedabad. Outflow of the project is connected to the Sabarmati River
(vii)	Other Sensitive Environmental Components listed in ESMF	No	-	Proposed development will be carried out within the existing STP.
(viii)	Drinking water source (Ground, Surface), upstream and downstream uses of rivers, etc.	Yes		Water is used for irrigation, During consultations issue of untreated sewage and effluents being released downstream has been raised. Drinking water and for domestic use is drawn from the borewell as per onlne discussion with some of the downstream village leaders/ sarpanch/ex-sarpanch.
(ix)	Low-lying areas/ areas of Tidal Influence (provide CRZ details)	No		Not applicable. The area is around 40m from Sabarmati River and at higher elevation (approx. 44 m) than the river bank (Approx. 34 m.)
(x)	Sensitive Receptors – a) Habitations/ Households/ Hostels, other special areas, etc. b) School c) Religious Places d) Tourist Areas	Νο		Not applicable. The location of the subproject does not have any ancient monuments and/or archaeological site(s), protected area of local importance. As per the Heritage Department of AMC and data available, there are no tangible or intangible Cultural heritage or protected monuments within the STP premises or adjacent to it. The nearest monument is the Fateh Baug Fort at a distance of 1.5 kms from the STP. Masjid Mohuddin at 135 m from the boundary. Ibrahim Masjid at 188 m from the boundary. Bag E Sukun Kabrastan (Shia Isthna Ashri Kabrastan) is



Ι.	Environmental Aspects	Yes/ No	Distance in meters	Details on its Importance
				located 1.2 km away from the STP boundary and is accessible by highway 64 and also through service road. It is located 1.6 km from the gate of the STP compound.
				Marthoma Church Ahmedabad Cemetery is located 1.6 km away from boundary and from the gate it is about 1.6 kms. Therefore, impacts on the same is not anticipated due to project activities.
				Considering Ahmedabad as a Heritage city and the banks of the river Sabarmati as being significant for potential heritage sites, chance find procedure will be framed and implemented for any such discovery during excavation and construction activities within STP premises.
2	Is the site in Critical/ Over Exploited Ground Water Block. Provide the level of the groundwater table	Yes		Ahmedabad city falls under "over exploited region" of ground water.
3	Is the site vulnerable to major natural or induced hazards such as Earthquakes, Landslides, Flooding, Storm surge, Severe wind damage, Fire, Explosion, Other (specify)	Yes		Site is vulnerable due to flooding in the and Sabarmati. Ahmedabad falls under Zone III: Moderate Damage Risk Zone. Previously occurred
				earthquakes were of <4.0-5.0 magnitude.
4	Describe the type of soil and vegetation on site	Yes		Trees and Shrubs observed which were planted during STP development. The site soil is predominantly alluvial.
5	Is the site present in the flood plains as recorded in the last 100 years? Provide the HFL level of the site/ region	No		Site is 900 metres from Sabarmati River. STP elevation is between 42 to 46 m which is above HFL which is 41.7 m.
6	Existing pollution/ contamination or degradation on site	No		Existing STP and related activities.



Ι.	Environmental Aspects	Yes/ No	Distance in meters	Details on its Importance
7	Any other remark on baseline condition: its suitability to proposed use?	Yes		Upgradation of STP and capacity augmentation project within existing boundary. Land use will not change. Consolidated consent and agreement from GPCB have been obtained for the project.

<i>II.</i>	Impacts on Land/ Soil Environment	Yes/ No	Area (in sqm)	Details
1	Totals extend of Demolition expected on-site (footprint in sqm and volume in cubic meter)	Yes		All the existing units/structures of Plant area is expected to be demolished
2	Extend of Land to be remediated/ repurposed	No		All proposed activities will be within existing STP boundary
3	Extend of land expected to be under green belt	Yes		About 10% of the land would be under green belt.
4	Will the proposed project cause the following on Land/Soil?			
(i)	Impact on Surrounding Environmental Conditions including Occupation on Low lying lands/ flood plains	Yes		Temporary during dismantling of few existing components and construction of proposed components.
(ii)	Substantial removal of Topsoil (mention area in sqm)	No		This is existing plant and therefore, significant removal of topsoil is not envisaged.
(iii)	Any degradation of land/ eco-systems expected due to the project?	NO		Not envisaged as proposed project is upgradation of the existing STP and under the area of AMC. Temporary impacts during construction period only
(iv)	Loss or impacts on Cultural/ heritage areas/ properties	NO		Construction activity within existing STP boundary and there are no cultural properties in premises.
(v)	Does the project activity involve cutting and filling/ blasting etc.?	NO		Not envisaged. will source materials from existing quarries
(vi)	Will the project cause physical changes in the project area (e.g., changes to the topography) due to excavation, earthwork, or any other activity?	NO		Not envisaged. All construction within the existing boundary and no change in topography. There may be filling up required after demolition of structures.

Anticipated Environmental Impacts: Impacts on Air, Noise, Land, Geology, and Soils



<i>II.</i>	Impacts on Land/ Soil Environment	Yes/ No	Area (in sqm)	Details
(vii)	Will the project involve any quarrying/ mining etc?	NO		Not applicable
(viii)	Will the project/ any of its components contaminate or pollute the Land?	No		Sludge will be managed as per consent conditions
(ix)	Will the project contribute to any long-term significant adverse (negative), large scale, irreversible, sensitive impact at a regional scale or area broader than the project sites; in combination with other projects proposed/ existing?	Νο		Proposed project will enhance the quality of water being disposed off in the river thereby will improve the quality of water in the river

<i>III.</i>	Impacts on Air and Noise Environment	Yes/ No	<b>Details</b> (including any Quantity Estimation)
1	Will the project cause or increase air pollution due to dust and/ or vehicle emissions?	Yes	Very Minimum & Temporary impact on air quality due to construction vehicles is envisaged. Open Storage of construction material may also contribute to the dust generation.
2	Will the project cause or increase pollution due to GHG emissions?	No	The project will help in mitigating the GHGs emission by implementation of energy efficient equipment and machineries.
3	Will the project cause or increase odor nuisance? (mention type of Gases expected)	No	The plant design includes a two-stage scrubbing unit designed to treat the foul air comprising of a biological system such as bio trickling filter followed by Activated Carbon Filter. The Activated Carbon Filter will act as a polishing unit only. Due to the two stage processes the odor
			limits are almost zero at the boundary of STP. The odor Control units will be provided for the inlet works area and sludge sump area where odor emissions are produced.
			Green belt will also be provided to mitigate odor in surrounding.
4	Is there a potential for the release of toxic gases or accident risks (eg: potential fire outbreaks)	No	No toxic gas emission is expected from the plant.
5	Will the project generate or increase noise levels or vibration which will impact surrounding biodiversity or communities?	No	Nature of project does not involve high level of noise & vibration.

IV.	Impacts on Water Environment	Yes/ No	<b>Details</b> (including any Quantity Estimation)
1	Will the proposed activities at the site(s) impact water quality (surface or ground) – leachate, runoff, waste deposition, erosion, effluent disposal?	No	Proposed project will enhance the quality of water being released in the river thereby will improve the quality of water in the river



IV.	Impacts on Water Environment	Yes/ No	<b>Details</b> (including any Quantity Estimation)
2	Will the activities proposed at the site(s) impact water resource availability and use – effluent disposal, leachate, runoff, wastes deposition, erosion?	No	Proposed project will enhance the quality of water being released in the river thereby will improve the quality of water in the river
3	Chances of Pollution of Water bodies/ groundwater wells, nearby or downstream	No	Proposed project will enhance the quality of water being released in the river thereby will improve the quality of water in the river
4	Will the activities proposed at the site(s) hinder natural drainage	No	Activities proposed are in the existing premises of the STP which will not interfere with the natural drainage of the area.
5	Will the activities proposed at the site(s) decrease permeability/ rainwater percolation	No	Activities proposed are in the existing premises of the STP which will not interfere with the rainwater percolation.
6	Will this sub-project involve creation/ use/ result in impacts on water storage structures in any way? Is this structure/ dam in concern above 15m in height?	No	Not Applicable (NA) Dam is not proposed under project
7	Will this sub-project involve the dredging of waterbodies, sea, canals, etc?	No	No dredging is envisaged in this project
8	Will the project affect the River flow pattern, stream pattern, or any other irrigation canal?	No	Activities proposed are in the existing premises of the STP which will not interfere with the river flow pattern
9	Will the project result in Stagnation of water flow or pondage or weed growth	No	Design aspects of the project will ensure that no water logging is occurred in the plant area due to the operations.

<i>V</i> .	Impacts on Biodiversity and Host Communities	Yes/ No	<b>Details</b> (including any Quantity Estimation)
1	Will the project necessitates cutting of Trees/ Loss of Vegetation	Νο	Tree cutting in existing plant area for the proposed upgradation is not envisaged. But to design and components some trees may be required to be cut which will be estimated after DPR finalization. Some shrubs may require cutting/ clearing, however, same would be replaced after construction of STP. Existing trees will be retained as far as possible.
2	Will the project necessitate substantial removal of Topsoil (mention area in sqm)	No	Minor amount of soil from existing premises will need to be removed. Same shall be used in the garden area of the premises.
3	Any degradation of land/ eco-systems expected due to the project?	No	Not applicable
4	Will the project result in Health & Safety Risks in the neighborhood (upstream, downstream, nearby) including heightened traffic, the	No	Proposed project will enhance the quality of water being released in the river thereby will improve the quality of water in the river. HSE risk identified during the ESIA preparation and



V.	Impacts on Biodiversity and Host Communities	Yes/ No	<b>Details</b> (including any Quantity Estimation)
	release of toxic gases, untreated sewage/ drainage, accident risks		mitigated. The ESMP will be updated after design finalization. There may be possibilities of OHS issues during construction operation.
5	Potential Noise, Light Pollution/ movements causing disturbance to nearby habitats/ communities mainly during night hours	No	Activities proposed are in the existing premises of the STP hence additional disturbance to the habitat or community is not envisaged.
6	Potential disruption to common property, accessibility, traffic disruptions, conflicts, or disruption to the local community within the subproject area?	No	Very minimal disturbance will be resulted during the construction phase.
7	The potential risk of habitat fragmentation due to the clearing activities? (eg. Hindrance to the local biodiversity like disturbing the migratory path of animals/ birds etc.)	No	Activities proposed are in the existing premises of the STP hence no disturbance to the habitat is envisaged

VI.	Impacts due to Storage and Wastes, Pollution and Hazards	Yes/ No	<b>Details</b> (including any Quantity Estimation)
1	Will the project use or store dangerous substances (e.g., large quantities of hazardous chemicals used for treatment/ other uses; materials like Chlorine, Diesel, Petroleum products; any other?	Yes	The proposed project may require storage of Chlorine and polyelectrolyte.
2	Will the project produce solid or liquid wastes; including construction/ demolition wastes (including dredging, de-weeding wastes, muck/ silt, dust); polluted liquids?	Yes	Sludge will be generated during operation of the project. Treated water will be as per the NGT norms with TSS<10 mg/l and will be disposed in the river.
3	Will the project cause or increase air pollution or odor nuisance?	No	Odorous air will be generated from the wastewater, bio solids and sludge management.
			The plant design includes a two-stage scrubbing unit designed to treat the foul air comprising of a biological system such as bio trickling filter followed by Activated Carbon Filter. The Activated Carbon Filter will act as a polishing unit only. Due to the two stage processes the odor
			limits are almost zero at the boundary of STP. The odor Control units will be provided for the inlet works area and sludge sump area where odor emissions are produced.
			Green belt will also be provided to mitigate odor in surrounding.
4	Will the project generate or increase noise levels that will impact surrounding biodiversity or communities?	No	Nature of project does not involve high level of noise & vibration.
5	Will the project generate or increase visual blight or light pollution?	No	Light pollution is not envisaged.
6	Will the project generate water pollution (waterbodies/ groundwater)?	No	Proposed project of upgradation will have a better treatment facility and will enhance the quality of water being disposed in the river



VI.	Impacts due to Storage and Wastes, Pollution and Hazards	Yes/ No	<b>Details</b> (including any Quantity Estimation)
			thereby will improve the quality of water in the river. Treated water will be as per the NGT norms with TSS<10 mg/l and will be disposed in the river.
7	Will the project involve dangerous construction activities which may be a safety concern to workers/ host communities	Yes	Construction activities may involve movement of heavy parts and working in enclosed areas. Safety of workers will be prioritised. HSE components will be assessed and appropriate mitigations will be implemented during construction phase of the project.
8	Describe any other features of the project that could influence the ambient environment	No	The proposed project will not affect the ambient environment.
9	Were the probable environmental impacts discussed with stakeholders?	Yes	Continuous stakeholder consultations are being carried out and further stakeholder meetings are being conducted.

#### Suggested Environmental Enhancement Measures

	Enhancement Measures	Yes/ No	Details
1	Has the subproject considered energy conservation measures/ energy recovery options incorporated in subproject design	Yes	Proposed project will include Energy efficient blowers and Energy efficient Desludging System, diffusers, SCADA, Solar panels and other energy saving measures such as LED lighting, VFD, etc.
2	Has the subproject considered energy efficiency options or use of alternate energy	Yes	Solar power is proposed for the project for meeting the partial requirement of common lighting.
3	Has the subproject considered reducing climate impacts of GHG, other releases	Yes	The project has significant potential for reducing GHGs in terms of energy efficient machineries, equipment, lighting, solar panels and SCADA etc. Also, with the reduced contaminants to the river ecosystem, there would be indirect benefit to the environment.
4	Has the subproject considered no disturbance to natural flora including trees	Yes	There is no major disturbance to the existing flora from the project. Green belt is planned to enhance the flora and fauna in the project boundary.
5	Has the subproject considered water reuse/ recycle options	Yes	Treated water will be discharged in the Fatehwadi Canal for irrigation after requisite approvals from concerned dep and consultations with downstream users and to the river for Sabarmati River rejuvenation.
6	Rainwater harvesting, water recycling, and other water resource enhancement measures	Yes	Rainwater Harvesting (RWH) is planned in the project (Roof top RWH)


7	Has the subproject considered waste minimization or waste reuse/ recycle options	Yes	Tertiary Treatment Plant (TTP) is planned for re-use and recycle treated sewage in horticulture. C&D waste will be reused for backfilling.
8	Considerations for extreme events, drought, flood, other natural disasters	Yes	The project design would take consideration of floods, HFL, Natural Disaster and extreme events.

Land L	and Use, Resettlement, and/ or Land Acquisition						
Sl.no	Components	Yes	No	Details			
1	Does the project involve the acquisition of private land?	F	V	The project is within the existing land of 126MLD STP			
2	Alienation of any type of Government lanc including that owned by Urban Local Body?	1	V	The land belongs to AMC and it is in their possession.			
3	Clearance of encroachment from		V	Not applicable. There are no encroachments in the			
	Government/ Local body Land?			existing STP.			
4	Clearance of squatters/ hawkers from		v	Not applicable. There are no squatters or hawkers in			
	Government/ Local Body Land?			the existing STP Premises.			
5	Number of structures, both authorized and, or unauthorized to be acquired/ cleared	/	V	Not applicable			
6	Number of households to be displaced?		V	Not applicable. There no houses or residential structures in STP premises or on rising main route			
7	Common properties to be alienated/ Pastureland (acres) Acquisition/ burial ground and others specify?	(	V	Not applicable.			
				The location of the subproject does not have any ancient monuments and/or archaeological site(s), protected area of local importance. As per the Heritage Department of AMC and data available, there are no tangible or intangible Cultural heritage or protected monuments within the STP premises or adjacent to it. The nearest monument is the Fateh Baug Fort at a distance of 1.5 kms from the STP.			
				Masjid Mohuddin at 135 m from the boundary. Ibrahim Masjid at 188 m from the boundary.			
				Bag E Sukun Kabrastan (Shia Isthna Ashri Kabrastan) is located 1.2 km away from the STP boundary and is accessible by highway 64 and also through service road. It is located 1.6 km from the gate of the STP compound.			
				Marthoma Church Ahmedabad Cemetery is located 1.6 km away from boundary and from the gate it is about 1.6 kms. Therefore, impacts on the same is not anticipated due to project activities.			
				Considering Ahmedabad as a Heritage city and the banks of the river Sabarmati as being significant for potential heritage sites, chance find procedure will be framed and implemented for any such discovery			



Land Us	e, Resettlement, and/ or Land Acquisition			
Sl.no	Components	Yes	No	Details
				during excavation and construction activities within STP premises.
8	Existing land uses on and around the project area (e.g., community facilities, agriculture, tourism, private property) will be affected?		V	No impact on any such structures. There is a squatter settlement near Fatehadi canal. While these are not impacted due to proposed project, temporary impacts related to community health and safety are identified due to vehicular movement on kaccha access road. Road repairs and upgradation is being undertaken under sub project 240MLD STP upgradation.
9	Will the project result in construction workers or other people moving into or having access to the area (for a long-time period and in large numbers compared to permanent residents)?		V	For construction activities labour/workers will be working within the project boundary. In urban setting the numbers estimated upto 200 at maximum are not large enough to make an impact within the area. All work will be done within the STP premises so disturbance due to workers/labour presence is not envisaged.
				O&M staff requirements is estimated to be 40.
10	Are financial compensation measures expected to be needed?		V	There are no impacted property, structures, CPR, cultural property or livelihood impacts and therefore compensation measures are not needed.
Loss of (	Crops, Fruit Trees, Household Infrastructure,	and l	ivelih	ood
11	Will the project result in the permanent or temporary loss of the following?	•		
11.1	Crops?		V	Proposed sub project is within STP premises with no cultivation
11.2	Fruit trees? Specify with numbers		V	There are no fruit trees. Other Trees and shrubs have been planted in the STP premises. Shrubs may be required to be cut during upgradation.
11.3	Petty Shops		v	There are no petty shops in STP premises
11.4	Vegetable/Fish/Meat vending		v	There is no vending within plant premises
11.5	Cycle repair shop		V	There are no such shops with plant premises
11.6	Garage		٧	There are no such shops with plant premises
11.7	Tea stalls		V	There are no such shops with plant premises
11.8	Grazing		V	
11.9	Loss of access to forest produce		V	



Land Use	e, Resettlement, and/ or Land Acquisition			
Sl.no	Components	Yes	No	Details
11.10	Any others - specify		V	Squatter settlement is located near Fatehwadi canal and road. Based on google map and transect walk roughly 600 to 700 temporary structures were observed although people have mentioned that there are 1600 to 1700 families/hhs. Temporary structures near the road may have health and safety issues due to vehicular movement during construction activities.
				Road repairs and upgradation will be taken up under sub project Upgradation of 240 MLD STP for smoother movement of vehicles and reduce/prevent dust, noise and air emissions due to vehicular movement. The road will be on existing kaccha road and displacement of any temporary squatter structure is not envisaged.
				The existing STP is located near the river and there are no restrictions of access to river or access road due to proposed project. The existing boundary of the STP will remain unchanged. Movement of machinery, raw material and labour will be from existing approach road. The road has very limited vehicular movement and hence there will be no hinderance to the traffic movement.
				Movement of traffic will be in daytime when most of the inhabitants of the settlement will be at work in the industrial areas and industries.
Welfare	e, Employment, and Gender			
12	Is the project likely to provide local employment opportunities, including employment opportunities for women?	V		During construction period employment opportunities will be created for women and men. Some skilled employment will also be created. There will be petty business opportunities due to the presence of labour working in the STP premises
13	Is the project being planned with sufficient attention to local poverty alleviation objectives?	V		Treated sewage will enhance the water quality of river and overall ecosystem which may have positive impacts to the downstream users.
				Some treated sewage would also be given for Industrial uses which will have positive impact in terms of better employment to the locals. Industries dependence on ground water will also be reduced with availability of treated water for industrial use.
				Treated water is also proposed to be used for the Fatehwadi canal which will be an improvement from current quality with better discharge standards due to rehabilitation of the STP.
				Sludge from the plant is being used as manure for horticulture. This is reducing dependence on chemical fertilizer and therefore saving in terms of energy and resources.



Land Use	Land Use, Resettlement, and/ or Land Acquisition					
Sl.no	Components	Yes	No	Details		
14	Is the project being designed with sufficient local participation (including the participation of women) in the planning, design, and implementation process?	V		Extensive consultations were conducted during preparation of ESIA to assess the prevalent issues related to sewage and wastewater and issues and concerns with respect to the STP functioning and release of treated water in the river.		
Historic	al, Archaeological, or Cultural Heritage Sites		1			
15	Historical heritage site(s) require excavation near the same?		V	There are no such historical heritage sites identified as such, Chance find procedures will be planned and implemented for the site as Ahmedabad has been declared as Heritage city		
16	Archaeological heritage site(s) require excavation near the same?		V	There are no such Archaeological heritage sites identified as such, Chance find procedures will be planned and implemented for the site		
17	Cultural heritage site(s) require excavation near the same?		V	There are no such Cultural heritage sites identified as such, Chance find procedures will be planned and implemented for the site		
18	Graves or sacred locations require excavations near the same?		V	Bag E Sukun Kabrastan (Shia Isthna Ashri Kabrastan) is located 50 m away from the STP boundary and is accessible by highway 64 and also through service access road. It is located 750 m from the STP gate. Marthoma Church Ahmedabad Cemetery is located 500 m away from boundary and from the gate it is about 1.2 kms. Therefore, impacts on the same is not anticipated due to project activities as access roads to the cemetery and church will be from alternate route from Highway 64. Therefore there are no excavations, impacts or loss of access to the cemetery and burial grounds. Not applicable as the burial grounds/cemeteries are located outside the 126 MLD plant premises and no project related activities are proposed at or near the cemeteries		
Tribal P	opulation/ Indigenous People	1				
19	Does this project involve acquisition of any land belonging to Tribal people?		V			
Benefic	iaries					
20	Population proposed to be benefitted by the proposed project	Appr no.:	ox.	Estimated population for 2041 of western part of the city will be 3.6 million. Estimated population of 7.1 million (Year 2020) residing in the municipal area spread over 488 sq.km, under the jurisdiction of Ahmedabad Municipal Corporation (AMC), along the eastern and western banks of river Sabarmati.		
21	No. of Females proposed to be benefitted by the proposed project	Appr no.:	ox.	Overall city population will be benefited.		



Land U	and Use, Resettlement, and/ or Land Acquisition				
Sl.no	Components	Yes	No	Details	
22	Vulnerable households/ population to be benefitted	Appr no.:	ox.	Overall city population will be benefited.	
23	No. of Families to be benefitted	Appr	ox.		

#### **Clearances and Permits Required**

VII.	Туре	Yes/ No	Details
i)	Environmental Clearance (mention State/ Centre)	No	The project doesn't require Environmental Clearance (EC) as per EIA Notification 2006. However, it will require Consent to Establish (CtE) and Operate (CtO) from Pollution Control Board (PCB) under Air and Water Act.
ii)	Consent from SPCB for establishment and operation of STP/ WTP	Yes	For proposed project augmentation, amendment in current consent, will be sought.
iii)	NOC Forest Department for either the conversion of forest land or for tree-cutting	No	Activities proposed are in the existing premises of the STP. Forest Clearance is not required.
iv)	Permission from AMC for Tree cutting	Yes	May be required after design finalization by DBOT contractor.
v)	NOC for the establishment of water supply intake	No	NA
vi)	NOC for water withdrawal from the surface water source	No	No surface water withdrawal is proposed
vii)	Mining Permit (for dredging)	No	Not applicable
viii)	Labor License and related	Yes	It shall be included in the scope of contractor
ix)	Permit for Batching Plant	No	Not envisaged
x)	NOC for transportation and storage of diesel, oil, and lubricants, etc.	Yes	It shall be included in the scope of contractor
xi)	Others (Mention)	No	

This Screening sheet must be completed for each of the proposed sites by the respective Designated Nodal Officer on Environment and Social in the concerned department (Sewage/ Wastewater, Drainage) and forwarded to the E&S Specialist in the PIU along with the following enclosures. In the case of TA, appropriate parts of this shall be filled for areas of concern. Provide available information at the start of the subprojects to initiate assessment and update the same as required.

**Enclosures:** Provide maps with the geographical location of the project; and an appropriately-scaled map clearly showing the project area and project sites with land use, existing buildings, infrastructure, vegetation, adjacent land use, utility lines, access roads, and any planned construction, and any other information to describe the project, locations and possible impact as required.

## Project Categorisation and Need for Instruments, Oversight

Project Category	□Low (L1) □ Moderate (M1) ✓ Substantial (S1) □High (H1)
Key Reasons	



Instruments Required	<ul> <li>a) S1: Project-specific ESIA (impact assessment considering the project details &amp; location) by Independent Consultant (with signed/ sealed Screening Form, Consultations, ESMP, Budget, Responsibilities); and/ or Environmental and Social Audit; RAP including LRP</li> <li>b) M1: Project-specific ESIA by DPR Consultant (with signed/ sealed Screening Form, Consultations, ESMP, Budget, Responsibilities); and/ or Environmental and Social Audit; RAP including LRP</li> <li>c) L1:signed/ sealed Screening Form, Consultations, ESMP, Budget, Responsibilities; and/ or Environmental and Social Audit</li> </ul>
Additional Responsibilities Expected	Mention: i) Specialists to be hired for Physical/ Cultural resources, Natural Habitats/ others, GHG estimation, etc for ESIA preparation, and/ or supervision), ii) Consultations, iii) any other aspect

Status	Agency/ Official	Name, Signature with Date, and Seal
Prepared by	ULB Department (project in- charge)	
	Environmental Engineer/ Social Specialist	
Checked, categorised as (S1, M1, L1) & ToR	PIU Environmental Specialist/ Social Specialist	
issueu by.	Approved by PIU Project Director	



#### ANNEXURE II: APPLICABLE REGULATIONS

## 1. Environmental Regulations at National Level:

#### i. National Environment Policy, 2006

The National Environment Policy by the MoEFCC aims at mainstreaming environmental concerns into all developmental activities. It emphasizes the conservation of resources and points out that the best way to aid conservation is to ensure that people dependent on resources obtain better livelihoods from conservation than from degradation of the resources. It argues that environmental degradation often leads to poverty and poor health outcomes among populations. The objectives of the National Environmental Policy are-

- Conservation of Critical Environmental Resources
- Intra-generational Equity: Livelihood Security for the Poor
- Inter-generational Equity: ensure judicious use of environmental resources Integration of Environmental Concerns in Economic and Social Development
- Efficiency in Environmental Resource Use
- Environmental Governance
- Enhancement of Resources for Environmental Conservation

## ii. The Environment Protection (Act) 1986 and The Environmental Protection Rules

The Environment (Protection) Act was enacted in 1986 to provide for the protection and improvement of the environment. It empowers the Central Government to establish authorities [under section 3(3)] charged with the mandate of preventing environmental pollution in all its forms and to tackle specific environmental problems that are peculiar to different parts of the country. The Act was last amended in 1991. This act was passed as an overall comprehensive act "for protection and improvement of environment". Under this act, rules have been specified for the discharge/emission of effluents and different standards for environmental quality. These include Ambient Noise Standard, Emission from Motor Vehicles, Mass Emission Standard for Petrol Driven Vehicles, General Effluent Standards, etc. in the exercise of the powers conferred under the Act, the following rules are devised

- The Water (Prevention and Control of Pollution) Act, 1974 and Water Cess Act, 1977
- The Air (Prevention and Control of Pollution) Act, 1981
- The Noise Pollution (Regulation and Control) Rules, 2000
- Environment Protection (EP) Act, 1986
- National Green Tribunal Act, 2010
- Waste Management Rules under EP Act including
  - Solid Waste Management Rules, 2016
  - Construction and Demolition Waste Management Rules, 2016.
  - Hazardous Waste (Management, Handling & Transboundary Movement) Rules, 2016, amended 2019
  - E-Waste (Management) Rules, 2016, amended 2018
  - Bio-medical Waste Management Rules, 2016, amended 2019
  - Plastic Waste Management (Amendment) Rules, 2018



Batteries (Management and Handling) Amendment Rules, 2010

#### iii. Environmental Impact Assessment Notification, 2006

EIA notification 2006 and its subsequent amendments list out the type of project that requires Environmental Impact Assessment and Environmental Clearance from MoEFCC or State Environment Impact Assessment Authority before the commencement of any developmental work or project expansion. The notification gives stage-wise guidance for the processing of Environmental Clearance. The objective of the notification is to formulate a transparent, decentralized, and efficient regulatory mechanism to:

- Incorporate necessary environmental considerations at the planning stage
- Involve stakeholders through the public hearing process
- Identify developmental projects based on impact potential
- Securing provision for mitigation efforts

## iv. The Water (Prevention and Control of Pollution) Act, 1974 and The Water Cess Act 1977

The Act is enacted to prevent pollution of water sources through industrial or any other construction activity and for maintaining or restoring of wholesomeness of water. The Act prohibits the discharge of pollutants into water bodies beyond a given standard and lays down penalties for non-compliance with its provisions.

The act resulted in the establishment of the Central and State Level Pollution Control Boards whose responsibilities include managing water quality and effluent standards, as well as monitoring water quality, prosecuting offenders, and issuing licenses for construction and operation of any facility. This will include the generation of liquid effluent during construction /civil engineering activities or from domestic activities in workers' colonies. Water (Prevention and Control of Pollution) Cess Act was enacted in 1977, to provide for the levy and collection of a cess on water consumed by persons operating and carrying on certain types of industrial activities. This cess is collected to augment the resources of the Central Board and the State Boards for the prevention and control of Pollution) Act, 1974. The Act was last amended in 2003.

## v. The Air (Prevention and Control of Pollution) Act. 1981

The purpose of this act is to prevent, and control air pollution and preserve air quality. This act empowers Central and State Pollution Control Boards for managing air quality and emission standards, as well as monitoring air quality, prosecuting offenders, and issuing licenses for construction and operation of any facility. Air quality includes noise levels also. This act has notified the National Ambient Air Quality Standard for different land uses.

## vi. The Noise Pollution (Regulation and Control) Rule,2000

The Noise Pollution (Regulation and Control) rules are promulgated under the Environmental (protection) Act, 1986. The noise pollution rules lay down terms and conditions as are necessary to reduce noise pollution, including during night hours. The rule provides ambient noise level standards for various types of land uses. PCB can take action if the sound level exceeds the standards by 10 dBA. Noise standard for different zones.

- Industrial zone- 75 & 70 dBA Leq during daytime and night-time respectively
- Commercial zone- 65 & 55 dBA Leq during daytime & night-time respectively
- Residential zone- 55 & 45 dBA Leq during daytime and night-time respectively
- Silence zone 50 & 40 dBA Leq during daytime and night-time respectively



## vii. The Wildlife Protection Act, 1972

The Wildlife Protection Act, 1972 has allowed the government to establish several Protected Areas like National Parks and Sanctuaries over the past 37 years, to protect and conserve the flora and fauna and their habitat.

Prior recommendation of the National Board for Wildlife (NBWL) will be required

- in case any subproject activity is proposed within the boundaries of a Protected area
- in case any project requiring Environmental Clearance (under the purview of EIA Notification 2006 and its subsequent amendments) is located within the eco-sensitive zone around a Wildlife Sanctuary or National Park or in absence of delineation of such a zone, within a distance of 10 km from its boundaries

## viii. The Wetlands (Conservation and Management) Rules, 2017

Wetlands (Conservation and Management) Rules, 2017 are promulgated under the Environmental (protection) Act, 1986 for prohibiting reclamation and degradation through drainage and landfill, pollution (discharge of domestic and industrial effluents, disposal of solid wastes), hydrological alteration (water withdrawal and changes in inflow and outflow), over-exploitation of their natural resources resulting in loss of biodiversity and disruption in ecosystem services provided by wetlands by conservation of wetlands.

As defined in the rule, 'wetland' means an area of marsh, fen, peatland, or water; whether natural or artificial, permanent or temporary, with water that is static or flowing, fresh, brackish, or salt, including areas of marine water the depth of which at low tide does not exceed six meters, but does not include river channels, paddy fields, human-made water bodies/tanks specifically constructed for drinking water purposes and structures specifically constructed for aquaculture, salt production, recreation, and irrigation purposes. Whereas, 'wetlands complexes' means two or more ecologically and hydrologically contiguous wetlands and may include their connecting channels/ducts

The rules shall apply to the wetlands or wetlands complexes of the following types-

- wetlands categorized as 'wetlands of international importance under the Ramsar Convention
- wetlands as notified by the Central Government, State Government, and Union Territory Administration

Section 4 of the rule elaborates restrictions of activities in wetlands which includes handling or storage or disposal of construction and demolition waste covered under the Construction and Demolition Waste Management Rules, 2016; hazardous substances covered under the Manufacture, Storage and Import of Hazardous Chemical Rules, 1989 or the Rules for the Manufacture, Use, Import, Export, and Storage of Hazardous Microorganisms/Genetically Engineered Organisms or Cells, 1989 or the Hazardous Wastes (Management, Handling and Transboundary Movement) Rules, 2008; Solid waste dumping; Discharge of untreated wastes and effluents from industries, cities, towns, villages and other human settlements; and any construction of a permanent nature.

## 2. Waste Management Regulations

## i. Solid Waste Management Rules, 2016

The Rules shall apply to every urban local body, other areas and to every domestic, institutional, commercial, and any other non-residential solid waste generator except



industrial waste, hazardous waste, hazardous chemicals, biomedical wastes, e-waste, leadacid batteries, and radioactive waste.

The rules define the duties of solid waste generators. The rules outline the responsibilities of line ministries, ULB's and other stakeholders, the duty of the operator of the Solid Waste Processing and Treatment Facility.

## ii. Construction and Demolition Waste Management Rules, 2016

Construction and demolition waste include waste comprising of building materials, debris, and rubble resulting from construction, remodelling, repair, and demolition of any civil structure.

As per rule-

- 1. Every waste generator shall prima-facie be responsible for the collection, segregation of concrete, soil, and others and storage of construction and demolition waste generated, as directed or notified by the concerned local authority in consonance with these rules ((Rule 4 sub-rule (1))
- 2. There should be no littering or deposition of construction and demolition waste to prevent obstruction to the traffic or the public or drains (Rule 4 sub-rule (4))

## iii. Plastic Waste Management Rules, 2016, amended 2018

MoEFCC issued the Plastic Waste Management Rules, 2016 to give thrust on plastic waste minimization, source segregation, recycling, and disposal effectively.

These rules shall apply to every waste generator, local body, Gram Panchayat, manufacturer, Importers, and producer. Section 6 and Section 8 of the rule explain the Responsibility of the Local Body and the Responsibility of the waste generator respectively.

# iv. Hazardous and Other Wastes (Management & Transboundary Movement) Rules, 2016, amended 2019

The rule dictates the entity generating hazardous wastes (as defined in the rule), to take all practical steps to ensure that such wastes are properly handled without any adverse effects, which may result from such wastes. It stipulates proper collection, reception, treatment, storage, and disposal of such wastes and provides for the process/mechanism to do so. Waste generators will need to obtain permission from the State Pollution Control Boards and other designated authorities for the storage and handling of any hazardous material.

- Schedule I of the rule lists out of processes that generate hazardous wastes.
  - Schedule II of the rule provide a list of waste constituents with concentration limits

## v. E-Waste Management Rule, 2016, amended in 2018

These rules shall apply to every manufacturer, producer, consumer, bulk consumer, collection centres, dealers, e-retailer, refurbisher, dismantler, and recycler involved in the manufacture, sale, transfer, purchase, collection, storage, and processing of e-waste or electrical and electronic equipment listed in Schedule I of the rule, including their components, consumables, parts, and spares which make the product operational. These rules are applicable

Two categories of electrical and electronic equipment namely (i) IT and Telecommunication Equipment and (ii.) Consumer Electricals and Electronics such as TVs, Washing Machines, Refrigerators Air Conditioners including fluorescent and other mercury-containing lamps are covered under these Rules

Section 5 of the rule defines the responsibilities of the producer of e-waste.

## vi. Batteries (Management and Handling) Rules, 2001



MoEFCC under the provisions of the Environmental Protection Act, 1986 issued the Batteries (Management and Handling) Rules, 2001. The rules were enacted with the primary objective of ensuring the safe disposal of discarded lead-acid batteries. Rules mandate proper control and record-keeping on the sale or import of lead-acid batteries and recollection of the used batteries by registered recyclers to ensure environmentally sound recycling of used batteries.

## vii. The Motor Vehicle Act, 1988 & Motor Vehicles Rules, 1989

The Act regulates all aspects of road transport vehicles. It provides in detail the legislative provisions regarding licensing of drivers/conductors, registration of motor vehicles, control of motor vehicles through permits, traffic regulation, insurance, liability, offenses, and penalties, etc.

## 3. Regulations Related to Pesticides/ Insecticides

## i. Insecticide Act 1968 and Rules 1971

The Insecticides Act, 1968 and Insecticides Rules, 1971 regulate the import, registration process, manufacture, sale, transport, distribution, and use of insecticides (pesticides) to prevent risk to human beings or animals and for all connected matters, throughout India. All insecticides (pesticides) have to necessarily undergo the registration process with the Central Insecticides Board & Registration Committee (CIB & RC) before they can be made available for use or sale.

The Act also has guidelines stipulated for the protective clothing of persons handling insecticides. Disposal of used packages, surplus material, and washing of insecticides are also included in the Act.

## ii. Draft Bill on Pesticide management, 2020 introduced in Rajya Sabha in March 2020

The purpose of the bill is to minimize risk to human beings, animals, living organisms other than pests and the environment, with an endeavour to promote pesticides that are biological and based on traditional knowledge. The bill on Pesticide management seeks to regulate the manufacture, import, sale, storage, distribution, use, and disposal of pesticides, to ensure the availability of safe pesticides and minimize the risk to humans, animals, and the environment. The Bill seeks to replace the Insecticides Act, 1968

## 4. Acts/ Rules applicable to Land Acquisition, RoW use

# i. The Right to Fair Compensation and Transparency in Land Acquisition, Rehabilitation and Resettlement Act, 2013

Aims to ensure, a humane, participative, informed, and transparent process for land acquisition with the least disturbance to the owners of the land and other affected families and provide just and fair compensation to the affected families whose land has been acquired or proposed to be acquired or those that are affected by such acquisition and make adequate provisions for their rehabilitation and resettlement and for ensuring that the cumulative outcome of compulsory acquisition should be that affected persons become partners in development leading to an improvement in their post-acquisition social and economic status.

## ii. The supreme court order, pertaining to removal and restriction of encroachment of religious structures on the public space

Provisions of the Order: disallow/regulate the use of RoW, public spaces for the construction of temples, mosques, shrines, the church in public land, and public spaces.

## 5. Other Regulations/Policies/Guidelines applicable to various construction/implementation activities



## i. Central Ground Water Authority- 'Guidelines to control and regulate groundwater extraction in India' September 2020

Central Ground Water Authority (CGWA), constituted by the Government of India under Section 3 (3) of the Environment (Protection) Act (EPA) of 1986, in pursuance of the Order of the Hon'ble Supreme Court of India, has been regulating groundwater development and management in the country and has proposed the guidelines for groundwater withdrawal.

The drawing/ proposing to draw groundwater through a pump of more than 2 HP and/ or through more than one functional tube well shall be required to seek NOC for groundwater withdrawal. NOC will be granted for drinking and domestic purpose only. NOC for groundwater withdrawal will be considered only in cases where the water supply department concerned is unable to supply an adequate amount of water in the area.

Government water supply agencies are also required to seek NOC from the authorized officers for existing as well as new schemes based on groundwater sources.

NOC shall not be granted for extraction of groundwater for construction activities in the project in Critical/ Over-exploited areas.

Quantum of groundwater for purposes other than drinking/ domestic use shall not exceed 25% of total groundwater abstraction

## ii. The Building & Other Construction Workers (Regulation of Employment & Conditions of Service) BOCW Act, 1996

As per the Act, the employer is required to provide safety measures at the building or construction work site along with other welfare measures, such as canteens, first-aid facilities, ambulance, housing accommodation, etc. to the workers.

These are comprehensive guidelines for the Occupational Health and Safety of Laborers.

## iii. Child Labour (Prohibition and Regulation) Act, 1986 and Rules, amended 2016 and Child Labour (Prohibition and Regulation) Amendment Rules, 2017

The Child Labour (Prohibition and Regulation) Act of 1986 designates a child as a person who has not completed their 14th year of age. It aims to regulate the hours and the working conditions of child workers and to prohibit child workers from being employed in hazardous industries. Children between the age of 14 and 18 are defined as "Adolescent" and the law allows adolescents to be employed except in the listed hazardous occupation and processes which include mining, inflammable substance, and explosives-related work, and any other hazardous process as per the Factories Act, 1948.

## iv. Minimum Wages Act, 1948

This act sets the minimum wages that must be paid to skilled and unskilled laborers. The act is legally non-binding but statutory. Payment of wages below the minimum wage rate amounts to forced labour. Wage boards are set up to review the industry's capacity to pay and fix minimum wages such that they at least cover a family of four's requirements of calories, shelter, clothing, education, medical assistance, and entertainment.

## v. The Bonded Labour System (Abolition) Act 1976

The Bonded Labour System (Abolition) Act 1976: States that all forms of bonded labour stands abolished and every bonded labour stands freed and discharged from any obligations to render any bonded labour.

## vi. Workmen's Compensation Act, 1923 & Rules 1924



The Act requires if personal injury is caused to a workman by accident arising out of and during his employment, his employer should be liable to pay compensation in accordance with the provisions of this Act.

## vii. Interstate Migrant Workmen Act 1979

The provisions of this Act regulate the conditions of service and protect the interests of interstate migrant workers. The project requires engaging interstate migrant workers for specialized activities The Inter-State migrant workmen, in an establishment to which this Act becomes applicable, are required to be provided certain facilities such as housing, medical aid, traveling expenses from home up to the establishment and back, among others.

## viii. Ancient Monuments and Archaeological Sites & Remains (Amendment and Validation) Act 2010

This Act is to ensure the preservation of ancient and historical monuments and archaeological sites and remains of national importance and for the regulation of archaeological excavations and the protection of sculptures, carvings, and other like objects. According to this Act, areas within the radii of 100m and 200m from the "protected property" are designated as "prohibited areas" and "regulated areas" respectively. No development activity is permitted in the "prohibited areas". Development activities are not permitted in the "regulated areas" without prior permission from the Archaeological Survey of India (ASI) if the site/remains/ monuments are protected by ASI or the State Directorate of Archaeology.

#### ix. Indian Treasure Trove Act, 1878

Whenever any treasure (anything of any value hidden in the soil, or anything affixed thereto) exceeding in amount or value ten rupees is found, the finder shall intimate District Collector in writing as soon as practicable.

## x. Right to Information Act, 2005

Provides a practical regime of right to information for citizens to secure access to information under the control of Public Authorities. The act sets out (a) obligations of public authorities with respect to the provision of information; (b) requires designating of a Public Information Officer; (c) process for any citizen to obtain information/disposal of request, etc.; and (d) provides for institutions such as Central Information Commission/State Information Commission.

## xi. Scheduled Castes and Scheduled Tribes (Prevention of Atrocities) Act 1989 and further Amendments 2018.

To prevent atrocities against scheduled castes and scheduled tribes. The objectives of the Act clearly emphasized the intention of the government to deliver justice to these communities through proactive efforts to enable them to live in society with dignity and self-esteem and without fear or violence or suppression from the dominant castes. With the reported misuse of the Act, In August 2018, the parliament of India passed the Scheduled Castes and Scheduled Tribes (Prevention of Atrocities) Amendment Bill, 2018, to bypass the ruling of the Supreme Court of India laying down procedures for arrests under the Act.

## xii. The Sexual Harassment of Women at Workplace (Prevention, Prohibition and Redressal) Act, 2013

An act that aims at providing a sense of security at the workplace that improves women's participation in work and results in their economic empowerment. It requires an employer to set up an "Internal Complaints Committee" (ICC) and the Government to set up a 'Local Complaints Committee' (LCC) at the district level to investigate complaints regarding sexual



harassment at workplace and for inquiring into the complaint in a time bound manner. The ICC need to set up by ever organization and its branches with more than 10 employees.

## xiii. The Street Vendors (Protection Of Livelihood and Regulation of Street Vending) Act, 2014

The act was enacted to regulate street vendors in public areas and protect the rights of the street vendors.

## xiv. The Prohibition of Employment As Manual Scavengers and Their Rehabilitation Act, 2013

An Act to provide for the prohibition of employment as manual scavengers, rehabilitation of manual scavengers and their families, and for matters connected therewith or incidental thereto.

#### 6. Technical Guidelines on Sewerage and Drainage at National Level

## i. Central Public Health and Environmental Engineering Organisation (CPHEEO), Ministry of Urban Development, Manual on Sewerage and Sewage Treatment Systems – 2013

Part A of the manual is on the Engineering aspect related to the sewerage system.

The manual provides detailed guidelines for:

- Planning
- Design and construction of sewers
- Design and construction of sewage pumping stations and sewage pumping mains
- Design and construction of sewage treatment facilities
- Design and construction of sludge treatment facilities
- Recycling and reuse of sewage
- Decentralized sewerage system
- On-site sanitation
- Preparation of city sanitation plan

**Part B** of the manual is on Operation and Maintenance aspects related to sewerage systems and includes:

- Sewer systems
- Pumping station
- Sewage treatment facilities
- Sludge treatment facilities
- Electrical and instrumentation facilities
- Monitoring of water quality
- Environmental conservation
- Occupational health hazards and safety measures
- On-site systems

Part C of the manual is on the Management aspect related to the sewerage system:

- Legal framework and policies
- Institutional aspects and capacity building
- Financing and financial management



- Budget estimates for operation and maintenance
- Public-private partnership
- Community awareness and participation
- Asset management
- Management information system

Potential disasters in sewerage and management

## ii. Central Public Health and Environmental Engineering Organisation (CPHEEO), Ministry of Urban Development, Manual on Storm Water Drainage Systems, 2019

This manual has been prepared for assisting engineers, planners, designers, architects, geographers, and hydrologists working in government / private institutions, urban local bodies, industrial and business concerns, consultancy services, etc., in planning and design of urban stormwater drainage systems in the country.

The manual is contained in three distinct Parts over two volumes.

Volume 1 contains Part A: Engineering Design,

Volume 2 contains Part B: Operation, Maintenance, and Part C: Management.

## iii. Central Public Health and Environmental Engineering Organisation (CPHEEO), Ministry of Urban Development, Manual on Operation and Maintenance of Water Supply System - 2005

The manual aims to serve as a guide for strengthening the technical, operational, and managerial capabilities required of the concerned personnel to operate and maintain water supply services as per acceptable norms of quantity, quality, sustainability, reliability, and cost. This manual provides systematic guidelines that provide the details of the operation, functioning, maintenance, and safety considerations of all the technical aspects related to water supply O & M.

## iv. Central Public Health and Environmental Engineering Organisation (CPHEEO) Ministry of Housing and Urban Affairs, Advisory on On-Site and Decentralized Composting of Municipal Organic Waste, June 2018

Methods to treat organic wastes, Reduce, Recycle, Reuse, Waste to Compost systems: Waste to Compost systems for Individual Households, Small Communities, Apartments, etc. up to 10 Household; Waste to Compost systems for Medium-Sized Communities, Apartments, RWAs – for 11 – 300 Households; medium-sized Offices, medium Hotels, Resorts, medium Schools, Canteens, Marriage Halls; Waste to Compost systems for large Communities, Apartments, RWAs, high rise buildings for 301 – 1000 Households; Large Offices, Large Hotels, Large Schools, Waste to Compost systems for Decentralized plants for more than 1000 Households operated by ULBs / Institutions / Outsourced agencies.

## v. Central Pollution Control Board, Guidelines for Management of Sanitary Waste, May'18

It covers possible waste management options for such kinds of wastes. Role of various stakeholders etc.

## vi. Central Pollution Control Board, Guidelines on Environmental Management of Construction & Demolition (C & D) Wastes

It discusses the Quantum & composition of C & D waste generation, Initiatives in promoting C & D waste products by GoI, C & D waste processing, Existing Guidelines on C & D waste management, Introduction to Guidelines on Environmental Management of C & D Wastes, Guidelines on Environmental Management of C & D Wastes – NOISE management, Guidelines



on Environmental Management of C & D Wastes – DUST management, Guidelines on Environmental Management of C & D Wastes – Other issues

Annexures on: Initiatives in C & D waste management in 69 cities (Literature Survey); Potential uses of C & D wastes, Global practices of the utilization of C & D wastes, Criteria for site selection of C & D waste processing facility

## 7. Policies and Regulations at State Level

## i. The Gujarat Infrastructure Development Act, 1999

This Act provides the framework for participation by persons other than the State Government and Government agencies in the financing, construction, maintenance, and operation of infrastructure projects and for that purpose to establish a Board and to provide for the matters connected therewith.

## ii. Gujarat Irrigation and Drainage Act, 2013

This Act is to provide for irrigation and drainage in the State of Gujarat. Whereas it is necessary to make provisions for the construction relating to irrigation in the State of Gujarat and for the matters connected therewith and incidental thereto.

## iii. Gujarat Irrigation and Drainage Rules, 2014

It shall apply to all the works constructed and maintained relating to irrigation including drainage and water supply for drinking and industrial purpose by the State Government, State Government institutions, and Grant-in-Aid Institutions of the State and includes all services rendered thereof.

## iv. The Gujarat Water Supply and Sewerage Board Act, 1978

An Act to provide for the establishment of a Water Supply and Sewerage Board for the rapid development and proper regulation of water supply and sewerage services in the State of Gujarat. It extends to the whole of the State of Gujarat excluding the areas comprised of Cities and cantonments.

## v. Saurashtra Felling of Trees (Infliction of Punishment) Act, 1951

An Act to provide for heavier punishment for felling of trees and for certain other matters. Whereas it is expedient to provide for heavier punishment for the unauthorized felling of trees and certain other matters

## vi. The Gujarat Highways Ac, 1955

An Act to provide for the restriction of ribbon development along highways, for the prevention and removal of encroachment thereon, for the construction maintenance and development of highways, for the levy of betterment charges, and certain other matters.

## vii. The Gujarat Water and Gas Pipelines (Acquisition of Right of User in Land) Act, 2000

An Act to provide for the acquisition of the right of users in land for laying water pipelines and gas pipelines in the State of Gujarat and for the matters connected therewith.

## viii. Gujarat Industrial Development Act, 1962

This act is to make special provision for securing the orderly establishment and organization of industries in industrial areas and industrial estates in the State of Gujarat and to establish commercial centres in Connection with the establishment and organization of such industries and for that purpose to establish an Industrial Development Corporation, and for purposes connected with the matters aforesaid.

## ix. The Gujarat Special Economic Zone Act, 2004



An Act to provide for the operation, maintenance, management, and administration of a Special Economic Zone in the State of Gujarat and to constitute an Authority and for matters connected therewith or incidental thereto

## x. The Gujarat Vacant Lands in Urban Areas (Prohibition of Alienation) Act, 1972

An Act to prohibit the alienation of certain vacant lands in urban areas in the State of Gujarat.

## xi. The Gujarat Town Planning and Urban Development Act, 1976

An Act to consolidate and amend the law relating to the making and execution of development plans and town planning schemes in the State of Gujarat.

## xii. The Right to Fair Compensation and Transparency in Land Acquisition, Rehabilitation and Resettlement Gujarat Amendment) Act, 2016 (effective from August 2016)

A further amendment to the "Principal Act" referred to the Right to Fair Compensation, Transparency in Land Acquisition and Resettlement and Rehabilitation Act, 2013 in its application to the State of Gujarat, enacted the Gujarat Amendment Act, 2016 with simplifying the provisions, which was commenced on 15th August 2016.; Major amendments include Power of State government to exempt public interest and SIA for certain projects mentioned in the sub section of 10A., R&R Assistance - lump sum amount equal to 50% of the amount of land compensation as determined under section 27 of principal Act to the affected families, in case of a project which are linear in nature.

## xiii. The Gujarat Ancient Monuments and Archaeological Sites and Remains Act, 1965

An Act to make better provision for the preservation of ancient and historical monuments and records and archaeological sites and remains (other than those declared to be of national importance) in the State of Gujarat and for matters connected with the purposes aforesaid.

## xiv. Gujarat Fisheries Act, 2003

An Act to provide for the protection, conservation, and development of fisheries in inland and territorial waters of the State of Gujarat and regulation of fishing in the inland and territorial waters along the coastline of the State and matters connected therewith or incidental thereto.

## xv. The Gujarat Public Premises (Eviction of Unauthorised Occupants) Act, 1972

An Act to provide for the eviction of unauthorized occupants from public premises and for certain incidental matters.

## xvi. The Gujarat Slum Areas (Improvement, Clearance, and Redevelopment) Act, 1973

An Act to provide for the improvement and clearance of Slum areas in the State of Gujarat and their development; and matters connected with the purposes aforesaid.

## xvii. Gujarat Special Investment Region Act, 2009

An Act to provide for the establishment, operation, regulation, and management of large size Investment Regions and Industrial Areas in the State of Gujarat; and to especially enable their development as global hubs of economic activity supported by world-class infrastructure, premium civic amenities, centres of excellence and proactive policy framework; and for setting up an organizational structure with that purpose and for matters connected therewith or incidental thereto.

## xviii. Gujarat State Disaster Management Act, 2003

An Act to provide for effective management of disaster, for mitigation of the effects of disaster, for administering, facilitating, coordinating and monitoring emergency relief during and after the occurrence of disasters, and for implementing, monitoring, and coordinating measures for reconstruction and rehabilitation in the aftermath of disasters, in the State of



Gujarat and for these purposes to establish the Gujarat State Disaster Management Authority and to specify other agencies and for matters connected therewith or incidental thereto.

#### xix. Gujarat Government-Policy for Reuse of Treated Wastewater, 2018

The concept of wastewater recycling and reuse and the need to include the same in all water supply and wastewater management programs is recognized by most of the policy frameworks and institutions in India.

Gujarat Government Policy for the use of treated wastewater is in force from May 2018 with a vision to maximize the collection and treatment of sewage generated and reuse of treated wastewater on a sustainable basis, thereby reducing dependency on freshwater resources and also promotes treated wastewater as an economic resource.

The Policy has the following objectives:

- To reach a minimum of 80% coverage and collection of sewage in all municipal towns
- To reach a level of 100% treatment collected sewage as per the prescribed standards
- To reuse at least 25% of total freshwater consumption from treated wastewater within the time limit set under the policy by every municipal body
- To reuse 70% of treated wastewater by 2025
- To reuse 100% of treated wastewater by 2030

The prime responsibility for the treatment of wastewater, wastewater recycling, and reuse will be with the local body. Accordingly, the creation of wastewater management and planning and implementation of wastewater reuse infrastructure will be the responsibility of the local body depending on the availability of funds. However, the state government will seek to augment these efforts.

#### xx. Gujarat Government-The 'Urban Sanitation and Cleanliness Policy, 2018

A comprehensive policy for solid and waste management. Under this policy, all major urban civic bodies need to ensure 100 percent waste segregation to ensure less generation of solid waste. The policy also allows civic bodies to make their laws, regulations and draw up rules concerning penalties for violators. Under the new policy, Gujarat is looking to reduce dependency on landfills and send collected waste directly to waste treatment plants. Construction waste will be recycled and reused. The main idea is to first reduce the generation of waste by encouraging segregation in households, resident welfare associations, and bulk waste generators like malls and hospitals.

This policy makes it mandatory for all households to have their drainage systems linked directly to sewage treatment plants (STPs), to avoid the direct flow of sewage into lakes or rivers.



## Table 53: Applicable Regulations

Sr. No.	Policy/ Act/ Rules	Policy/ Act/ Rules Key provisions and Purpose		Sub Project Phase	
1.	National Environment Policy, 2006	The National Environment Policy by the MoEFCC aims at mainstreaming environmental concerns into all developmental activities. It emphasizes the conservation of resources and points out that the best way to aid conservation is to ensure that people dependent on resources obtain better livelihoods from conservation than from degradation of the resources.	Prevention of pollution and degradation of resources caused due to the existing STPs functioning.	Construction and Operation phase	
2.	The Environmental (Protection) Act. 1986, and the Environmental (Protection) Rules, 1987- 2002 (various amendments)	All environmental Notifications, Rules and Schedules are issued under the EPA Act	Prevention of pollution and degradation of resources caused due to the existing STPs functioning.	Construction and Operation phase	
3.	Environmental Impact Assessment Notification, 2006	The EIA Notification of 2006 and 2009 (replacing the EIA Notification of 1994), set out the requirement for environmental assessment in India. This states that Environmental Clearance is required for certain defined activities/projects, and this must be obtained before any construction work or land preparation (except land acquisition) may commence. Projects are categorized as A or B depending on the scale of the project and the nature of its impacts. Category A projects requires Environmental Clearance from the National Ministry of Environment, Forest and Climate Change (MoEFCC). Category B projects require Environmental Clearance from the State Environmental Impact Assessment Authority (SEIAA).	None of the components of this subproject falls under the ambit of the notification. and EC is not required for STP.	Not applicable	
4.	The Water (Prevention and Control of Pollution) Act, 1974 and The Water Cess Act 1977	Consent required for not polluting ground and surface water during construction	Shall be applicable throughout the project cycle. Consent to Establish (CTE) and Consent to Operate (CTO) is required for new STPs. In this case,	Construction and Operation phase	



Sr. No.	Policy/ Act/ Rules	Key provisions and Purpose	Applicability to the Sub Project	Sub Project Phase	
			amendment to existing CCA will be required.		
5.	The Air (Prevention and Control of Pollution) Act. 1981	Consent required for establishing and operation of crushers, hot mix and batching plants etc.	Shall be applicable throughout the project cycle. Consent to Establish (CTE) and Consent to Operate (CTO) is required for new STPs. In this case, amendment to existing CCA will be required.	Construction Operation phase	and
6.	The Noise Pollution (Regulation and Control) Rule, 2000	Construction machineries and vehicles to conform to the standards for construction	Shall be applicable throughout the project cycle.	Construction Operation phase	and
7.	The Wildlife Protection Act, 1972	An Act to provide for the comprehensive protection of wild animals, birds and plants. This would cover matters concerning appointment of forest authorities, hunting of wild animals, protection of specified plants, conservation of national parks and sanctuaries, trade commerce in relation to plants and animals and prevention of any offences.	Not applicable as subprojects components are not located in designated protected area.	Not applicable	
8.	Saurashtra Felling of Trees (Infliction of Punishment) Act, 1951	The rule indicates restriction on felling the trees without due permission <sup>53</sup> .	Applicable as the project will require felling of trees.	Applicable	
	Amended by Sau. 28 of 1952.				
	Amended by Sau. 27 of 1954.				
	Amended by Sau. 21 of 1955?				
	Adapted and modified by the Bombay (Saurashtra Area) Adaptation of Laws ( State and Concurrent Subjects ) Order, 1956.				
	Amended by Gui. 9 of 1960.				

<sup>&</sup>lt;sup>53</sup> https://ifp.gujarat.gov.in/DIGIGOV/StaticAttachment?AttachmentFileName=/pdf/approvals/pre\_establishment\_approvals/10\_Tree\_Cutting\_Permission.pdf



Sr. No.	Policy/ Act/ Rules	Key provisions and Purpose Applicability to the Sub Project Sub Project P		Sub Project Phase
9.	The Wetlands (Conservation and Management) Rules, 2017	Conservation of wetlands for their ecosystem	Not applicable as the subproject is not near any wetland	Not applicable
10.	Solid Waste Management Rules, 2016	Disposal of Municipal Solid Waste as per rules	Applicable, construction workers camp and the waste generated from employees during operation will generate municipal solid waste which needs to be handled as per SWM rules.	Construction and Operation phase
11.	Construction and Demolition (C&D) Waste Management Rules, 2016	Safe disposal for C&D Waste	Applicable, construction waste shall be generated due to demolition of existing structures & construction activities.	Construction phase
12.	Plastic Waste Management Rules, 2016, amended 2018	Safe disposal of plastic/ packaging material waste	Applicable, plastic and packaging waste will be generated in vast quantities during the implementation/ construction stage. In operation phase screening/ floating waste of plastic will be generated.	Construction phase
13.	Hazardous and Other Wastes (Management & Transboundary Movement) Rules, 2016, amended 2019	According to the Rules, hazardous wastes are wastes having constituents specified in schedule II of the rules, if their concentration is equal to or more than the limit indicated in the said schedule.	Applicable, the generated hazardous waste like waste oil. Paint, grease etc., has to be handled as per rules. Use and storage of Chlorine will attract consent from Petroleum & Explosive Safety Organization	Construction and Operation phase
14.	E-Waste Management Rule, 2016, amended 2018	The rule dictates the entity generating hazardous wastes (as defined in the rule), to take all practical steps to ensure that such wastes are properly handled without any adverse effects, which may result from such wastes. It stipulates proper collection, reception, treatment, storage, and	Applicable as e-waste will be generated during the project construction as well as during operation.	Construction and Operation phase



Sr. No.	Policy/ Act/ Rules	Policy/ Act/ Rules Key provisions and Purpose Applicability to the Sub Projections		Sub Project Phase
		disposal of such wastes and provides for the process/mechanism to do so.		
15.	Bio-medical Waste Management Rules, 2016, amended 2019	To improve the collection, segregation, processing, treatment, and disposal of the bio-medical wastes in environmentally sound management thereby, reducing biomedical waste generation and its impact on the environment.	The subproject does not directly deal with bio-medical wastes or its management. However, this may be Applicable as there may be household / other biomedical waste in the screenings	Construction (Rehabilitation of existing STP) and Operation Phase
16.	<ul> <li>Batteries (Management and Handling) MoEFCC under the provisions of the Rules, 2001</li> <li>Protection Act, 1986 issued to (Management and Handling) Rules, 2</li> <li>were enacted with the primary ensuring the safe disposal of disca batteries.</li> </ul>		Applicable as the project will involve use of batteries for vehicles and plant	Construction and Operation phase
17.	The Motor Vehicle Act, 1988 & Motor Vehicles Rules, 1989	State Transport Authority to enforce standards for vehicular pollution.	All the vehicles used for construction and operation will need to comply with the provisions of this act.	Construction phase
18.	Insecticide Act 1968 and Rules 1971	The Insecticides Act, 1968 and Insecticides Rules, 1971 regulate the import, registration process, manufacture, sale, transport, distribution, and use of insecticides (pesticides) to prevent risk to human beings or animals and for all connected matters, throughout India. It directs the usage of only approved pesticides / insecticides	Applicable in case the subproject involves purchase or use of any insecticide or pesticides in the STP premises for landscaping purpose	Applicable
19.	The Right to Fair Compensation and Transparency in Land Acquisition, Rehabilitation and Resettlement Act, 2013.	Private land acquisition is guided by the provisions and procedures under this Act. Before the acquisition of any land, the Government is required to consult the concerned Panchayat or Municipal Corporation and carry out a Social Impact Assessment in consultation with them. The Act provides a transparent process for land acquisition for industrialization, development of essential	The STP is in ownership of AMC. The proposed project doesn't involve any land acquisition or livelihood impacts as the area proposed for upgradation is within existing project premises. Workers directly or indirectly engaged with AMC/Contractors are working within the existing premises	Not applicable



Sr. No.	Policy/ Act/ Rules	Key provisions and Purpose	Applicability to the Sub Project	Sub Project Phase
		infrastructural facilities and urbanization by giving adequate financial compensation to the affected people.	who will be absorbed during construction related activities and continue to be engaged in current	
	Right to Fair Compensation and Transparency in Land Acquisition, Rehabilitation and Resettlement (Gujarat Amendment) Act, 2016.	Amendment of section 2 of 30 of 2013: Following proviso is inserted, provided also that the acquisition of land for the projects listed in Section 10A and the purposes specified therein shall be exempted from the provisions of the first provision.	tasks.	
		10 A Power of the state government to exempt certain projects including projects vital to national security or defence of India, rural infrastructure including electrification, affordable housing and housing for poor, industrial corridors set up by State Government and its undertaking (up to 1 km on both side of railways or roads of such corridor), infrastructure projects including projects under PPP where ownership of land lies with state government		
20.	The Honorable Supreme Court of India order, pertaining to removal and restriction of encroachment of religious structures on the public space.	Banned fresh encroachment of roads, pavements and sideways by construction of religious structures or installation of statues of public figures. The order can empower municipal and government bodies to prevent unauthorized constructions being carried out under the garb of religious structures as often local political interests and religious sentiments render authorities helpless.	The project will be developed within the existing project boundary only which is enclosed.	Not applicable
21.	Central Ground Water Authority- 'Guidelines to control and regulate groundwater extraction in India' September 2020	All new infrastructure projects, who have submitted their applications prior to 24.09.2020 and propose to draw more than 20 KLD of ground water are required to submit proof of installation of STP or submit an affidavit as per format available on the website.	Not applicable. As no Ground water extraction is envisaged.	Not Applicable



Sr. No.	Policy/ Act/ Rules	Key provisions and Purpose	Applicability to the Sub Project	Sub Project Phase	
22.	The Factories Act 1948, amended 1954, 1970, 1976 and 1987	An Act to consolidate and amend the law regulating labour in factories. WHEREAS it is expedient to consolidate and amend the law regulating labour in factories;	Applicable as more than 10 workers are expected to be involved in any year n the project.	Construction operation	and
		Health, Safety, Welfare and other provisions are mentioned specifically for compliance.			
23.	The Building & Other Construction Workers (Regulation of Employment & Conditions of Service) BOCW Act, 1996	All the establishments who carry on any building or other construction work and employ 10 or more workers are covered under this Act. All such establishments are required to pay Cess at rate not exceeding 2% of the cost of construction as may be notified by the Government	<ul> <li>Applicable to any building or other construction work employing 10 or more workers;</li> <li>Provide safety measures at the construction work and other welfare</li> </ul>	Construction p Operations Maintenance phases	hase, and
		The employer of the establishment is required to provide safety measures at the building or construction work and other welfare measures, such as canteens, first-aid facilities, ambulance, housing accommodation for workers near the workplace etc.	measures, such as insurance, canteens, first-aid facilities, ambulance, housing accommodation for workers near the workplace etc.,	ures, such as insurance, ens, first-aid facilities, lance, housing accommodation orkers near the workplace etc.,	
		The employer to whom the Act applies has to obtain a registration certificate from the Registering Officer appointed by the Government and require reporting as desired by the Registering Office in compliance to the Act			
		- Cess should be paid at a notified rate;			
24.	Child Labour (Prohibition and Regulation) Act, 1986 and Rules, amended 2016	No child below 14 years of age will be employed or permitted to work in any of the occupations set forth in the Act's Part A of the Schedule or in any workshop wherein any of the processes set forth in Part B of the Schedule.	No child labour will be appointed for any work related to this project.	Construction Operation phase	and



Sr. No.	Policy/ Act/ Rules	Key provisions and Purpose	Applicability to the Sub Project	Sub Project Phase	
		Child can help his family or family enterprise, which is other than any hazardous occupations or processes set forth in the Schedule, after his school hours or during vacations			
25.	Minimum Wages Act, 1948	The employer is supposed to pay not less than the Minimum Wages fixed by appropriate Government as per provisions of the Act, if the employment is a scheduled employment. Construction of Buildings, Roads, Runways are scheduled employment.	All construction workers should be paid not less than the prescribed minimum wage.	Construction Operation phase	and
26.	The Bonded Labour System (Abolition) Act 1976	The Bonded Labour System (Abolition) Act 1976: States that all forms of bonded labour stands abolished and every bonded labour stands freed and discharged from any obligations to render any bonded labour	Applicable. Labour involved during the project will be appointed as per prevailing laws and rules.	Construction Operation phase	and
27.	Workmen's Compensation Act, 1923 & Rules 1924	The Act requires if personal injury is caused to a workman by accident arising out of and during his employment, his employer should be liable to pay compensation in accordance with the provisions of this Act.	Applicable during the construction phase.	Construction phase	
28.	Interstate Migrant Workmen Act 1979	The Act is applicable to an establishment which employs 5 or more inter-state migrant workmen through an intermediary (who has recruited workmen in one state for employment in the establishment situated in another state). The inter- state migrant workmen, in an establishment to which this Act becomes applicable, are required to be provided certain facilities such as housing, medical aid, traveling expenses from home up to the establishment and back, etc.,	Contractor shall register with Labour Department, if Inter-state migrant workmen are engaged. Adequate and appropriate amenities and facilities to be provided to workers - housing, medical aid, traveling expenses	Construction phase	



Sr. No.	Policy/ Act/ Rules	Key provisions and Purpose	Applicability to the Sub Project	Sub Project Phase
29.	Ancient Monuments and Archaeological Sites & Remains (Amendment and Validation) Act 2010	The Rules designate areas within a radius of 100 m and 200 m from the "protected property/ monument/ area" as "prohibited area" and "regulated area" respectively. Henceforth, no permission for construction of any public projects or any other nature shall be granted in the prohibited areas of the protected monument.	Rules designate areas within a radius of 100 m 200 m from the "protected property/ ument/ area" as "prohibited area" and ulated area" respectively. reforth, no permission for construction of any ic projects or any other nature shall be granted e prohibited areas of the protected monument.	
		In respect of regulated area, the Competent Authority may grant permission for construction, reconstruction, repair and renovation based on recommendation of the National Monument Authority duly taking note of heritage bye-laws, which shall be prepared in respect of each protected monument and protected area		
30.	Right to Information Act, 2005	To secure access to information under the control of public authorities	Applicable, general public are entitled to ask information under this	Construction and Operation phase
		To promote transparency and accountability in the working of every public authority	act related to the subproject. The project authorities shall provide necessary information.	
31.	Gujarat (Right of Citizens to Public Services) Act, 2013	An Act to lay down an obligation upon every public authority to render public services within the prescribed time limit and provide for a grievance redressal mechanism to citizens for non-compliance and for the matters connected therewith or incidental thereto.	Applicable, general public are entitled to public services related to the subproject including access to water supply and sewerage services.	Construction and Operation phase
32.	The Street Vendors (Protection of Livelihood and Regulation of Street Vending) Act was passed in 2014	An Act to protect the rights of urban street vendors and to regulate street vending activities and for matters connected therewith or incidental thereto.	Not applicable as STP development is within the existing boundary and no street vendors are present in the plant premises or adjacent to the plant premises	Not applicable



Sr. No.	Policy/ Act/ Rules	Key provisions and Purpose	Applicability to the Sub Project	Sub Project Phase
33.	The Constitution (Seventy-Fourth Amendment) Act, 1992	An act to strengthen the Municipal Authorities.	Applicable as the subproject is being implemented by Municipal Corporation	Construction and Operation phase
34.	The Gujarat (Panchayats, Municipalities, Municipal Corporations And State) Tax On Professions, Traders, Callings And Employments Act, 1976 Amended till 2008	An act to strengthen the Municipal Authorities.	Applicable as the subproject is being implemented by Municipal Corporation	Construction and Operation phase
35.	Scheduled Castes and Scheduled Tribes (Prevention of Atrocities) Act 1989 and further Amendments 2018.	To prevent atrocities against scheduled castes and scheduled tribes. The objectives of the Act clearly emphasized the intention of the government to deliver justice to these communities through proactive efforts to enable them to live in society with dignity and self-esteem and without fear or violence or suppression from the dominant castes.	Not applicable. specifically, to project but shall be applicable to all those working indirectly and directly on the sub-project. and in AMC.	Overall applicability to all working, directly and indirectly in sub-project, during construction and operation.
36.	The Sexual Harassment of Women at Workplace (Prevention, Prohibition and Redressal) Act, 2013	To provide protection against sexual harassment of women at workplace and for the prevention and redressal of complaints of sexual harassment and for matter connected therewith or incidental thereto	Applicable, to all workers, including female workers/ employees engaged in project activities to have legal protection and recourse under the act.	Construction and Operation phase
37.	The Prohibition of Employment as Manual Scavengers and their Rehabilitation Act, 2013	An Act to provide for the prohibition of employment as manual scavengers, rehabilitation of manual scavengers and their families, and for matters connected therewith or incidental thereto.	<ul> <li>Applicable. As G-ACRP involves sub project which includes upgradation or setting up new projects which involves sewer lines and STP. As per definition in act, it includes:</li> <li>hazardous cleaning in relation to sewers and septic tanks and manual cleaning;</li> <li>unsanitary latrines which requires manual removal and disposal of excreta;</li> <li>local authority meaning municipal bodies/ panchayat.</li> </ul>	Construction and operation



## 1.1.10.1.1 ANNEXURE III: WORLD BANK ESSs APPLICABLE TO THE PROJECT

ESSs	Objectives	Requirements	ESF Relevance & Extent of Relevance to
World Bank Environmental and Social Framework for Investment Project Financing	It sets out the mandatory requirements of the Bank in relation to the projects it supports through Investment Project Financing.	<ul> <li>The types of E&amp;S risk and impacts that should be considered in the environmental and social assessment.</li> <li>The use and strengthening of the Borrower's environmental and social framework for the assessment, development and implementation of World Bank financed projects where appropriate.</li> </ul>	Applicable to this project for rehabilitation of STP and associated activities such as TSPS repairs and access road surfacing
ESS-1 Assessment and Management of Environmental and Social Risks and Impacts	Identify, assess, evaluate, and manage environment and social risks and impacts in a manner consistent with the ESF. To adopt a mitigation hierarchy approach to: (a) Anticipate and avoid risks and impacts; (b) Where avoidance is not possible, minimize or reduce risks and impacts to acceptable levels; (c) Once risks and impacts have been minimized or reduced, mitigate; and (d) Where significant residual impacts remain, compensate for or offset them, where technically and financially feasible.	<ul> <li>The types of E&amp;S risk and impacts that should be considered in the environmental and social assessment.</li> <li>The use and strengthening of the Borrower's environmental and social framework for the assessment, development and implementation of World Bank financed projects wherever appropriate.</li> </ul>	<ul> <li>Requirement under this component includes: <ul> <li>i) Upgradation of STP,</li> <li>ii) Construction activities which include demolition and construction wastes from existing STP, new construction activities and</li> <li>iii) Appropriate technology application to handle the current/ future load with potential environmental and social risks and impacts.</li> <li>iv) Facilities or activities that are to be carried out, or planned to be carried out, contemporaneously with the project</li> <li>v) Benefits occurring from the sub-project include labor opportunities, procurement of local goods, services, equipment, and materials, the release of treated water for non-domestic purposes, improvement in quality of life for city and</li> </ul> </li> </ul>



ESSs	Objectives	Requirements	ESF Relevance & Extent of Relevance to
			downstream users due to better
ESS-2 Labor-and-Working- Conditions	<ul> <li>Promote safety and health at work.</li> <li>Promote the fair treatment, non-discrimination, and equal opportunity of project workers.</li> <li>Protect project workers, with particular emphasis on vulnerable workers.</li> <li>Prevent the use of all forms of forced labor and child labor.</li> <li>Support the principles of freedom of association and collective bargaining of project workers in a manner consistent with national law.</li> <li>Provide project workers with accessible means to raise workplace concerns.</li> </ul>	<ul> <li>Requirements of the Borrower to assess the scale, duration/timing and nature of workers to be employed, impacts/ risks associated with their engagement and how they will be addressed.</li> <li>Provisions on the treatment of direct, contracted, community, and primary supply workers, and government civil servants.</li> <li>Requirements on terms and conditions of work, non-discrimination and equal opportunity and workers organizations. Provisions on child labor and forced labor and prevention of SEA/SH.</li> <li>Requirements on occupational health and safety, in keeping with the World Bank Group's Environmental, Health, and Safety Guidelines (EHSG).</li> <li>Develop and implement written labor management procedures applicable to the sub-project and compliance to national requirements, laws, procedure, guidelines, standards etc.</li> </ul>	<ul> <li>Follow national, state, guidelines on OHS and WB EHGS for all works / activities</li> <li>Project will be hiring following types of workers: <ul> <li>i) Direct workers will include the project managers and supervisors, who are employees of AMC, GUDM.</li> <li>ii) The work force deployed by the Contractors and the Project Management Consultant will be deemed to be contracted workers. The Contractor(s) might further engage multiple vendors and subcontractors;</li> <li>iii) Migrant laborers may be employed by the conflicts with local people, moderate risk of Gender based Violence (GBV), social disturbance, and communicable diseases due to the low-level influx of migrant workers, including resource related conflicts.</li> <li>v) Labor and employment opportunities will be increased during the construction activities and local labor will be hired as far as possible.</li> </ul> </li> </ul>
ESS-3 Resource-Efficiency- and-Pollution-Prevention- and-Management	• Promote the sustainable use of resources, including energy, water, and raw materials.	<ul> <li>Resource efficiency measures should be analyzed as part of the environmental and social assessment</li> </ul>	To ensure Resource Efficiency, the project preparation and the ESIA process



ESSs	Objectives	Requirements	ESF Relevance & Extent of Relevance to the Project
	Avoid or minimize adverse impacts on human health and the environment caused by pollution from project activities. To avoid or minimize project-related emissions of short and long-lived climate pollutants. To avoid or minimize generation of hazardous and non-hazardous waste.	<ul> <li>When the project is a potentially significant user of water or will have potentially significant impacts on water quality, in addition to applying the resource efficiency requirements of this ESS, the Borrower will adopt measures, to the extent technically and financially feasible, that avoid or minimize water usage so that the project's water use does not have significant adverse impacts on communities, other users, and the environment.</li> <li>Efficiency in use of raw materials and, thereby, efficiency in costs and labor, can be achieved by eliminating and/or minimizing the quantity used in the project, selecting the most appropriate raw materials possible, and reducing and recycling wastes.</li> <li>The Borrower will avoid the release of pollutants or, when avoidance is not feasible, minimize and control the concentration and mass flow of their release using the performance levels and measures specified in national law or the EHSGs, whichever is most stringent. This applies to the release of pollutants to air, water, and land due to routine, on routine, and accidental circumstances, and with the potential for local, regional, and transboundary impacts.</li> <li>ESS-3 refers to national law and Good International Industry Practice, in the first instance the World Bank Groups' EHSGs. treated sewage and sludge</li> </ul>	<ul> <li>will identify feasible measures for efficient <ul> <li>(a) Energy use;</li> <li>(b) Water management to minimize water usage during construction, and recycling of water used construction, treated water reuse, upcycling of wastes and byproducts such as gases</li> <li>(c) Raw materials use by exploring use of local materials, recycled aggregates, the project would also need to address the management of solid and liquid waste generated during the construction and operation phases.</li> <li>(d) Avoid the release of pollutants, avoid, minimize and control such releases and comply to regulations under nationals and local laws; and WB EHS especially in terms of discharge of treated effluents, sludge, screenings and other wastes (including C&amp;D wastes, solid wastes, plastics, hazardous, e-wastes, biomedical wastes if any in screenings) emanating from proposed rehabilitation and operation &amp; maintenance of STP</li> <li>e) minimize pollution impacts (waste and wastewater (bypass) outflow, erosion of soil, construction materials, chemicals used, siltation and other such impacts) during construction activities, maintenance, emergencies, disasters</li> </ul> </li> </ul>
			ine includy has consent to dispose

treated water in Sabarmati. Currently as



ESSs	Objectives	Requirements	ESF Relevance & Extent of Relevance to the Project
			there is no consent from GPCB and as per consent conditions, AMC is not supplying water from this facility in Fatehwadi canal. In case of maintenance work of Canal, the treated water is disposed in the Sabarmati River. Issues related to pollution from effluents, pollutants and untreated sewage in Sabarmati River & Fatehwadi were reported during consultations and discussions. The subproject shall ensure regulatory compliance, and best standards for proposed reuse, after consultations with the stakeholders. This will reduce pollution, and resource efficiency
ESS-4 Community-Health- and-Safety	<ul> <li>Anticipate or avoid adverse impacts on the health and safety of project-affected communities during project life-cycle from routine and non-routine circumstances</li> <li>Promote quality, safety, and climate change considerations in infrastructure design and construction, including dams</li> <li>Avoid or minimize community exposure to project-related traffic and road safety risks, diseases and hazardous materials</li> <li>Have in place effective measures to address emergency events</li> <li>Ensure that safeguarding of personnel and property is carried out in a manner that avoids or minimizes risks to the project-affected communities</li> </ul>	<ul> <li>Requirements on infrastructure, considering safety and climate change, and applying the concept of universal access, where technically and financially feasible.</li> <li>Requirements on traffic and road safety, including road safety assessments and monitoring</li> <li>Ecosystem services: Addresses risks arising from impacts on provisioning and regulating ecosystem service</li> <li>Community exposure to health issues: Measures to avoid or minimize the risk of water-related, communicable, and non-communicable diseases on downstream communities</li> <li>Requirements to assess risks associated with security personnel, and review and report unlawful and abusive acts to relevant authorities</li> <li>Management and safety of hazardous materials</li> </ul>	<ul> <li>In the project there is likely to be <ul> <li>i) Earth excavation, use of vibratory equipment, construction debris handling and disposal etc. during construction</li> <li>ii) High likelihood of direct exposure to increased construction related traffic and equipment especially at road section connecting canal road to the highway.</li> <li>iii) There may be risks to and due to emergency release from the Vasna barrage, safety risks to project due to flooding, extreme events and mitigation and impacts on downstream communities. Unanticipated risks to the downstream communities in case of</li> </ul></li></ul>



ESSs	Objectives	Requirements	ESF Relevance & Extent of Relevance to the Project
		Emergency preparedness and response	release of untreated sewage from STPs during construction or bypass during emergencies, or maintenance to Fatehwadi Canal or Sabarmati River
			iv) Moderate dust levels from earthworks, moderate noise and emission level from traffic congestion and idling of vehicles, demolition of STP units during rehabilitation works
			<ul> <li>v) Treated water released in the river and Fathewadi canal will be improved due to the subproject and contribute in enhancing overall community health conditions.</li> </ul>
			<ul> <li>vi) There may be adverse impacts of discharge from STP on adjoining communities, especially during construction phase;</li> </ul>
			<ul> <li>vii) Women and girls in adjacent communities may face increased risk of gender based violence, sexual exploitation and abuse and sexual harassment (GBV and SEA/SH) due to larger labor presence and; other labor influx related risks</li> </ul>
ESS-5 Land-Acquisition- Restrictions-on-Land-Use- and-Involuntary- Resettlement	<ul> <li>Avoid or minimize involuntary resettlement by exploring project design alternatives</li> <li>Avoid forced eviction</li> <li>Mitigate unavoidable adverse impacts from land acquisition or restrictions on land use by providing compensation at replacement cost and assisting displaced persons in their efforts</li> </ul>	<ul> <li>Project design alternatives for avoiding and minimizing involuntary resettlement impacts</li> <li>Applies to permanent or temporary physical and economic displacement resulting from differen types of land acquisition and restrictions or access</li> </ul>	<ul> <li>Land acquisition and IR will not be required for the project as the proposed project involves upgradation of existing STP and capacity augmentation by AMC. Land use will remain the same. Land is under the Ahmedabad</li> </ul>



ESSs	Objectives	Requirements	ESF Relevance & Extent of Relevance to the Project
	<ul> <li>to improve, or at least restore, livelihoods and living standards to pre-displacement levels or to levels prevailing prior to the beginning of project implementation, whichever is higher</li> <li>Improve living conditions of poor or vulnerable persons who are physically displaced, through provision of adequate housing, access to services and facilities, and security of tenure</li> <li>Conceive and execute resettlement activities as sustainable development programs</li> <li>Ensure that resettlement activities are planned and implemented with appropriate disclosure of information, meaningful consultation, and the informed participation of those affected</li> </ul>	<ul> <li>Does not apply to voluntary market transactions, except where these affects third parties</li> <li>Provides criteria for "voluntary" land donations, sale of community land, and parties obtaining income from illegal rentals</li> <li>Prohibits forced eviction (removal against the will of affected people, without legal and other protection including all applicable procedures and principles in ESS5)</li> <li>Requires that acquisition of land and assets happens only after payment of compensation and resettlement has occurred. Envisages benefits for affected persons</li> <li>Requires community engagement and consultation, disclosure of information and a grievance mechanism</li> </ul>	<ul> <li>municipality as per land records available</li> <li>Accessibility to road and river will not change and uninterrupted. There is no livelihood loss expected from the proposed upgradation and rehabilitation of the STP.</li> <li>Accessibility to the river is not restricted currently or in the proposed sub-project upgradation. There are no commercial or residential or common property within the STP site.</li> <li>Kaccha access road is existing and therefore road repairs and upgradation is proposed to enhance the access in the subproject of rehabilitation of 240 MLD.</li> <li>No resettlement activities are envisaged.</li> </ul>
ESS-6 Biodiversity- Conservation	<ul> <li>Protect and conserve biodiversity and habitats.</li> <li>Apply the mitigation hierarchy and the precautionary approach in the design and implementation of projects that could have an impact on biodiversity.</li> <li>To promote the sustainable management of living natural resources.</li> </ul>	For the sub project, the ESIA will assess whether sub project activities will have impacts on natural habitat and biodiversity. Impacts on Sabarmati River due to discharge of treated sewage from the STP, will be assessed.	<ul> <li>Subproject areas are not protected areas or critical habitats. Sabarmati and Khari River and canals are all modified due to lack of water during most time of the year, and discharge of industrial effluents and poorly treated sewage, and altered water retention and flows.</li> <li>Minimal impacts include site clearance activities for rehabilitation of STP or allied activities such as material storage, which may require clearing of site overgrowths. No tree at the site is proposed to be cut or</li> </ul>



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			disturbed. Treated water of the STP
			will be discharged into the Sabarmati
			River. After upgradation of the 126
			MLD STP, discharged treated sewage
			will confirm to better quality which
			ultimately will benefit the aquatic
			life downstream. The biodiversity
			studies have indicated that the
			project will very negligibly affect
			biodiversity.
			• There are no critical habitats in the
			Sabarmati downstream as it is
			modified due to developments
			around, discharge of wastes and
			effluents from Ahmedabad and
			nearby regions and receives no
			natural flow during most part of the
			year and also suffer around 50
			percent deficit rainfall. It gets water
			diverted from Narmada Canal since
			past 8 years (sourcing from Sardar
			Sarovar Dam around 300kms away,
			from which water is shared between
			4 States including Gujarat) which is
			stored at riverfront for aesthetics
			and tourism as envisaged under
			riverfront redevelopment project;
			and then let out to the canal or river.
			in the major contributor to the flow
			is the major contributor to the flow
			through the river most of the year,
			and to the Fatenwadi Canal Which
			downstroam
			uownsuleani.



ESSs	Objectives	Requirements	ESF Relevance & Extent of Relevance to the Project
ESS-7 Indigenous-People	<ul> <li>Ensure that the development process fosters full respect for affected parties' human rights, dignity, aspirations, identity, culture, and natural resource-based livelihoods.</li> <li>Promote sustainable development benefits and opportunities in a manner that is accessible, culturally appropriate and inclusive.</li> <li>Improve project design and promote local support by establishing and maintaining an ongoing relationship based on meaningful consultation with affected parties.</li> <li>Obtain the Free, Prior, and Informed Consent (FPIC) of affected parties in three circumstances.</li> <li>Recognize, respect and preserve the culture, knowledge, and practices of Indigenous peoples, and to provide them with an opportunity to adapt to changing conditions in a manner and in a timeframe acceptable to them.</li> </ul>	<ul> <li>Applies when the Indigenous Peoples are present or have a collective attachment to the land, whether they are affected positively or negatively and regardless of economic, political or social vulnerability.</li> <li>The option to use different terminologies for groups that meet the criteria set out in the Standard.</li> <li>The use of national screening processes, providing these meet World Bank criteria and requirements.</li> <li>Coverage of forest dwellers, hunter gatherers, and pastoralists and other nomadic groups.</li> <li>Requirements for meaningful consultation tailored to affected parties and a grievance mechanism.</li> <li>Requirements for a process of free, prior and informed consent in three circumstances.</li> </ul>	Not relevant to this project.
ESS-8 Cultural-Heritage	<ul> <li>Protect cultural heritage from the adverse impacts of project activities and support its preservation.</li> <li>Address cultural heritage as an integral aspect of sustainable development.</li> <li>Promote meaningful consultation with stakeholders regarding cultural heritage.</li> <li>Promote the equitable sharing of benefits from the use of cultural heritage.</li> </ul>	<ul> <li>The term 'cultural heritage' encompasses tangible and intangible heritage, which may be recognized and valued at a local, regional, national or global level, as follows:</li> <li>Tangible cultural heritage, which includes movable or immovable objects, sites, structures, groups of structures, and natural features and landscapes that have archaeological, paleontological, historical, architectural, religious, aesthetic, or other cultural significance. Tangible cultural heritage may be located in urban or rural settings, and may be above or below land or under the water;</li> </ul>	<ul> <li>Not relevent for this subproject except for Chance Finds.</li> <li>The location of the subproject does not have any ancient monuments and/or archaeological site(s), protected area of local importance. As per the Heritage Department of AMC and data available, there are no tangible or intangible Cultural heritage or protected monuments within the STP premises or adjacent to it. The nearest monument is the</li> </ul>



ESSs		Objectives	Requirements	ESF Relevance & Extent of Relevance to
ESSs		Objectives	<ul> <li>Requirements</li> <li>Applies to all projects that are likely to have risks or impacts on cultural heritage. This will include a project which: <ul> <li>(a) Involves excavations, demolition, movement of earth, flooding or other changes in the physical environment;</li> <li>(b) Is located within a legally protected area or a legally defined buffer zone;</li> <li>(c) Is located in, or in the vicinity of, a recognized cultural heritage site; or</li> <li>(d) Is specifically designed to support the conservation, management and use of cultural heritage.</li> </ul> </li> <li>Applies to cultural heritage regardless of whether or not it has been legally protected or previously identified or disturbed.</li> </ul>	<ul> <li>ESF Relevance &amp; Extent of Relevance to the Project</li> <li>Fateh Baug Fort at a distance of 1.5 kms from the STP.</li> <li>Masjid Mohuddin at 135 m from the boundary. Ibrahim Masjid at 188 m from the boundary.</li> <li>Bag E Sukun Kabrastan (Shia Isthna Ashri Kabrastan) is located 1.2 km away from the STP boundary and is accessible by highway 64 and also through service road. It is located 1.6 km from the gate of the STP compound.</li> <li>Marthoma Church Ahmedabad Cemetery is located 1.6 km away from boundary and from the gate it is about 1.6 kms. Therefore, impacts on the same is not anticipated due to project activities.</li> <li>Considering Ahmedabad as a Heritage city and the banks of the river Sabarmati as being significant for potential heritage sites, chance find procedure will be framed and</li> </ul>
				implemented for any such discovery during excavation and construction activities within STP premises.
ESS-9 Intermediaries	Financial- •	Sets out how Financial Intermediaries (FI) will assess and manage environmental and social risks and impacts associated with the subprojects it finances. Promote good environmental and social management practices in the subprojects the FI finance.	<ul> <li>Financial Intermediaries (FIs) to have an Environmental and Social Management System (ESMS) - a system for identifying, assessing, managing, and monitoring the environmental and social risks and impacts of FI subprojects on an ongoing basis.</li> <li>FI to develop a categorization system for all subprojects; with special provisions for</li> </ul>	Not relevant as there is no financial intermediary involved.


ESSs	Objectives	Requirements	ESF Relevance & Extent of Relevance to the Project
	<ul> <li>Promote good environmental and sound human resources management within the FI.</li> </ul>	subprojects categorized as high or substantial risk. FI borrowers to conduct stakeholder engagement in a manner proportionate to the risks and impacts of the FI subprojects.	
ESS-10 Stakeholder- Engagement-and- Information-Disclosure	<ul> <li>Establish a systematic approach to stakeholder engagement that helps Borrowers identify stakeholders and maintain a constructive relationship with them.</li> <li>Assess level of stakeholder interest and support for the project and enable stakeholders' views to be taken into account in project design.</li> <li>Promote and provide means for effective and inclusive engagement with project-affected parties throughout the project life cycle.</li> <li>Ensure that appropriate project information is disclosed to stakeholders in a timely, understandable, accessible and appropriate manner.</li> </ul>	<ul> <li>Requires stakeholder engagement throughout the project life cycle, and preparation and implementation of a Stakeholder Engagement Plan (SEP).</li> <li>Requires early identification of stakeholders, both project-affected parties and other interested parties, and clarification on how effective engagement takes place.</li> <li>Stakeholder engagement to be conducted in a manner proportionate to the nature, scale, risks and impacts of the project, and appropriate to stakeholders' interests.</li> <li>Specifies what is required for information disclosure and to achieve meaningful consultation.</li> </ul>	<ul> <li>Relevant as the subproject will involve a wide variety of stakeholders during its project cycle. SEP has been prepared and it is a dynamic document for the G- ACRP project and this sub project. Consultations have been carried out for preparation of draft ESIA, ESIA, SEP and ESMF and details are included in the Chapter 8.</li> </ul>

World Bank Group General ESHS Guidelines, April 2007, and Industry-specific Guidelines (for Water, Sanitation, and other Good International Industry Practices will be applicable for this project. The General ESHS Guidelines contain information on cross-cutting environmental, health, and safety issues potentially applicable to all industry sectors. It has requirements for environmental and social health and safety issues during construction and operation. All applicable guidelines on COVID 19 also will be followed.



## ANNEXURE IV: BIODIVERSITY ASSESSMENT: FLORA & FAUNA

	Flora										
SI No:	Family	Scientific name	Author name	Common name		Origi n	IUCN status				
				English	Gujarati/Hi ndi						
Tree	S										
1	Annonaceae	Annona squamosa	L.	Custard apple	Sitaphal	E	NA				
2	Annonaceae	Polyalthia longifolia	(Sonn.) Thwaites	Mast tree	Asopalav	E	NA				
3	Apocynaceae	Holarrhena pubescens	Wall. Ex G.Don	Indrajao	Kadvo indrajav	Ν	LC				
ŀ	Apocynaceae	Wrightia tinctoria	R. Br.	Sweet indrajao	Mitho dudhalo	Ν	NA				
5	Arecaceae	Borassus flabellifer	L.	Toddy palm	Taad	E	NA				
5	Arecaceae	Cocos nucifera	L.	Coconut	Nariel	Ν	NA				
7	Caesalpiniaceae	Delonix regia	(Hook.) Raf.	Flame Tree	Gulmohor	E	LC				
3	Casuarinaceae	Casuarina equisetifolia	L.	Whistling Pine	Vilayti saru	Ν	NA				
)	Combretaceae	Anogeissus latifolia	(Roxb. ex DC.) Wall. ex Guillem. & Perr.	Axle Wood Tree	Dhavdo	N	NA				
LO	Ebenaceae	Diospyros melanoxylon	Roxb.	Coromandel Ebony	Timru	Ν	NA				
11	Fabaceae	Albizia saman	(Jacq.) Merr.	Rain Tree	Roto sarasdo	E	NA				



SI No:	Family	Scientific name	Author name	Common name		Origi n	IUCN status
				English	Gujarati/Hi ndi		
12	Fabaceae	Butea monosperma	(Lam.) Taub.	Flame of the Forest	Palas, Kesudo	Ν	NA
13	Lamiaceae	Gmelina arborea	Roxb.	White Teak	Sivan	Ν	NA
14	Leguminosae	Leucaena leucocephala	(Lam.) de Wit	Wild tamarind	Su Baval	Е	NA
15	Leguminosae	Peltophorum pterocarpum	(DC.) K.Heyne	Copperpod	Tamrafali	Е	NA
16	Leguminosae	Pithecelobium dulce	(Roxb.) Benth.	Sweet Tamarind	Vilayti Amli	Е	NA
17	Leguminosae	Pongamia pinnata	(L.) Pierre	Pongam Tree	Karanja	Ν	LC
18	Leguminosae	Prosopis cineraria	(L.) Druce	Indian Mesquite	Khijado	Ν	NA
19	Meliaceae	Azadirachta indica	A.Juss.	Neem	Limbdo	Ν	NA
20	Mimosaceae	Acacia nilotica	(L.) Del.	Indian gum Tree	Baval	Ν	LC
21	Moraceae	Ficus benghalensis	L.	Banyan Tree	Vad	Ν	NA
22	Moraceae	Ficus hispida	L.f.	Hairy fig	Dedh umbar	Ν	NA
23	Moraceae	Ficus racemosa	L.	Cluster fig	Umbar	Ν	NA
24	Moraceae	Ficus virens	Aiton	White Fig	Pepri	Ν	NA
25	Moringaceae	Moringa oleifera	Lam.	Drumstick	Mittho Saragvo	Ν	NA
26	Myrtaceae	Syzygium cumini	(L.) Skeels	Jamun	Jambu	Ν	NA
27	Rubiaceae	Morinda citrifolia	L.	Indian Mulberry	Aal	E	NA



SI No:	Family	Scientific name	Author name	Common name		Origi n	IUCN status
				English	Gujarati/Hi ndi		
28	Rutaceae	Aegle marmelos	(L.) Corrêa	Wood apple	Bili	Ν	NA
29	Sapindaceae	Schleichera oleosa	(Lour.) Merr.	Lac Tree	Kusum	Ν	NA
30	Sapotaceae	Madhuca longifolia var. latif olia	(Roxb.) A.Chev.	Indian Butter Tree	e Mahudo		NA
31	Simaroubaceae	Ailanthus excelsa	Roxb.	Indian Tree of Heaven	Arduso	N	NA
32	Verbenaceae	Tectona grandis	L. f.	Teak	Sag	Ν	NA
Shru	bs						
1	Apocynaceae	Calotropis procera	(Aiton) Dryand.	Rubber Bush	Akdo, Nani rui	Ν	NA
2	Capparaceae	Capparis sepiaria	L.	Wild Caper Bush	Kalo kantharo	Ν	NA
3	Cucurbitaceae	Cucumis sativus	L.	Cucumber	Keshar	Ν	NA
4	Euphorbiaceae	Croton bonplandianus	Baill.	Ban tulsi	Kala Bhangra	Ν	NA
5	Euphorbiaceae	Euphorbia neriifolia	L.	Indian Spurge Tree	Thor	Ν	NA
6	Euphorbiaceae	Ricinus communis	L.	Castor oil plant	Aerendiyo	Ν	NA
7	Leguminosae	Abrus precatorius	L.	Coral bead vine	Chanothi	Ν	NA
8	Leguminosae	Prosopis juliflora	(Sw.) DC.	Algaroba	Gandobaval	E	NA
9	Lythraceae	Lawsonia inermis	L.	Henna	Mendi	Ν	NA



SI No:	Family	Scientific name	Author name	Common name		Origi n	IUCN status
				English	Gujarati/Hi ndi		
10	Malvaceae	Abutilon pannosum	(G.Forst.) Schltdl.	Ragged mallow	Khapat	Ν	NA
11	Rhamnaceae	Ziziphus nummularia	(Burm.f.) Wight & Arn.	Jhar Beri	Chania bor	Ν	NA
12	Rhamnaceae	Ziziphus xylopyrus	(Retz.) Willd.	Kath ber	Ghat bor	Ν	NA
13	Verbenaceae	Lantana camara	L.	Lantana	Gandhari	E	NA
Herb	s						
1	Acanthaceae	Blepharis integrifolia	(L.f.) E.Mey. & Drège ex Schinz	Narrow-Leaf Rankklits Blepharis		N	NA
2	Acanthaceae	Elytraria acaulis	(L.f.) Lindau	Asian Scalystem Shat muli		Ν	NA
3	Amaranthaceae	Alternanthera paronychioide s	A.StHil.	Smooth Chaff Flower		E	NA
4	Amaranthaceae	Amaranthus viridis	L.	Pigweed	jungali chaulayi	Ν	NA
5	Amaranthaceae	Chenopodium album	L.	Bathua	Bathavo	Ν	NA
6	Apocynaceae	Hemidesmus indicus	(L.) R. Br. ex Schult.	Indian Sarsaparilla	Anantamul	Ν	NA
7	Asteraceae	Sphaeranthus indicus	L.	East Indian Globe Thistle	Gorakhmun di	N	LC
8	Asteraceae	Blumea eriantha	DC.	wool-flower blumea	Kapurio	Ν	NA
9	Asteraceae	Cyanthillium cinereum	(L.) H.Rob.	Little ironweed	Sahadevi	E	NA



SI No:	Family	Scientific name	Author name	Common name		Origi n	IUCN status
				English	Gujarati/Hi ndi		
10	Asteraceae	Blumea viscosa	(Mill.) V.M.Badillo	Sticky Blumea		Ν	NA
11	Asteraceae	Echinops echinatus	Roxb.	Gokhru	Shulio	Ν	NA
12	Asteraceae	Pentanema indicum	(L.) Ling	Sonkadi	Bichhloo		NA
13	Asteraceae	Tridax procumbens	(L.) L.	Tridax daisy	Pardesi Bhangro	E	NA
14	Boraginaceae	Coldenia procumbens	L.	Creeping coldenia	Okhrad	Ν	NA
15	Convolvulaceae	Convolvulus arvensis	L.	Field Bindweed	Nari vel	Ν	NA
16	Cyperaceae	Kyllinga bulbosa	P.Beauv.	White Water Sedge		Ν	LC
17	Euphorbiaceae	Euphorbia hirta	L.	Asthama Weed	Bara dudhi	Ν	NA
18	Lamiaceae	Ocimum basilicum	L.	Basil	Maruo	Ν	NA
19	Leguminosae	Clitoria ternatea	L.	Butterfly Pea	Garni	Ν	NA
20	Leguminosae	Indigofera linnaei	Ali	Birdsville Indigo	Leel	Ν	NA
21	Leguminosae	Rhynchosia minima	(L.) DC.	Memnonia Snoutbean	Nahnikamal vel	Ν	LC
22	Leguminosae	Senna tora	(L.) Roxb.	Stinking Cassia	Pochandio	Ν	NA
23	Leguminosae	Tephrosia purpurea	(L.) Pers.	Common tephrosia	ghodakan	Ν	NA
24	Malvaceae	Abelmoschus manihot	(L.) Medik.	Sweet Hibiscus	Kantalo bhende	Ν	NA



SI No:	Family	Scientific name	Author name	Common name		Origi n	IUCN status
				English	Gujarati/Hi ndi		
25	Malvaceae	Abutilon theophrasti	Medik.	Buttonweed	Bhony kanskai	Ν	NA
26	Malvaceae	Sida cordifolia	L.	Heart leaf sida	Kharenti	Ν	NA
27	Malvaceae	Sida rhombifolia	L.	Cuban jute	Khetraubat- atibala	N	NA
28	Marsileaceae	Marsilea quadrifolia	L.	Four Leaf Clover		Е	LC
29	Menispermacea e	Cissampelos pareira	L.	Velvet Leaf	Pahadvel	E	NA
30	Molluginaceae	Glinus lotoides	L.	Lotus Sweetjuice	Mitho Okharad	N	NA
31	Molluginaceae	Glinus oppositifolius	(L.) Aug.DC.	Jima	Gholo Ohkrad	N	NA
32	Nelumbonacea e	Nelumbo nucifera	Gaertn.	Lotus	Motunkama I	N	NA
33	Nyctaginaceae	Boerhavia diffusa	L.	Punarnava	Nano vasedo	N	NA
34	Nyctaginaceae	Bougainvillea spectabilis	Willd.	Great Bougainvillea	Boganvel	E	NA
35	Papaveraceae	Argemone mexicana	L.	Satyanashi	Darudi	E	NA
36	Poaceae	Alopecurus nepalensis	Trin. ex Steud.	Nepal Foxtail Grass	Kang	Ν	NA
37	Poaceae	Cynodon dactylon	(L.) Pers.	Bermuda grass	Darbh	Ν	NA



SI No:	Family	Scientific name	Author name	Common name			IUCN status
				English	Gujarati/Hi ndi		
38	Poaceae	Desmostachya bipinnata	(L.) Stapf	Daabh	Dabh	Ν	LC
39	Poaceae	Eragrostis amabilis	(L.) Wight & Arn.	Japanese lovegrass	Limor	Ν	NA
40	Polygonaceae	Polygonum plebeium var. brevifolia	R.Br.	Small Knotweed	Zinako Okhrad	Ν	NA
41	Polygonaceae	Polygonum plebeium var. plebium		Small Knotweed	Machechi		
42	Portulacaceae	Portulaca oleracea	L.	Purslane	Ghol Kotbo	Ν	NA

## Fauna

Common Name	Scientific Name	Authority	Family	IUCN Status	WPA Schedule	CITES appendix	Migration Status
Avifauna							
African Comb Duck	Sarkidiornis melanotos	(Pennant, 1769)	Anatidae	LC	IV	II	R
Ashy prinia	Prinia socialis	(Sykes, 1832)	Cisticolidae	LC	-	-	R
Ashy-crowned Sparrowlark	Eremopterix griseus	(Scopoli, 1786)	Alaudidae	LC	IV	-	R
Asian Brown Flycatcher	Muscicapa dauurica	(Pallas, 1811)	Muscicapidae	LC	IV	-	WV
Asian koel	Eudynamys scolopaceus	(Linnaeus, 1758)	Cuculidae	LC	IV	-	R



Common Name	Scientific Name	Authority	Family	IUCN Status	WPA Schedule	CITES appendix	Migration Status
Asian Openbill	Anastomus oscitans	(Boddaert <i>,</i> 1783)	Ciconiidae	LC	-	-	R
Asian Palm Swift	Cypsiurus balasiensis	(Gray, 1829)	Apodidae	LC	-	-	R
Bank Myna	Acridotheres ginginianus	(Latham, 1790)	Sturnidae	LC	IV	-	R
Barn Swallow	Hirundo rustica	(Linnaeus, 1758)	Hirundinidae	LC	-	-	WV
Baya Weaver	Ploceus philippinus	(Linnaeus, 1766)	Ploceidae	LC	-	-	R
Black Drongo	Dicrurus macrocercus	(Vieillot, 1817)	Dicruridae	LC	IV	-	R
Black-hooded Oriole	Oriolus xanthornus	(Linnaeus, 1758)	Oriolidae	LC	IV	-	R
Black-rumped Flameback	Dinopium benghalense	(Linnaeus, 1758)	Picidae	LC	IV	-	R
Blyth's reed-warbler	Acrocephalus dumetorum	(Blyth, 1849)	Acrocephalidae	LC	-	-	WV
Brahminy Starling	Sturnia pagodarum	(Gmelin, 1789)	Sturnidae	LC	IV	-	R
Cattle Egret	Bubulcus ibis	(Linnaeus, 1758)	Ardeidae	LC	IV	-	R
Common Babbler	Argya caudata	(Dumont <i>,</i> 1823)	Leiotrichidae	LC	IV	-	R
Common lora	Aegithina tiphia	(Linnaeus, 1758)	Aegithinidae	LC	IV	-	R
Common Myna	Acridotheres tristis	(Linnaeus <i>,</i> 1766)	Sturnidae	LC	IV	-	R
Common Quail	Coturnix coturnix	(Linnaeus, 1758)	Phasianidae	LC	IV	-	R
Common Tailorbird	Orthotomus sutorius	(Pennant, 1769)	Cisticolidae	LC	-	-	R



Common Name	Scientific Name	Authority	Family	IUCN Status	WPA Schedule	CITES appendix	Migration Status
common Woodshrike	Tephrodornis pondicerianus	(Gmelin, 1789)	Vangidae	LC	-	-	R
Coppersmith Barbet	Psilopogon haemacephalus	(Müller, 1776)	Megalaimidae	LC	IV	-	R
Eurasian collared Dove	Streptopelia decaocto	(Frivaldszky, 1838)	Columbidae	LC	IV	-	R
Golden-fronted leafbird	Chloropsis aurifrons	(Temminck, 1829)	Chloropseidae	LC	-	-	R
Green bee-eater	Merops orientalis	(Latham, 1802)	Meropidae	LC	-	-	R
House Crow	Corvus splendens	(Vieillot <i>,</i> 1817)	Corvidae	LC	V	-	R
House sparrow	Passer domesticus	(Linnaeus, 1758)	Passeridae	LC	-	-	R
Indian Golden Oriole	Oriolus kundoo	(Sykes, 1832)	Oriolidae	LC	IV	-	R
Indian Jungle Crow	Corvus macrorhynchos	(Wagler, 1827)	Corvidae	LC	-	-	R
Indian peafowl	Pavo cristatus	(Linnaeus, 1758)	Phasianidae	LC	I	111	R
Indian Pond Heron	Ardeola grayii	(Sykes, 1832)	Ardeidae	LC	IV	-	R
Indian robin	Saxicoloides fulicatus	(Linnaeus, 1766)	Muscicapidae	LC	-	-	R
Indian Roller	Coracias benghalensis	(Linnaeus, 1758)	Coraciidae	LC	IV	-	R
Indian Silverbill	Euodice malabarica	(Linnaeus, 1758)	Estrildidae	LC	IV	-	R
Intermediate Egret	Ardea intermedia	(Wagler, 1829)	Ardeidae	LC	IV	-	R
Jungle Babbler	Turdoides striata	(Dumont, 1823)	Leiotrichidae	LC	IV	-	R
Large Grey Babbler	Argya malcolmi	(Sykes, 1832)	Leiotrichidae	LC	IV	-	R



Common Name	Scientific Name	Authority	Family	IUCN Status	WPA Schedule	CITES appendix	Migration Status
Laughing Dove	Streptopelia senegalensis	(Linnaeus, 1766)	Columbidae	LC	IV	-	R
Little Cormorant	Microcarbo niger	(Vieillot, 1817)	Phalacrocoracidae	LC	IV	-	R
Little Egret	Egretta garzetta	(Linnaeus, 1766)	Ardeidae	LC	IV	-	R
Little Grebe	Tachybaptus ruficollis	(Pallas, 1764)	Podicipedidae	LC	IV	-	R
Oriental Honey-buzzard	Pernis ptilorhynchus	(Temminck, 1821)	Accipitridae	LC	-	II	R
Oriental Magpie-robin	Copsychus saularis	(Linnaeus, 1758)	Muscicapidae	LC	-	-	R
Oriental white-eye	Zosterops palpebrosus	(Temminck, 1824)	Zosteropidae	LC	-	-	R
Pied Kingfisher	Ceryle rudis	(Linnaeus, 1758)	Alcedinidae	LC	IV	-	R
Plain prinia	Prinia inornata	(Sykes, 1832)	Cisticolidae	LC	-	-	R
Plum-headed Parakeet	Psittacula cyanocephala	(Linnaeus, 1766)	Psittacidae	LC	IV	II	R
Purple Sunbird	Cinnyris asiaticus	(Latham, 1790)	Nectariniidae	LC	IV	-	R
Purple-rumped Sunbird	Leptocoma zeylonica	(Linnaeus, 1766)	Nectariniidae	LC	IV	-	R
Red-collared Dove	Streptopelia tranquebarica	(Hermann, 1804)	Columbidae	LC	IV	-	R
Red-naped Ibis	Pseudibis papillosa	(Temminck, 1824)	Threskiornithidae	LC	IV	-	R
Red-vented Bulbul	Pycnonotus cafer	(Linnaeus, 1766)	Pycnonotidae	LC	IV	-	R
Red-wattled Lapwing	Vanellus indicus	(Boddaert, 1783)	Charadriidae	LC	-	-	R
Rock Bush Quail	Perdicula argoondah	(Sykes, 1832)	Phasianidae	LC	IV	-	R



Common Name	Scientific Name	Authority	Family	IUCN Status	WPA Schedule	CITES appendix	Migration Status
Rock Dove	Columba livia	(Gmelin <i>,</i> 1789)	Columbidae	LC	-	-	R
Rose-ringed parakeet	Psittacula krameri	(Scopoli, 1769)	Psittacidae	LC	IV	NC	R
Rufous Treepie	Dendrocitta vagabunda	(Latham, 1790)	Corvidae	LC	-	-	R
Rufous-tailed Lark	Ammomanes phoenicura	(Franklin, 1831)	Alaudidae	LC	IV	-	R
Shikra	Accipiter badius	(Gmelin <i>,</i> 1788)	Accipitridae	LC	-	II	R
Small Minivet	Pericrocotus cinnamomeus	(Linnaeus, 1766)	Campephagidae	LC	IV	-	R
Southern coucal	Centropus sinensis	(Stephens, 1815)	Cuculidae	LC	-	-	R
Streak-throated Swallow	Petrochelidon fluvicola	(Blyth, 1855)	Hirundinidae	LC	-	-	R
Thick-billed flowerpecker	Dicaeum agile	(Tickell, 1833)	Dicaeidae	LC	IV	-	R
Tickell's Blue flycatcher	Cyornis tickelliae	(Blyth, 1843)	Muscicapidae	LC	IV	-	R
Whiskered tern	Chlidonias hybrida	(Pallas, 1811)	Laridae	LC	-	-	WV
White-breasted Waterhen	Amaurornis phoenicurus	(Pennant, 1769)	Rallidae	LC	-	-	R
White-browed Bulbul	Pycnonotus luteolus	(Lesson, 1841)	Pycnonotidae	LC	IV	-	R
White-browed Fantail	Rhipidura aureola	(Lesson, 1830)	Rhipiduridae	LC	-	-	R
White-browed Wagtail	Motacilla maderaspatensis	(Gmelin, 1789)	Motacillidae	LC	-	-	R
White-eared Bulbul	Pycnonotus leucotis	(Gould, 1836)	Pycnonotidae	LC	IV	-	R



Common Name	Scientific Name	Authority	Family	IUCN Status	WPA Schedule	CITES appendix	Migration Status
white-spotted fantail	Rhipidura albogularis	(Lesson, 1832)	Rhipiduridae	LC	-	-	R
White-breasted Kingfisher	Halcyon smyrnensis	(Linnaeus, 1758)	Alcedinidae	LC	IV	-	R
Wire-tailed Swallow	Hirundo smithii	(Leach, 1818)	Hirundinidae	LC	-	-	R
Yellow-eyed Babbler	Chrysomma sinense	(Gmelin, 1789)	Sylviidae	LC	IV	-	R
Black-headed Ibis	Threskiornis melanocephalus	(Latham, 1790)	Threskiornithidae	NT	IV	-	R
Black-winged Kite	Elanus caeruleus	(Desfontaines, 1789)	Accipitridae	LC	-	II	R
Indian Thick-knee	Burhinus indicus	(Salvadori, 1865)	Burhinidae	LC	IV	IV	R
Greater Flamingo	Phoenicopterus ruber	-	Phoenicopteridae	LC	IV	II	R
Eurasian Spoonbill	Platalea leucorodia	-	Threskiornithidae	LC	I	II	R
Asian Openbill Stork	Anastomus oscitans	-	Ciconiidae	LC	IV	II	R
Painted Stork	Mycteria leucocephala	-	Ciconiidae	NT	IV	II	R
		_					

# Butterflies

Blue Pansy	Junonia orithya	(Linnaeus, 1758)	Nymphalidae	-	-	-
Common emigrant	Catopsilia pomona	(Fabricius, 1775)	Pieridae	-	-	-
Common Grass yellow	Eurema hecabe	(Linnaeus, 1758)	Pieridae	-	-	-



Common Name	Scientific Name	Authority	Family	IUCN Status	WPA Schedule	CITES appendix	Migration Status
Common Gull	Cepora nerissa	(Fabricius, 1775)	Pieridae	-	-	-	
Crimson tip	Colotis danae	(Fabricius, 1775)	Pieridae	-	-	-	
Dark cerulean	Jamides bochus	(Stoll, 1782)	Lycaenidae	-	-	-	
Gram blue	Euchrysops cnejus	(Fabricius, 1798)	Lycaenidae	-	II	-	
Grass Demon	Udaspes folus	(Cramer, 1775)	Hesperiidae	-	-	-	
Lesser Grass Blue	Zizina otis	(Fabricius, 1787)	Lycaenidae	-	-	-	
Lime swallowtail	Papilio demoleus	(Linnaeus, 1758)	Papilionidae	-	-	-	
Pioneer	Belenois aurota	(Fabricius, 1793)	Pieridae	-	-	-	
Plain tiger	Danaus chrysippus	(Linnaeus, 1758)	Nymphalidae	-	-	-	
Psyche	Leptosia nina	(Fabricius, 1793)	Pieridae	-	-	-	
Common Pierrot	Castalius rosimon	(Fabricius, 1775)	Lycaenidae	-	-	-	
Striped Pierrot	Tarucus nara	(Kollar, 1848)	Lycaenidae	-	-	-	
Silverline	Spindasis vulcanus	(Fabricius, 1775)	Lycaenidae	-	-	-	
Small Cupid	Chilades parrhasius	(Fabricius, 1793)	Lycaenidae	-	-	-	
Spotless Grass Yellow	Eurema laeta	(Boisduval, 1836)	Pieridae	-	-	-	
Striped Tiger	Danaus genutia	(Cramer, 1779)	Nymphalidae	-	-	-	
Tawny coster	Acraea terpsicore	(Linnaeus, 1758)	Nymphalidae	-	-	-	
Yellow orange tip	lxias pyrene	(Linnaeus, 1764)	Pieridae	-	-	-	
Zebra Blue	Leptotes plinius	(Fabricius, 1793)	Lycaenidae	-	-	-	



Common Name	Scientific Name	Authority	Family	IUCN Status	WPA Schedule	CITES appendix	Migration Status
Reptiles & Amphibians							
Common Name	Scientific Name	Authority	Family	IUCN Status	WPA Schedule	CITES appendix	
Brahminy Skink	Eutropis carinata	(Schneider, 1801)	Scincidae	LC			
Indian Garden Lizard	Calotes versicolor	(Daudin, 1802)	Agamidae	-	-	-	
Indian Monitor Lizard	Varanus bengalensis	(Daudin, 1802)	Varanidae	LC	I	I	
Rat Snake	Ptyas mucosa	(Linnaeus, 1758)	Colubridae	-	II	-	
Rock Agama	Psammophilus blanfordanus	(Stoliczka, 1871)	Agamidae	LC	-	-	
Common Skittering Frog	Euphlyctis cyanophlyctis	(Schneider, 1799)	Dicroglossidae	LC	-	-	
Indian Bullfrog	Hoplobatrachus tigerinus	(Daudin, 1802)	Dicroglossidae	LC	IV	II	
Common Indian Tree Frog	Polypedates maculatus	(Gray, 1830)	Rhacophoridae	LC	-	-	
Mammals							
Common Name	Scientific Name	Authority	Family	IUCN Status	WPA Schedule	CITES appendix	
Five Striped Squirrel	Funambulus pennantii	(Wroughton, 1905)	Sciuridae	LC	IV	-	



Common Name	Scientific Name	Authority	Family	IUCN Status	WPA Schedule	CITES appendix	Migration Status
Grey Mongoose	Herpestes edwardsii	(E. Geoffroy Saint- Hilaire, 1818)	Herpestidae	LC	II		
Northern Plains Langur	Semnopithecus entellus	(Dufresne, 1797)	Cercopithecidae	LC	II	I	
Indian Hare	Lepus nigricollis	(F. Cuvier, 1823)	Leporidae	LC	IV	-	

#### ANNEXURE V: OHS RISKS DURING VARIOUS SUBPROJECT PHASES

#### **OHS Risks due to Pre-construction/ Construction Activities**

Inherent risk during construction like fatal accidents, fire, explosion, falling from height, occupational injuries, excavation, welding, material shifting, Loading/unloading are discussed in this report and relevant mitigation measures are also suggested.

Some of the common risks during operation phase of the project, risk of fire, explosion due to LPG (if used in labour camps, canteen / kitchen on site), traffic fatal accidents, Industrial accident due to Manmade & natural calamities.

#### Transportation

Transportation for sourcing construction material will be required. Trucks and other vehicular movement may lead to risk of accidents and Hazards created by Air, Dust & Noise pollution. This will not only affect workman but also residents of nearby settlements. Qualitative hazards with control measure are stated in **Table 51**.

SI.	Activity	Hazards	Likelihood/	Control Measures
1	Paw material		Consequence	1) Work as par Safa aparating Procedures
1	Stone		D	2) Lise of DDE /DDA
	Crusher- coarse		C	3) Avoid Manual operation
				- 4) Safety supervision / communication
	Aggregate and		С	
	fine aggregate			
	capacity			-
	Truck load 12MT		С	
2	Transportation	Road accidents	С	1) Follow strict Motor Vehicle Rules
				2)PPE/PPA/First aid Box/Communication
				3) Proper planning for avoiding Traffic
				congestion
	Crusher to site	Dust evolution	D	4) Authorized & Trained Driver
				5) During unloading using fluorescent coloured
	Tipper/Trucks	Spillage on road	D	high visibility apparel.
				6) Truck/ tipper floor Checks
		Fatal and dank		<ol> <li>Visual and auditory contact of the road worker</li> <li>Demonstrate views to service a service servic</li></ol>
3	Unioading /	Fatal accident	Ľ	1) Permanent right-or-way to provide room for
		Podviniun		2) Lise of DDE/DDA/ Barricade / Safety sign
	Levening	Body Injuly	D	display on Road / Caution board Display
4	Site Clearance/	Fatal Operators may	B	1)Roll-over protective structure and a seatbelt to
•	Borrow Pits/	get killed in machine	D	restrain the operator
	Quarrying using	roll-overs		2) Provide a supplementary steering system
	(a)Wheeled and			3) Valid approval for operating nuclear gauge
	crawler tractors,			from the appropriate authority
	loaders and			
	dozers;			
	(b) Motor graders			
	and scrapers;			
	(c) Self-propelled			
	rollers and			
	compactors	6 HL		
5	Earth work	talling or sliding	D	1) Provide adequate piling and bracing against
		material or article		such bank or side

Table 54: Construction Stage OHS Risks

SI.	Activity	Hazards	Likelihood/	Control Measures
No			Consequence	
		from any bank or side of such excavation		<ul> <li>2) Provide adequate shoring</li> <li>3) Excavated material not to store at least 0.65 m from the edge of an open excavation or trench</li> <li>4)Provide metal ladders, staircases or ramps</li> </ul>
6	Movement of trucks numbers 50 – 500	Fall over Tip Head	C	<ol> <li>1)A protective beam or timber baulk should be used.</li> <li>2) Back under the control of a signalman</li> </ol>
7	Bulldozers	<ol> <li>1) Fatal Accident</li> <li>2) Injuries</li> <li>3) Dusty environment</li> <li>4) High Noise hazards</li> </ol>	C	<ol> <li>Avoid side hill travel</li> <li>Avoid obstacles such as rocks or logs</li> <li>Avoid overhanging material to fall due to vibration/Load</li> <li>Do not work alone in deep water</li> </ol>
8	Excavators	<ol> <li>1) Fatal Accident</li> <li>2) Injuries</li> <li>3) Dusty environment</li> <li>4) High Noise hazards</li> </ol>	C	<ol> <li>When excavating trenches, place the excavated material at least 600 mm clear of the edge<sup>54</sup></li> <li>Avoid swinging your boom downhill any further than necessary</li> <li>Maintain Stability, Watch boom clearance when travelling, Avoid jerky swings or sudden braking</li> </ol>
9	Backhoe loader	<ol> <li>1) Fatal Accident</li> <li>2) Injuries</li> <li>3) Dusty environment</li> <li>4) High Noise hazards</li> </ol>	C	<ol> <li>1) Operate the backhoe from the correct area, Never from the ground.</li> <li>2) When operating on a slope, swing load uphill to dump</li> <li>3) Select a level site While Parking</li> <li>4) Lower bucket and backhoe to ground and block wheels</li> <li>5) Engage parking brake, remove ignition key (parking)</li> </ol>
10	Motor Grader	1) Fatal Accident 2) Toppled down 3) Physical Injury	C	<ol> <li>Give the right-of-way to loaded vehicles</li> <li>Drive at a slow speed in congested areas</li> <li>Remove ignition key when leaving grader.</li> <li>Ground the blade when leaving grader unattended.</li> <li>Use coloured flags at each end of mouldboard when blading.</li> <li>Shift blade to centre and lock it when parking.</li> </ol>
11	Smooth wheeled tandem roller	<ol> <li>1) Fatal Accident</li> <li>2) Injuries</li> <li>3) Dusty environment</li> <li>4) High Noise hazards</li> </ol>	C	<ol> <li>1) Examine edges for soft</li> <li>Spots before starting work.</li> <li>2) Avoid gear changes on steep sections</li> <li>3) Park on the flat</li> </ol>
12	Vibratory Roller	<ol> <li>1) Fatal Accident</li> <li>2) Injuries</li> <li>3) Dusty environment</li> <li>4) High Noise hazards</li> </ol>	С	<ol> <li>Use Rollover Protection safety when the machine is operated over unsafe ground</li> <li>Use a three-point approach when entering or exiting the roller.</li> </ol>
13	Surface courses	<ol> <li>Accident.</li> <li>Fire, severe burns, Eye Injury,</li> <li>Inhalation of Toxic gases</li> </ol>	C	<ol> <li>Use proper safety equipment</li> <li>Avoid wear rings, wristwatches, jewellery, loose or hanging apparel</li> <li>Keep away from the machine's articulation area when the engine is running.</li> </ol>

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#### Note: A-Remote, B- Unlikely, C- Likely, D- Highly likely, E-Near certainty

#### Site excavation work

Major work during initial project phases is to level project area & provide Pipeline for water supply, Natural Drainage system, sewer lines, AWC, cables and main trunk road development. Thus, major excavation work will be required to be undertaken, as per Concept Plan.

#### Site excavation Risk:

- A person falling into an excavation
- A person being trapped by the collapse of an excavation
- A person working in an excavation being struck by a falling thing
- A person working in an excavation being exposed to an airborne contaminant.

To manage the risks, all relevant matters must be considered including: i) The nature of the excavation ii) The method of the excavation work, including the range of possible methods of carrying out the work

The means of entry into and exit from the excavation to be restricted/ regulated, hard barricading, cordoning etc,

#### Identifying the Excavation Hazards

The first step in the risk management process is to identify the hazards associated with excavation work. Examples of excavation specific hazards include:

Underground essential services including gas, water, sewerage, telecommunications

- Electricity lines Underground services network not found as being placed on ground.
- Any storage tanks, in and adjacent to the workplace, must be established before
- Directing or allowing excavation work, Controlled by site engineer through Site supervisor
- The fall or dislodgement of earth or rock
- Falls from one level to another
- Falling objects
- Inappropriate placement of excavated materials, plant or other loads
- The instability of any adjoining structure caused by the excavation
- Any previous disturbance of the ground including previous excavation
- The instability of the excavation due to persons or plant working adjacent to the excavation
- Hazardous atmosphere in an excavation To be checked before work vibration and hazardous noise from Excavators & Overhead essential services (power lines) and ground mounted essential services – During visit, HT/LT overhead lines noticed in proposed plot area.

#### Factors for suitable control measures

Excavating plan - when quantities are large, it may be effective to use for the various materials to be excavated.

Stockpiling arrangements – Proper site may need to be found for temporary stockpiling of materials. Materials should not dissolve and drained during Monsoon leading to water pollution

Material placement - The methods and plant used for excavating, transporting and compacting the material should be evaluated.

Dewatering equipment, if required, and the system to be used, transport of the excavated material - the type of plant used, length of haul, the nature of the haul route, and the conditions of tipping and/or spreading.

For Excavation planning to minimize functional Risk to workers and society following steps are required:

- Study nature and/or condition of the ground and/or working environment
- Predict weather conditions
- Consider nature of the work and other activities that may affect health and safety
- Calculate static and dynamic loads near the excavation
- Storm Water Management System
- Vibration
- Select proper type of equipment used for excavation work
- Plan for public safety
- Go through existing services and their location
- The length of time the excavation is to remain open
- Provision of adequate facilities
- Procedures to deal with emergencies

# Table 55: Common hazards associated with excavation work and examples of control measures

Potential hazards	Examples of control measures
Ground collapse	The use of benching or the installation of ground support (e.g., shoring)
Water inrush	Pumps or other dewatering systems to remove water and prevent build-up
Hazardous manual task	Ramps, steps or other appropriate access into the excavation
Airborne contaminants	Rotating tasks between workers
Working underground or in closed structures	Appropriate ventilation arrangements shall be provided
Underground services	Obtain information from the relevant authorities on the location of underground services.



Figure 31: Safety Precautions in Excavations

**Figure 32** shows an excavation with shoring that has been designed to carry vehicle and material loads. This may be required where there is limited space around the excavation for vehicle movement and /or material storage. An excavation with shoring that has been designed only to carry the load of the excavated faces and the related zone of influence.

Any material will add a load to the area where it is placed. It is important that materials are not placed or stacked near the edge of any excavation as this would put persons working in the excavation at risk. For example, the placement of material near the edge of an excavation may cause a collapse of the side of the excavation.

To reduce the risk of ground collapse, excavated or loose material should be stored away from the excavation. Excavated material should be placed outside the zone of influence. Alternatively, a ground support system should be designed and installed to carry the additional loads, including any ground water pressures, saturated soil conditions and saturated materials.

#### Mobile plant operator blind spots

Powered mobile plant operating near ground personnel or other powered mobile plant should be equipped with warning devices (e.g. reversing alarm and a revolving light).



Figure 32: Mobile Plant Operator Blind Spots

An effective system of communication based on two-way acknowledgement between mobile plant operators and ground workers should be established before work commences. Relevant workers should also be trained in the procedures involved prior to the work commencing. The system should stop ground workers from approaching mobile plant until the operator has agreed to their request to approach. Similarly, the system should stop operators from moving plant closer than a set distance from ground workers until the operator has been advised by ground workers that they are aware of the proposed movement. Mobile plant operators and ground workers should be made familiar with the blind spots of particular items of plant being used. Induction training programs should emphasis the dangers of workers working near mobile plant, and adequate supervision should be provided.

Mobile plant operators and ground workers should be provided with and required to wear high-visibility clothing. *Table 53* presents the risk and remedial measures during the pre and post construction phase.

SI. No	Operations	Risk/Impact
1	Tower Crane	Injury, Fatal accident.
		Contact with High Voltage Live wires
2	Batching Plant	Accident
3	Construction/material Hoists	Personal injury
		Accidents
5	Portable electrical equipment pre-& post construction	Burn/fatal
6	Pressure vessels	Pressure air-Rupture
7	Hazardous substances paint/ thinner, waxes Plastics sheets	Fire, explosion, toxic release, Unhygienic dust.
8	Scaffolding	Fall from Height
		Fatal accident
9	Ladders	Accident, Injury, Fall, Slip
10	Lifts	Accidental, Injury even fatal
11	Hoists	Accidental Injury
12	Material handling cranes	Accidental Injury
		even fatal
13	Rigging during erection work of STP	Accidental Injury
14	Using tools/equipment with moving part(s)	Nipping
		Injury to hand
		Electrical Shocks, Leg Injury
15	Using tools/ equipment that vibrate	Vibration hazard
	Electrical wiring	Electrical shocks
	Asbestos removal	Asbestosis
- 16	Welding	Eye, Body Burns, Toxic gases inhalation
16	working around electrical installations/	Electrical shocks, injury
	(>2m)/ Working in isolation Working in a	Fatal accident nazard of toxic gases inhalation
	(>SIII)/ WORKING III ISOlation. WORKING III a	
17	Work environment	Accidental Injury Occupational Hazards
17	Noise	Rashes
	Dust/fumes/vapours/gases	Burn
	Extreme temperatures	Skin deceases
	Slipperv surfaces/ trip hazards	
	Poor ventilation/air guality	
	A poorly designed work area for the project/	
	task	

Table 56: OHS Risks due to various Tools and Equipment



#### ANNEXURE VI: DISCUSSION ON MAJOR PROPOSED/ ONGOING PROJECTS IN AHMEDABAD

SI NO	Project		Ahmedabad Metro Phase 1 and Phase 2	
1	Proponent		Gujarat Metro Rail Corporation Ltd (GMR earlier known as Metro-Link Express for C	RC); SPV of Government of Gujarat and Government of India; Gandhinagar And Ahmedabad (Mega) Company Ltd.
2	EIA Assessment	/Risk	Yes, by RITES	
3	Details		Phase 1:	
			Date of Opening Phase 1	06/03/2019
			Current Operational Length	6.10 Km
			Current Ridership	820 Passenger/day for FY 2019-20
			No. of Train	1(One)
			Frequency	50 minutes
			Lines operated	1 (One)
			No. of Station in operation	4
			Important Destinations covered by metro	Ahmedabad famous Cotton Mills near ARPK station, Ahmedabad Railway station (4.4 Km) and residential societies of Vastral Gam
			North - South Corridor	
			18.87 KM	1.5th
			and and and and	S - Constant - Constant - Constant

The total length of the Ahmedabad Metro Rail Project Phase-I is about 40.03 km out of which approximately 6.5 KM is underground, and the rest is elevated section. The project will connect 4 corners of the Ahmedabad city with 2 corridors and 32 stations.



The length of the East-West Corridor is about 21.16 km with 17 stations in the route. This corridor will connect Vastral Gaam to Thaltej Gaam and will be passing through Nirant Cross Road, Vastral, Rabari Colony, Amraiwadi, Apparel Park, Kankaria East, Kalupur Railway Station, Ghee Kanta, Shahpur, Old High Court, Stadium, Commerce Six Road, Gujarat University, Gurukul Road, Doordarshan Kendra, Thaltej stations. In the East-West corridor, approximately 6.5 km is the underground section with 4 underground stations and the rest is the elevated section with 13 elevated stations. Old High Court station will be an interchange station for both the corridors.

Phase 2:

Phase-2 of Ahmedabad Metro Rail Project comprises construction of 28.25 km long fully elevated corridor in 2 parts. The first part is Line-2 from Motera Stadium to Mahatma Mandir of length 22.83



km with 20 stations while the second part is Line-3 from GNLU to GIFT City of length 5.41 km with two stations.

Phase-2 received approval from Union Government in February 2019 with an estimated cost of INR 5384.17 Crores with civil construction activities started from February this year. This is expected to be complete by 2023 December.



 Important points for G-ACRP Subproject ESIA
 The influence zone of 11 meter has been created as per GMRC policy. No construction shall be permitted within 5 meters from the edge of metro corridor/ station structure for the safety reasons as per GMRC NOC policy. Applicable for subprojects (STP new constructions) at Vasna
 Alignment of trunk sewers along metro line to consider impacts; especially work scheduling, Occupational and Community Health and Safety, cumulative air pollution impacts

- Check corridor from Koteswar to Airport; and consider impacts of Metro corridor passing near proposed Koteswar STP. Vibration, pollution.
- New Metro bridge upstream and proposed Barrage for water supply to city



SI NO	Project	Smart City Project, Ahmedabad
1	Proponent	Government of India and Ahmedabad Municipal Corporation
2	EIA / Risk Assessment	No
3	Details	Car parking, IT for parking, health; street lighting LED, OFC, Water supply, Anganwadi, Water & Drainage network in Ranip, Kali, STP with power plant – 100 mld; micro-tunnelling : Vadaj to Paldi, Juna Vadaj Slum Rehabilitation, Waste to Energy, BRT automated swing gates, Water SCADA, Cybersecurity, NMT, Veg supply E-Rick, GRM chatbots
4	Map	70 PROJECTS       5.754 AMOUNT (Rs. CR.)       Image: Comparison of the second
5	Important points for G-ACRP Subproject ESIA	<ul> <li>Check at subproject ESIA if any associated facility, in drainage or sewerage micro tunneling, or STP development contemporaneous to G-ACRP.</li> </ul>
SI NO	) Project	Sabarmati Riverfront Development Phase 2 From Acher – Hansol to Indira Bridge At District Ahmedabad, Gujarat
<b>SI NC</b>	) Project Proponent	Sabarmati Riverfront Development Phase 2 From Acher – Hansol to Indira Bridge At District Ahmedabad, Gujarat         Ahmedabad Municipal Corporation, through its SPV Sabarmati Riverfront Development Corporation Ltd (SRFDCL)
51 NC	Project Proponent EIA /Risk Assessment	Sabarmati Riverfront Development Phase 2 From Acher – Hansol to Indira Bridge At District Ahmedabad, Gujarat         Ahmedabad Municipal Corporation, through its SPV Sabarmati Riverfront Development Corporation Ltd (SRFDCL)         Yes (except for newly proposed Barrage), by Kadam Enviro Group of Companies
51 NC	Project Proponent EIA /Risk Assessment Details	Sabarmati Riverfront Development Phase 2 From Acher – Hansol to Indira Bridge At District Ahmedabad, Gujarat         Ahmedabad Municipal Corporation, through its SPV Sabarmati Riverfront Development Corporation Ltd (SRFDCL)         Yes (except for newly proposed Barrage), by Kadam Enviro Group of Companies         Extending existing riverfront (11 kms) to further 5 kms towards Gandhinagar, along both edges of the river Sabarmati for Rs 850 Crores (113 million USD). The newly upgraded area will have recreational facilities and pathways as in the case of existing riverfront development from Vasna Barrage to Hansol. During first phase of Riverfront development SRFDCL was provided with a seed capital of Rs. 9 crore and entrusted with the responsibility of developing the riverfront on a Build, Maintain, Operate and Transfer (BMOT) basis. The SPV model was used to avoid the delays associated with municipal decision-making. Riverbed land, which was originally held by the Government of Gujarat, was transferred to the AMC. AMC has, in turn, granted development rights to SRFDCL for this reclaimed riverbed land. Activities under Phase 2 include : 1. Construction of green embankment on both banks of the river.
51 NC	Project Proponent EIA /Risk Assessment Details	Sabarmati Riverfront Development Phase 2 From Acher – Hansol to Indira Bridge At District Ahmedabad, GujaratAhmedabad Municipal Corporation, through its SPV Sabarmati Riverfront Development Corporation Ltd (SRFDCL)Yes (except for newly proposed Barrage), by Kadam Enviro Group of CompaniesExtending existing riverfront (11 kms) to further 5 kms towards Gandhinagar, along both edges of the river Sabarmati for Rs 850 Crores (113 million USD). The newly upgraded area will have recreational facilities and pathways as in the case of existing riverfront development from Vasna Barrage to Hansol. During first phase of Riverfront development SRFDCL was provided with a seed capital of Rs. 9 crore and entrusted with the responsibility of developing the riverfront on a Build, Maintain, Operate and Transfer (BMOT) basis. The SPV model was used to avoid the delays associated with municipal decision-making. Riverbed land, which was originally held by the Government of Gujarat, was transferred to the AMC. AMC has, in turn, granted development rights to SRFDCL for this reclaimed riverbed land. Activities under Phase 2 include :1. Construction of green embankment on both banks of the river.2. Reclamation of approximately 108 Ha of land
51 NC	Project Proponent EIA /Risk Assessment Details	Sabarmati Riverfront Development Phase 2 From Acher – Hansol to Indira Bridge At District Ahmedabad, Gujarat         Ahmedabad Municipal Corporation, through its SPV Sabarmati Riverfront Development Corporation Ltd (SRFDCL)         Yes (except for newly proposed Barrage), by Kadam Enviro Group of Companies         Extending existing riverfront (11 kms) to further 5 kms towards Gandhinagar, along both edges of the river Sabarmati for Rs 850 Crores (113 million USD). The newly upgraded area will have recreational facilities and pathways as in the case of existing riverfront development from Vasna Barrage to Hansol. During first phase of Riverfront development SRFDCL was provided with a seed capital of Rs. 9 crore and entrusted with the responsibility of developing the riverfront on a Build, Maintain, Operate and Transfer (BMOT) basis. The SPV model was used to avoid the delays associated with municipal decision-making. Riverbed land, which was originally held by the Government of Gujarat, was transferred to the AMC. AMC has, in turn, granted development rights to SRFDCL for this reclaimed riverbed land. Activities under Phase 2 include : <ol> <li>Construction of green embankment on both banks of the river.</li> <li>Reclamation of approximately 108 Ha of land</li> <li>Annual retention of water in the river</li> </ol>
51 NO	Project Proponent EIA /Risk Assessment Details	Sabarmati Riverfront Development Phase 2 From Acher – Hansol to Indira Bridge At District Ahmedabad, Gujarat         Ahmedabad Municipal Corporation, through its SPV Sabarmati Riverfront Development Corporation Ltd (SRFDCL)         Yes (except for newly proposed Barrage), by Kadam Enviro Group of Companies         Extending existing riverfront (11 kms) to further 5 kms towards Gandhinagar, along both edges of the river Sabarmati for Rs 850 Crores (113 million USD). The newly upgraded area will have recreational facilities and pathways as in the case of existing riverfront development from Vasna Barrage to Hansol. During first phase of Riverfront development SRFDCL was provided with a seed capital of Rs. 9 crore and entrusted with the responsibility of developing the riverfront on a Build, Maintain, Operate and Transfer (BMOT) basis. The SPV model was used to avoid the delays associated with municipal decision-making. Riverbed land, which was originally held by the Government of Gujarat, was transferred to the AMC. AMC has, in turn, granted development rights to SRFDCL for this reclaimed riverbed land. Activities under Phase 2 include : <ol> <li>Construction of green embankment on both banks of the river.</li> <li>Reclamation of approximately 108 Ha of land</li> <li>Annual retention of water in the river</li> <li>Development of public gardens, amenities and facilities</li> </ol>

- 6. Development of street network along the river for North-South connectivity
- 7. Development of Urban infrastructure along both the banks
- 8. Self-Financed mechanism for the development of the entire project



4	Мар	(III) MILI» (Satesdawar - Propoked		
		Sabarmate River Rord Bridge Proposed New Barrage curr Bridge		
		Vassna Bairrage Goog		
5	Important points for G- ACRP Subproject ESIA	<ul> <li>Though the location of proposed barrage (upstream of Vasna Barrage within city limits) is indicated in approved EIA, no impacts or risks identified or assessed for proposed Barrage</li> <li>Disposal of treated effluent from proposed subprojects upstream of proposed barrage, or into riverfront may have health impacts considering the dead storage</li> <li>New metro bridge upstream of Barrage</li> </ul>		

- Safety: Vasna Barrage, Flooding

SI NO	O Project Proponent		Waste to Energy Plant at Gyaspur, near Pirana	
1			1 Proponent Ahmedabad Municipal Corporation	
2	EIA /Risk Assessment		No	
3	Details		Waste to Energy plant at Piplaj near Pirana, will get operational by Dec 2021. Abelleon Clean Energy is implementing this 14 MW plant on DBOT for 30 years, for a cost of 240 crore (including 8-10% for O&M annually), spread over 13 acres. Power generated from the plant will be fed into the national power grid. It will convert 1,000 metric tonnes of mixed waste into energy daily.	
4	Мар			



5 - Pirana and Vasna areas are complexes for waste management including solid wastes and sewage. This points for Gentire area needs need comprehensive and integrated environmental management and flood ACRP /resilience approaches, considering location near Sabarmati and Earthquake Zone III. AMC has Subproject mechanisms to manage solid and mixed wastes which might also be generated during construction and ESIA operations of the subprojects



SI NO	Project	Biomining of Pirana Dumpsite	
1	Proponent	AMC	
2	EIA /Risl Assessment	No	
3	DetailsStarted in 2019. AMC reclaimed around 24% of the Pirana dump yard land (19 acres of the total 8 by freeing it from garbage through biomining. Around 33 lakh metric tonnes of garbage hav processed and expects to remove the dump in next three years. At present, 39 trommel mack processing about 15,000 MT of garbage daily. Construction debris and large stones, which form ab 		
4	Мар	Coogle Earth	
5	Important points for G ACRP Subproject ESIA	<ul> <li>C&amp;D waste from biomining is sent to C&amp;D processing facility. AMC has made a policy to buy 25 % of Paver blocks and 50% of Manhole covers Final product of the C &amp; D Waste processing agency in the development of different civil &amp; infrastructures projects of AMC by the approval of competent authority. Recently, competent authority of AMC has also approved a policy of procuring Precast / Prestress wall from the agency to build compound wall for AMC's various properties. This source shall be considered in project estimates.</li> </ul>	



## ANNEXURE VII: ENVIRONMENTAL AUDIT OF EXISTING VASNA 180 MLD STP, AHMEDABAD



October 2021

Prepared by TATA CONSULTING ENGINEERS LIMITED



# 1. INTRODUCTION

## 1.1 BACKGROUND

Ahmedabad is one of the major cities in India having a population of about 5.6 million as per Census of India 2011. The city is governed by Ahmedabad Municipal Corporation (AMC) having an area of 505 sq. km. Ahmedabad city is seventh largest metropolitan city in India.

The city is located on the banks of River Sabarmati and is the administrative centre of Ahmedabad district. River Sabarmati is dividing the city in two parts i.e., Eastern and Western sides. The city is further divided in to seven zones for ease of managing the necessary Urban Infrastructure and allied facilities.

AMC has proposed list of projects which will strengthen the city's drainage and sewer lines system. Also, there is requirement of upgrading the existing STPs capacities and sewer lines in order to perform smooth functioning. AMC is exploring funding from World Bank under the Gujarat Resilient Cities Partnership: Ahmedabad City Resilience Project (G-ACRP) with an investment in the range of Rs. 3000 – Rs. 4000 Crores. Environmental & Social Impacts Assessment (ESIA) including Environmental & Social Management and Monitoring Plan (ESMP) for 30% investments in wastewater sector (USD 130mn) will be undertaken.

# 1.2 OBJECTIVES

The audit report is mainly focused on assessing the performance of 126 MLD STP at Vasna, Ahmedabad and its operational environmental impacts.

## The objectives of audit are :

- Physical assessment of the STP and units' operation status
- > Identification and assessment of environmental management practices

## 2. GENERAL DESCRIPTION OF 126 MLD STP AT VASNA, AHMEDABAD

## 2.1 BACKGROUND

AMC/ AUDA had setup this 126 MLD capacity STP in 2005 to treat sewage at Vasna site with Up-flow anaerobic sludge blanket (UASB) technology/ process. The STP area is spread in an area of around 54 acres on the banks of Sabarmati River. Site setting of the STP are given in the table below;

Directions	Particulars
North	Canal and Road
East	240 MLD STP
South	Sabarmati River
West	Residential area

## Table 1: Site setting of 126 MLD STP, Vasna

## 2.2 DESCRIPTION OF STP FACILITY & ITS ARRANGEMENTS

The 126 MLD sewage treatment plant has Inlet Chamber, Screen Chamber, Grit Chamber, UASB reactors, Pre-aeration tank, Flash mixer, Clari-flocculator, Sludge drying bed and Gas Holder. The treatment scheme selected is based upon the Up-flow anaerobic sludge blanket.

The raw sewage is received in inlet chamber from AUDA's pumping station. The raw sewage is passed through 8 nos. of screens for removal of floating material, from screen it will be fed to grit chambers



of 4 nos. for removal of grits. The sewage from grit chambers is fed to 10 nos. of UASB reactors for biological treatment, the biologically treated sewage from UASB is fed to 2 nos. of pre-aeration tanks. The pre-aerated sewage is added with alum in flash mixer before being fed to clari-flocculator for settling. There is provision for gas collection from the UASB reactor and storing in Gas holder tank. The sludge from the clari-flocculator is sent to sludge drying bed for drying. There is no disinfection in the 126 MLD STP. The treated sewage after clari-flocculator is released for final discharge in the Sabarmati River. Flow chart of the 126 MLD STP is given in the Figure 1 below.

 Raw Sewage

 ↓

 Screens

 ↓

 Grit Chamber 4 nos.

 ↓

 UASB reactors 10 nos.

 ↓

 Pre-aeration tank 2 nos.

 ↓

 Flash mixer 2 nos.

 ↓

 Clariflocculator 2 nos.

 ↓

 Sludge Drying beds

 ↓

 Gas holder

Figure 1: Flow chart of 126 MLD STP



Figure 2: 126 MLD Vasna STP on Google map





Figure 2: STP layout

# 3. DESIGN QUANTITY & QUALITY OF WASTE WATER:

The table below enlists the various inlet and outlet characteristics considered for the design of STP:

SL No	Parameter	<u>linit</u>	Inlet
51. NO.	rarameter	Onit	mee
1.	Flow	MLD	126
2.	Peak factor	-	2.25
3.	Peak flow	MLD	283.5
4.	BOD	mg/l	215
5.	COD	mg/ l	415
6.	Suspended solids	mg/ l	290
7.	рН	mg/ l	6.5 to 8.5
8.	Total Alkalinity as CaCO3	mg/ l	< 450
9.	Chlorides	mg/ l	< 300
10.	Sulphates	mg/ l	< 200
11.	Ammoniacal Nitrogen (as N)	mg/ l	< 20
12.	Total Kjeldahl Nitrogen (as N)	mg/ l	< 30
13.	Phosphates (as P04)	mg/l	< 4

Table 1 : Design Inlet Sewage Characteristics



14.	Oil & Grease	mg/ l	< 30





# Table 2 : Design Outlet/ treated Sewage characteristics

Sr. No.	Parameter	Unit	Outlet Values
1.	BOD	mg/l	30
2.	COD	mg/l	100
3.	SS	mg/l	50
4.	рН	-	6.5 to 8.0
5.	Residual Chlorine	mg/l	0.5
6.	Fecal Coliform	MPN / 100 ml	1000-10000
7.	Oil & Grease	mg/l	<10

# Final treated outlet after clari-flocculator





## 4. AUDIT FINDINGS

The audit represents a physical assessment of the STP and operation of the units and equipment. Along with the physical assessment, environmental aspects are also covered in this audit report.

## 4.1 PROCESS & TREATMENT UNITS' DESCRITPTION:

As mentioned earlier, the STP is designed with UASB technology which is not functioning as per the design requirement as per the physical audit observations, other points of audit are in following sections.

The Sewage Treatment Plant comprises the following main units / equipment:

- 1. Inlet Chamber
  - a) Bar Screen (Manual)
  - b) Mechanical Screen (Auto)
  - c) Grit & Classifier Mechanism
  - d) Parshall Flume
- 2. UASB reactors
- 3. Pre-aeration tanks
- 4. Flash mixer
- 5. Clari-flocculators
- 6. Sludge drying beds
- 7. Biogas holder

## 4.1.1 INLET CHAMBER



The inlet chamber is designed to take peak flow of 284 MLD of sewage. The inlet chamber receives the flow from the pumping station and the chamber is designed having adequate depth and free board above top water tightness of the inlet chamber has been performed. A bypass arrangement is provided in the inlet chamber.



#### 4.1.1.a SCREEN (MANUAL & MECHANICAL)

The raw sewage entering the screen channels of passes through the manual Bar Screens. The bar screens have opening more than 20 mm, the screen will trap the floating trash from the sewage. The collected screens are cleaned manually.



Mechanical screens are provided for 4 channels, these screens remove fine floating impurities from sewage. Conveyor belt and chute arrangement is provided to collect the screenings. Screenings removed are disposed of suitably by means of wheeled manually operated trolleys.





## 4.1.1.b Grit Chamber/ Classifier

The flow from the screen channels is allowed into the grit chamber for the removal of grit matter by means of RCC square tanks each designed as per relevant IS code of practice. Four Grit chambers each designed for around 71 MLD peak flow, capable of removing grit of particle size of 0.15 mm and above and specific Gravity of 2.65.

The grit chamber consists of a series of vertical adjustable type fibre reinforced plastic (FRP) deflectors at the inlet as per mechanical specifications and the flow is admitted through these deflectors. The chamber is square in shape. Provision of suitable weir is made so that the flow beyond the chamber is discharged over the weir to the outlet channel. Two cast iron pen-stock gates at the inlet of each tank are provided. Grit chamber provides quiescent conditions for grit to settle at chamber bottom. To scrape the grit to chamber bottom, the scrapper mechanism is provided.



Each detritus tank is designed to handle a peak load of 71 MLD. Grit removed is disposed of suitably by means of wheeled trolley. Isolation Gates are provided at inlet & outlet of these detritus tanks to control/divert flow to these chambers.

# 4.1.1.FLOW MEASURING CHANNEL (PARSHALL FLUME)





The outlet channels emerging from the grit chamber have necessary arrangement for measurement with the help of Parshall Flume.



# 4.1.2 UPFLOW ANAEROBIC SLUDGE BLANKET (UASB) REACTOR

The preliminary treated sewage flows to UASB reactors of 10 nos. the sewage is introduced from the bottom of the reactor. This helps in maintaining a sludge blanket, the incoming sewage passes through the blanket and fine suspended particles are filtered and soluble components are absorbed in the Biomass. This Biomass converts the waste into the Biogas and some new Biomass. The gas leaves the


blanket in bubbles and provides necessary mixing. The settled sludge is digested in the bottom zone. These units treat the sewage anaerobically & remove the organic load from the sewage.

#### 4.1.3 **PREAERATION TANKS**

The anaerobically treated sewage from UASB reactor will flow to pre-aeration tanks of 1 nos. for the further aerobic treatment.



#### 4.1.4 FLASH MIXER

The treated sewage will be routed to flash mixer of 2 nos. by addition of alum for aiding floc formation and settling.



#### 4.1.5 CLARIFLOCCULATOR



The alum dosed sewage from flash mixer is transferred to clari-flocculator for settling. There are 2 nos. of clari-flocculator in the plant, the settled sludge is sent to sludge drying bed and the supernatant is sent for final discharge through outlet channel.



#### 5. EQUIPMENT LIST

SI. No.	Unit	Dimension in m (L x B x LD + FB)	Qty
1.	Inlet chamber	11.6 m x 2.0 m x 3.23 m LD	10
	Screen chambers - 4 nos.	+ 0.5 III FB	10
	Mechanical + 4 No. Manual	2.2 m x 2.2 m LD	
2.	Grit Chamber	12 m dia x 0.9 m LD	4
3.	Distribution box	3.1 m x 2.4 m	20
4.	UASB reactors	32 m x 28 m x 5.4 m LD	10
5.	UASB sludge pumping station		
	Dry well	3.7 m x 2.2 m x 7 m LD	
	Wet well	5 m x 5 m	
6.	Pre-aeration tank	27.4 m x 13.7 m x 3.5 m LD	1
7.	Flash mixer	3.85 m x 3.85 m x 3 m LD	2
8.	Clari-flocculator	60 m dia x 2.35 m LD	2
9.	Sludge drying beds	28.4 m x 16.7 m	56
10.	Gas holder tank	12.3 m dia x 5 m LD	1
11.	Generator room	-	1
12.	Main panel room	-	1

#### 6. ENVIRONMENTAL MONITORING PLAN



It is informed by the O&M contractor that the treated sewage sampling is being analysed by third party monitoring agency every month, but the reports were not available with the contractor during the time of audit site visit, it is told that the reports are available with Ahmedabad Municipal Corporation.

#### 7. <u>SAMPLING</u>

At present there is no in house laboratory at STP, the equipment like Total Organic Carbon (TOC) are not functional. Water quality analysis is not conducted at the STP at present.

#### 8. <u>RECORDS / LOGS</u>

Records like flow measurement, power consumption, corrective and preventive maintenance are being maintained manually. Some of the records are produced are as under.



Daily logs are written and maintained by the shift in-charge for the particular shift. These shift reports contains information regarding the general operation of plant. The flow rate of the raw inlet and oulet, power consumption, maintenance details, problems encountered in any equipment is also highlighted along with the corrective measures taken or that need to be taken.

#### 9. TREATMENT EFFICIENCY

As per the monitoring report of June 2021 for the STP inlet and outlet (Appendix1), the plant efficiency for BOD removal is 91% and the same for COD removal is 83%. Simultaneously, the sludge tests of STP indicate lesser amounts of Phenolic compounds, hexavalent Chromium, Copper, Nickel and Lead compared to analysis results of other STPs. However, since many of the STP units are not functioning as per desired STP design, the analysis shall be conducted for individual units.

#### 10. AUDIT FINDINGS

The audit findings/ observations made during the site visit to 126 MLD STP are given in the following table.



Unit/ Audit finding	Photographs
Inlet chamber and Screen	
Inlet chamber and Screena.Water leakage seen RCCstructure of inlet chamber andscreens.b.Railings corroded andweakened, at some placesrailings are replaced with newones.c.Inlet chamber bypassgate not working at the time ofvisit.d.4 mechanical screensare not in operation at the timeof visit.e.Belt conveyor of	
screening unit seen damaged.	Leakage in structure
	Inlet bypass gate not in working condition
	We have a stateWe have a state </th





Damaged belt conveyor



Hand rails damage/ absence due to corrosion

# Grit Chamber and Parshall flume:

- a. Central shaft was seen working.
- b. Grit chamber bridges are corroded in most of the places.
- c. Deflectors damaged and not working in grit chambers at the time of visit.
- d. Electrical cables are seen submerged in the water, which is highly risky. Cable trays damaged.
- e. Grit chamber scraper was seen not working at the time of visit.



Corroded Grit Chamber Bridge



- f. There are no handrails in most of the places of grit chamber, which makes walking on ramps dangerous to human safety at a height of 10-12 m from ground level.
- g. Parshall flume flow sensor seen working.



Damaged deflectors in grit chamber





Submerged electrical cables in sewage



	Parshall flume flow meter
<ul> <li><u>UASB reactors</u></li> <li>a. There are total 10 UASB reactors, FRP sheets of the reactors are seen damaged at the time of visit.</li> <li>b. All 10 UASB reactors are not functioning as per the design, air collection is not happening.</li> <li>c. Each UASB reactor contains 4 chambers.</li> <li>d. It was informed by plant manager that all 120 nos. of valves are defunct.</li> </ul>	Type           Dysfunctional UASB reactors
<ul> <li><u>Pre-aeration tank</u></li> <li>a. Pre-aeration tank has 2 surface aerators.</li> <li>b. One was seen working and one defunct at the time of visit.</li> </ul>	Pre-aeration tank



Fla a. b.	sh mixer There are 2 nos. of flash mixers. One was seen is working and another defunct at the time of visit.	
		Flash mixer not in working condition
<u>Cla</u>	ri-flocculator	~
a. b. c. d. e.	2 nos. of Clari-flocculators of 60 m dia are present. Clari-flocculator 1 near flash mixer is seen not in operation and defunct. Clari-flocculator 2 is not in operation at the time of visit. Bridge, hand rail corrosion observed. Central shaft of clari- flocculator 2 not in working condition at the time of visit.	
Shi	dge drying bed	
a.	Sludge drying beds are not in operation as informed by plant manager. sludge drying bed area had safety issues, as there was grass/ weed growth.	



 Gas Holder

 Not in operation and defunct

 due to no gas generation in

 UASB reactors

#### Other observations

- a. There is no chlorination/ disinfection done for the treated sewage before final discharge.
- b. Treated sewage visibly looks clear, but has odor.
- c. The DG set is defunct, there is no storage of diesel.
- d. There is no storage of chemicals except alum.
- e. Good green belt development seen across the STP. Internal roads are seen in good condition.



Appendix -1: Sample Analysis Report





## **NISARG ENVIRO CONSULTANTS**

**GPCB RECOGNIZED SCHEDULE - II AUDITOR** NABL ACCREDITED LABORATORY

		TEST	<u>r report</u>		
Report No.: NEC/ WW-WW-22	8-01	1/21			Date: 10/06/2021
Name & Address of Customer		Ahmedabad Muni Sardar Patel Bha Finance Departme Ahmedabad GPO, Ahmedabad, Guja	cipal Corporation van, ent, rat- 380001		
Sample Collection Date	1	31/05/2021	Sampling Type	1	Grab
Sample Receipt Date	:	31/05/2021	Sample ID	:	WW-228-01/21
Sampling Location	:	126 MLD Vasna Inlet	Sample Description	1	Waste Water
Sample Collected / Submitted by		Jayraj Parmar	Protocol used for monitoring	1	APHA 23 <sup>rd</sup> Edition
Quantity / No. of Sample	4	2 Litre / 1 Nos.	Analysis Start Date	1	01/06/2021
Packing / Seal		Cap Seal	Analysis Completion Date	:	09/06/2021
Type of Container	1	Plastic Container	Format No.	:	7.8 F-01
Environmental Condition during the test	:	25*C ±2 *C	Contact Person	:	Ms. Darshna Patel Ms. Neha Patel

#### Waste Water Analysis Results

Sr. No	Parameter	Result	Unit	Reference Method	
1.	pH at 27°C	7.06	**	APHA 23rd Edition 2017/4500-H+B	
2.	Phenolic Compound	4	mg/L	5530 D, pg 5-49, APHA Edition 23nd	
3.	Hexavalent Chromium	0.08	mg/L	mg/L APHA 23 <sup>rd</sup> Edition 2017 / 3500 Cr B	
4.	BOD(5 days at 20°C)	233	mg/L	IS 3025 (part 44):1993/ reaffirmed 2014	
5.	COD	513	mg/L	IS 3025 (part 58):2006/ reaffirmed 2017	
6.	Total Dissolved Solids	874	mg/L	APHA 23 <sup>rd</sup> Edition 2017 / 2540-C	
7.	Total Chromium	0.11	mg/L	APHA, 3111- B, 23rd Edition, 2017	
8.	Copper	0.034	mg/L	APHA, 3111- B, 23 <sup>rd</sup> Edition, 2017	
9.	Nickel	< 0.01	mg/L	APHA, 3111 B, 23rd Edition, 2017	
10.	Lead	< 0.01	mg/L	APHA, 3111- B, 23rd Edition, 2017	
11.	Arsenic	< 0.001	mg/L	APHA, 3111- B, 23rd Edition, 2017	

Tested by (sr. Chemist/Chemist)



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Engineer Jagdish Chauhan

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## **NISARG ENVIRO CONSULTANTS**

**GPCB RECOGNIZED SCHEDULE - II AUDITOR** 

NABL ACCREDITED LABORATORY

		11.	SI KEPUKI				
Report No.: NEC/ WW-228-02/2	21				Date: 10/06/2021		
Name & Address of Customer		Ahmedabad Municipal Corporation Sardar Patel Bhavan, Finance Department, Ahmedabad GPO, Ahmedabad, Gujarat- 380001					
Sample Collection Date	:	31/05/2021	Sampling Type	1	Grab		
Sample Receipt Date	:	31/05/2021	Sample ID	:	WW-228-02/21		
Sampling Location		126 MLD Vasna Outlet	Sample Description	:	Waste Water		
Sample Collected / Submitted by	*	Jayraj Parmar	Protocol used for monitoring	:	APHA 23 <sup>rd</sup> Edition		
Quantity / No. of Sample	:	2 Litre / 1 Nos.	Analysis Start Date	:	01/06/2021		
Packing / Seal	-	Cap Seal	Analysis Completion Date	1	09/06/2021		
Type of Container		Plastic Container	Format No.	:	7.8 F-01		
Environmental Condition during the test	-	25°C ±2 °C	25°C ±2 °C Contact Person : Ms. Darshna Patel Ms. Neha Patel				

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#### Waste Water Analysis Results

Sr. No	Parameter	Result	Unit	Reference Method
1.	pH at 27°C	7.2	**	APHA 23rd Edition 2017/4500 H+B
2.	Phenolic Compound	3	mg/L	5530 D, pg 5.49, APHA Edition 23nd
3.	Hexavalent Chromium	<0.01	mg/L	APHA 23 <sup>rd</sup> Edition 2017 / 3500 Cr B
4.	BOD(5 days at 20°C)	19	mg/L	1S 3025 (part 44):1993/ reaffirmed 2014
5.	COD	88	mg/L	IS 3025 (part 58):2006/ reaffirmed 2017
б.	Total Dissolved Solids	860	mg/L	APHA 23rd Edition 2017 / 2540-C
7.	Total Chromium	< 0.01	mg/L	APHA, 3111 B, 23rd Edition, 2017
8.	Copper	0.010	mg/L	APHA, 3111- B, 23rd Edition, 2017
9.	Nickel	< 0.01	mg/L	APHA, 3111 B, 23rd Edition, 2017
10.	Lead	< 0.01	mg/L	APHA, 3111- B, 23rd Edition, 2017
11.	Arsenic	< 0.001	mg/L	APHA, 3111- B, 23rd Edition, 2017

Kojo Tested by (sr. Chemist/Chemist)

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Engineer Jagdish Chauhan

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### **NISARG ENVIRO CONSULTANTS**

**GPCB RECOGNIZED SCHEDULE - II AUDITOR** 

NABL ACCREDITED LABORATORY

		TE	<u>ST REPORT</u>		
Report No.: NEC/ HAZ/228/01/	21				Date: 10/06/2021
Name & Address of Customer		Ahmedabad Mur Sardar Patel Bl Finance Departr Ahmedabad GP Ahmedabad, Gu	nicipal Corporation havan, ment, O, jarat- 380001		
Sample Collection Date	1	31/05/2021	Sampling Type	:	Grab
Sample Receipt Date	:	31/05/2021	Sample ID	:	HAZ/228/01/21
Sampling Location	-	126 MLD Vasna	Sample Description	:	Hazardous Waste
Sample Collected / Submitted by	:	Jayraj Parmar	Protocol used for monitoring	:	APHA 23rd Edition
Quantity / No. of Sample	-	5 Kg	Analysis Start Date	1	01/06/2021
Packing / Seal	\$	Cap Seal	Analysis Completion Date	÷	05/06/2021
Type of Container	:	Plastic Bag	Format No.	1	7.8 F-01
Environmental Condition during the test	-	25°C ±2 °C	Contact Person	:	Ms. Darshna Patel Ms. Neha Patel

#### **Hazardous Waste Analysis Results**

Sr. No	Parameter	Result	Unit	Reference Method
1.	Phenolic Compound	20	mg/Kg	5530 D, pg 5-49, APHA Edition 23nd
2.	Hexavalent Chromium	80	mg/Kg	APHA 23 <sup>rd</sup> Edition 2017 / 3500 Cr B
3.	Cadmium	< 0.01	mg/Kg	APHA, 3111 B, 23 <sup>rd</sup> Edition, 2017
4.	Total Chromium	84.05	mg/Kg	APHA, 3111- B, 23 <sup>rd</sup> Edition, 2017
5.	Copper	205.1	mg/Kg	APHA, 3111 B. 23 <sup>rd</sup> Edition, 2017
6.	Nickel	<0.01	mg/Kg	APHA, 3111 B. 23 <sup>rd</sup> Edition, 2017
7.	Lead	< 0.01	mg/Kg	APHA, 3111- B, 23 <sup>rd</sup> Edition, 2017
8.	Arsenic	<0.01	mg/Kg	APHA, 3111 B, 23rd Edition, 2017
9.	Cyanide	Absent	mg/Kg	APHA, 3111 B, 23rd Edition, 2017



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# ANNEXURE VIII: OUTCOME OF THE STAKEHOLDER/PUBLIC CONSULTATIONS FOR 375 MLD STP AT VASNA AHMEDABAD

Project	Guiarat Basiliant Citing Basilian
Agency/Department	Sujurat Resilient Lities Project
Consultant	Anmedabad Municipal Corporation
Consultation Stage	Tata Consulting Engineers
Type of Consultation	Consultations on ESMF & Draft ESIAs
rype of Consultation	(Focus Group Discussion, Public Consultations, Virtual Consultation
Date & Time	22222
Venue	do J. da
Total no: of Participants	Gyasper, Braina,
Name & Designation of Agency / Consultant Representatives	AMC. PIV
Name & Designation of Other officials	Neh U Env. Erg. Inayat M ACO
Remarks	MKShit S. CO . Shayyuffa S. NCO.

Key Points / Concerns raised (Heads)	Details (as bullet points)	Type of Stakeholder who raised the
e call H	- Darly Unio Parto a still 1	concern
J	Dung wale karbins skilled	
	a linskilled Workers	
	tamily size - 5 to 10 persons	
hand e Elandia	with 3 to 10 children	
reaun à Estuanosi	- nealth & Edulation	
	facilities they use core	
	of AMC.	
welitze	- Lack & Richhal conduct	
and a second	wan of sevenies approvinge	3
Issues.	- Lack of Wester Draince	
	connection (as it is	
	informal sanotlenes	
	after the officients of	
	- House and kurtha and	
	model by tast	
	mostly numeros.	
	- poor or no pussion	
	poso is no inggene	
	- They story Writer from	
	porchell & around writer	
	is of very poor quality	
	- Jome of them have goats	
	and youts fall ill because	2
	of over Duter (drinking & his	thing 1
Attendance :	of and build country of	( GIA
(Please note that this list will be a	resented in the ESIA / ESMF Report. If the participa	at has any shineting a
disclosing their names or details	they can put designation / location / greg / or tupo	it has any objection
enotest sumber / datails if ok)	ancy can put designation y location y area y or type	of stakeholder &

••



Project	GRCP Project	
Agency/Dept	Ahmedabad Municiapl Corporation	
Consultants	Tata Consulting Engineers	
Consultant Stage	Consultations of ESMF and Draft ESIAs	
Type of Consultation		1
	FGDs, Public consultations, Virtual Consultati	ons, etc)
Date and Time	28.3.2022	
Venue	AMC Community Hall	
Total Participants	60	
Name and Designation of		1
Agency/Consultant	AMC, PIU	
Name and Designation of other Officials	Neha U - Env Eng, Akshit-Env, Darshana, Mr. Mistry	
Remarks		
Key Points/Concerns raised (Heads)	Details (as bullet points)	Type of Stakeholder who
salient points	GRCP project - pollution related aspects	
	Basis for project.	1
	Prioritize the projects. City has to prioritize which projects it has to be taken up	
	The points considered for planning.	T T T
	Waste water treatment and reducing	T I
	pollution. NGT guidelines.	T T
	Storm water management will be dealt with separately.	
	Institutional framework and technical support	
	Monitoring and implementation	1
	Strengthen Organization for undertaking	1
	such projects in the future.	I I I
	ESMF provide frameworks for the GRCP project.	
Sub projects under 30 % investment-Priority	Brief description of the existing and	
	proposed projects for 375 MLD and 240 MLD STPs in Vasna and 180 MLD in Pirana.	
	Identification of risks and institutional	I I
	responsibilities. Plan for monitoring impacts	
	and implementation measures and strategy of public consultations.	



	Samples are collected: noise quality, sludge,		
	air water etc. and analysed.		
	Findings of the project. Not ecological		
	sensitive areas in Ahmedabad. Air pollution		
	concerns		
	Baseline data described here.		
	Samples of 126 plants. 54 acres of land within		
	compound wall. No structures within		
	compound		
	CND wastes, improvement of water quality	1	
	and sludge post implementation.		
	In pirana 27 acres within plant boundary wall		
	No R&R issues ESMP plans are prepared		
	Residential areas are more than 1 kms away.		
	In vasna there are some settlements nearby.		
	water quality in Sabarmati river will		
	improved due to technology and NGT		
	standards		
	The reports can be accessed on the AMC		
Link to access Draft	website. AMC invites participants comments		
reports/website	and suggestion.		
	PMC will be appointed for the project.		
	Participants to give their comments, views		
	and suggestion for the ESIA and ESMP		
	uploaded.		
Summing up, disclosure and	Mr. Mistry summed up and gave details of		
availability of Draft reports	the disclosure of all documents on the AMC		
on AMC Website, Vote of	website and invited participants		
Thanks	comments/views and suggestion on the	1	
	same. He also invited comments from the		
	participants who have accessed the reports.		



# Public Consultation for Understanding the Environmental & Social Impacts of the Projects Initiated under the G-ACRP

As part of the process under SEP, a public consultation was conducted on 07/06/2022 by AMC in Pandit Dindayal Upadhyaya Auditorium, Bodakdev, Ahmedabad. Invitations was circulated to various stakeholders in English and Gujarati. Notices were also published in the newspapers in both languages. The proceedings of the meeting key concerns raised by stakeholders and responses form AMC are reproduced in the table below, along with the photographs and the invitation and notice issued.

Project	G-ACRP Project		
Agency/Dept	Ahmedabad Municipal Corporation		
Consultant Stage	Consultation ESIAs and ESMF		
Type of Consultation	Stakeholder Consultations		
Date and Time	07.06.2022		
Venue	Pandit Dindayal Upadhyay Auditorium, Bokadev Ahmedabad		
Total Participants	160		
Name and Designation of Agency/Consultant Representatives	AMC, PIU,TCE, DHV		
Name and Designation of other Officials	AMC Officials and Elected Representatives: Municipal Commissioner, Dy M.C, Mayor, Dy Mayor, AMC Committees chairpersons, Councillors, Citizens,		
Remarks	Conducted in Local Language Gujarati		
Key Points/Concerns raised (Heads)	Details (as bullet points)	Type of Stakeholder who raised the concern	
Introduction and welcome note by AMC Officials: G-ACRP	Welcome the participants and introduction to the G-ACRP project and Stakeholder Consultation		
Municipal Commissioner			
CE, WRM,	Introduction to the G-ACRP project, process followed till date, total funding to be released for the project by World Bank, preparation of reports such as ESIA, ESMF, etc and availability of these reports on AMC website		
	History of the Ahmedabad City and underground drainage system, compliance standards, population increase and the need for the project, and implementation mechanism for the project, sub projects under G-ACRP, disclosure of documents ESMF &ESIA on AMC website, preparation of labour Management Procedure and Cultural & Heritage Management Framework, Resettlement Policy Framework; SEP. The process of consultations undertaken to understand issues and concerns with respect to the project and sub projects, Baseline monitoring of environmental conditions undertaken for preparing the ESIA reports. Suggestions invited on email: piugrcdpamc@gmail.com in the next 15 days.		



NGO	Will other STPS be upgraded considering the total sewage received for city, Storm water and gutter connection was taken by residents after payment and the same has been removed by AMC. What is proposed to be done to rectify this issue.	
	How will the sewage generated and bypass be dealt with during construction period of 126 MLD STP?	
	Naroda, Vatva and other areas with common ETPs there are issues with respect to the releases of effluents and it has been highlighted in various reports and studies carried out by different organizations. How will the untreated industrial be treated? Data pertaining to census 2011. Data should be updated for recent areas.	
Response by CE, WRM	For all sub projects design and technology will adhere to NGT standards for discharge of treated water; these are two priority investment projects and rest of the sewage treatment also will be taken care further through other projects of new STPs and upgradation of old STPs. 126 MLD STP will be functioning till the time new stream of approximately 120 MLD in the adjacent land inside the 126 MLD STP premises is built and the flow of existing 126 MLD will be diverted to the new stream and then demolition will take place hence there will be no bypass from 126 MLD campus during construction of 375 MLD STP in campus of 126 MLD STP. Storm water project will be undertaken in other funding schemes like NRCP and Amrut; CETP discharge come under the purview of the GPCB. 3500 connections from industries removed by AMC. Data from Master planning consultants has been used for the reports.	
NGO	Many workers/labour will be hired. There are violations of labour standards and non-compliance in AMC projects. Many workers have lost their lives and health and safety compliances are violated especially in storm water works.	
	AMC gives funds for labour welfare for workers. There is committee to raise the violation. Rehabilitation of the migrants' colonies who may be affected and who don't have drinking water, sanitation and other facilities. Response: PIU will address the issues with help of its	
	labour management plan. Please send suggestions on the email.	
NGO	Whether details for use of treated water in industries is available.	
Response	Discussion is ongoing with industries for reuse of treated sewage. Through Amrut, DPR is being prepared and will be shared after finalization.	



	Industries were reluctant earlier due to easy availability of groundwater. Some industries are now willing to use treated water and discussions are being undertaken with industries         In Fatehwadi canal, treated water was being released and studies will be undertaken for the same if we will use treated sewage from 126/375 MLD STP with help of agricultural university, subject	
	water for irrigation.	
Addl. City Engineer , Drainage Project, AMC	Vote of thanks to all the	attendees and participants
<image/>	CON WORKSHOP CORPORATION COMPO	<image/> <image/> <image/> <image/> <image/> <image/> <image/> <image/>
Invite (Eng) Issued by Commissioner	Deputy Municipal	Invite (Guj) Issued by Deputy Municipal Commissioner



el. deveniering, utilità eli additta di personali di la	પ્રખાપ્ત ahmedabadcity.gov.in ઉપરથી પ્રઉભેલીડ કરી શકાશે. ભરેલ ટેન્ડરો તારીખ ૧૭-૦૯-૨૦૨૨ ના રોજ ૧૪.૦૦ વાગ્યા સુધી સ્વીકારવામાં આવશે તથા (૨) બગીચા ખાતામાં જૂદા જુદા કામ માટે ઇન્ ટેન્ડર નોટીસ નં. ૯/૨૦૨૨-૨૩ (ઓનલાઇન) થી ઇ-ટેન્ડરો મંગવવામાં આવે છે. આવ કામના અનુભવી એન્ડ્રાક્ટરોએ ઇન્ટેન્ડરોની વિગતો ખપ્ત ahmedabadcity.gov.in અને https://amc.nprocure.com ઇપરથી મેળવી શકાશે. ભરેલ ઇ-ટેન્ડરો તારીખ ૨૪-૦૯-૨૦૨૨ ના રોજ ૧૪.૦૦ વાગ્યા સુધીસ્વીકારવામાં આવશે. કે. મ્યુનિસિપ્લ કબિશનર (પાર્કસ એન્ડ માર્કન્લ)
	NEWS CLIPPINGS - AMDAVAD MUNICIPAL CORPORATION           Eccal CHI252         02.06.3022         23           Thursday         23
NEWS CLIPPINGS - AMDAVAD MUNICIPAL CORPORATION       THE TIMES OF INDIA       Openation     Project involumentation unit	અમદાવાદ મ્યુનિસિપલ કોર્પોરેશન પ્રોવેક્ટ ઇમ્પ્રીમેન્ટેશન યુનિટ ગુપરાત રેસીલીચલ્પ પાર્ટનરશીપ અમદાવાદ સીદી રેઝીલીચલ્પ પ્રોપેક્ટ બાદેર નોટીસ
GUJARAT RESULENT CITIES PARTNERSHIP: AMMEDABAD CITY RESULENCE PROJECT PUBLIC MOTICE Environment Social management framework (ESMF) and Drait Environment Social impact assessment report of 375 kUD under Ahmedabadeltgragenitie webelle. In this regard the concentred experts and stateholders including public and NOCA are invited for a stateholder consultation on 7.60222 tion 10.30 and to 12.00 noos al Plankt Dindragi Upachysy Auditorium Hall, Bodakidev fo understand the project and stateholders including public and NOCA are invited for a stateholder consultation on 7.60222 tion 10.30 and to 12.00 noos al Plankt Dindragi Upachysy Auditorium Hall, Bodakidev fo understand the project and stateholders including public less implementation of the projects with Word Barks francia assistance. Bd-Commissioner, AMC	અમદાવાદ સીટી રેઝીલીપન્સ પ્રોજેક્ટ અંતર્ગત તૈયાર કરેલ એન્વાયર્પેન્ટ સોશિયલ મેનેજમેન્ટ કેપ્વર્ક તથા ડ્રાક્ટ ૩૭૦ એમએલડી એસટીપીના એન્વાયર્પેન્ટ સોશિયલ ઇમ્પેક્ટ એસેસમેન્ટ રીપોર્ટ www.ahmcdabadcity.gov.in વેબસાઇ ૧૫ ઉપલગ્ય છે. સદર વર્લ્ડ બેંકની આર્થિક સહાયથી થનાર પ્રોજેક્ટની એન્વાયર્પેન્ટ તથા સોશિયલ અસરોને સમયવા માટે આયોજન જાતેર પરાયશંમાં તમામ વિષ્ય નિષ્ણાતો, એન. જ. ઓ., જાઢે જ્યાતો નાવુંન્ટિંગ ૮૨ ના રોજ સવારે ૨૦. ૩૦ વાચાથી બપોરે ૧૨.૦૦ દરમ્યાન પંડિત કિન્દયાળ ઉપાયાય અડિટોરિયમ હોલ, બોડકદેવ ખાતે રાખેલ છે જેમાં ભાગ લેવા તથા તેએના સૂચનો પરાયશે દરમ્યાન અથવા પરાયર્થના ૧૫ દિવસમાં pigerofome@mil.com ૧૫ પ્યોકવા જજ્ઞાવવામાં આવે છે જેથી સદર પ્રોજેક્ટનું અસરકારક રીતે અપલીકરણ થઇ શકે. અદી/- કબ્રિઝાનર, અ.થુ. છે.
Public Notice published in the English Newpaper	Public Notice published in the Gujarati
	Newpaper
Detailed introduction on State, city and G-	CE, WRM: Presentation in Gujarati on
АСКР	G-ACRP, WB funding, Process followed, Studies undertaken and Documents prepared