

Initial Environmental Examination

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Prepared by Project Management Unit, Rajasthan Urban Drinking Water Sewerage and Infrastructure Corporation Limited, Government of Rajasthan for the Asian Development Bank.

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CURRENCY EQUIVALENTS

(as of 26 May 2020)

Currency unit	–	Indian rupee (₹)
₹1.00	=	\$0.01319
\$1.00	=	₹75.7905

ABBREVIATIONS

ADB	–	Asian Development Bank
AC	–	Asbestos Cement
ASI	–	Archaeological Survey of India
CAPP	–	Community Action Public Participation Consultant
CMSC	–	Construction Management and Supervision Consultant
CTE	–	consent to establish
CTO	–	Consent to Operate
CPCB	–	Central Pollution Control Board
EA	–	Executing Agency
EAC	–	Expert Appraisal Committee
EC	–	environmental clearance
EHS	–	Environmental Health & Safety
EIA	–	Environmental Impact Assessment
SEIAA	–	State Environmental Impact Assessment Authority
EMP	–	Environmental Management Plan
GOI	–	Government of India
GOR	–	Government of Rajasthan
IA	–	Implementing Agency
IEE	–	initial environmental examination
PIU	–	project implementation unit
PMU	–	project management unit
LSGD	–	Local Self Government Department
MOEF& CC	–	Ministry of Environment, Forest and Climate Change
MLD	–	Million Liters per Day
LPCD	–	Liters per Capita per Day
PE	–	Polyethylene
DWC	–	Double Wall Corrugated
NHAI	–	National Highways Authority of India
NOC	–	No Objection Certificate
PHED	–	Public Health Engineering Department
PO	–	Project Officer
PMCBC	–	Project Management and Capacity Building Consultant
PWD	–	Public Works Department
REA	–	Rapid Environmental Assessment Checklist
ROW	–	right-of-way
RPCB	–	Rajasthan State Pollution Control Board
RUIDP	–	Rajasthan Urban Infrastructure Development Project

RSTDIP	–	Rajasthan Secondary Towns Development Sector Project
SO	–	safeguards officer
SPS (ADB)	–	Safeguard Policy Statement, 2009
SPS	–	sewage pumping station
STP	–	sewage treatment plant
ULB	–	urban local body
WTP	–	water treatment plant

WEIGHTS AND MEASURES

°C	–	Degree Celsius
km	–	kilometer
LPCD	–	litres per capita per day
mm	–	milli meter
m	–	meter
MLD	–	million litres per day
mm	–	millimeter
nos	–	numbers
km ²	–	square kilometer

NOTE

In this report, "\$" refers to United States dollars.

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EXECUTIVE SUMMARY

Rajasthan Secondary Towns Development Sector Project (RSTDSP), the fourth phase of investment projects financed by Asian Development Bank (ADB) and implemented by the Rajasthan Urban Drinking Water Sewerage and Infrastructure Corporation Limited-Externally Aided Projects (RUDSICO), previously known as Rajasthan Urban Infrastructure Development Project (RUIDP). RSTDSP will support the ongoing efforts of the Government of Rajasthan (GOR) towards improving the water and wastewater services in about 14 towns.¹ RSTDSP seeks to improve WSS services in secondary towns with populations between 20,000-115,000 through a sector loan modality. The project is aligned with the following impact(s): access to potable, affordable, reliable, equitable, and environmentally sustainable drinking water supply in all urban areas of Rajasthan improved;² and health status of urban population, especially the poor and under-privileged improved.³ The project will have the following outcome: urban service delivery in secondary towns of Rajasthan improved. There are three outputs.

- **Output 1:** Water supply infrastructure in project towns improved with climate-resilient and inclusive features. By 2027: (i) about 1,350 kilometers of water supply pipelines will be commissioned through a district metered area approach for effective NRW management, (ii) about 100,000 households will be connected to an improved water supply system (including at least 95% BPL households) with 100% functional meters allowing for the introduction of volumetric billing, (iii) 3 new water treatment plants will be commissioned with total capacity of at least 28 million liters per day and (iv) 2 water treatment plants will be rehabilitated.
- **Output 2:** Sanitation systems in project towns improved with climate-resilient, cost-effective and inclusive features.⁴ By 2027: (i) about 1,300 kilometers of sewers will be constructed, (ii) 19 STPs with co-treatment of wastewater and fecal sludge and with a total capacity of about 80 million liters per day will be commissioned and 3 existing STPs will be upgraded to meet current effluent standards, (iii) about 103,000 new household connections (including at least 95% BPL households) to sewer system will be installed, (iv) 1 fecal sludge treatment plant with total 10 kilo liters per day capacity will be commissioned, and (v) agreements for reuse of wastewater mainly for industry or agriculture will be signed in at least 5 project ULBs.
- **Output 3:** Institutional and human capacities strengthened for service improvements, gender equality and sustainability. Under the sector project: (i) at least 500 women will gain professional experience through an internship program at RUDSICO, (ii) about 500 staff and 500 elected representatives of project ULBs, including 80% of eligible women, will report increased knowledge on O&M of WSS services, CWIS, financial sustainability and GESI action plan implementation, (iii) about 500 girls will report enhanced knowledge in conducting

¹ Secondary towns under consideration are Abu Road, Banswara, Didwana, Fatehpur, Khetri, Kuchaman, Laxmangarh, Ladnu, Mandawa, Makrana, Pratapgarh, Ratangarh, Sardarshahar, and Sirohi

² Government of Rajasthan. 2018. *Rajasthan: Urban Water Supply Policy*. Jaipur.

³ Government of Rajasthan. 2016. *State Sewerage and Wastewater Policy*. Jaipur.

⁴ Climate resilient and inclusive features included are: improvements in the distribution system to reduce losses; rainfall water harvesting; energy-efficient pumps; solar panels at project facilities; pressure control mechanisms in the water system to help avoid losses through pipe bursts; and wastewater reuse for productive uses.

water audits in schools and households, and (iv) data platforms will be established in all project towns.⁵

- Makrana Town sewerage subproject is one of the subprojects proposed under the investment component of Phase-IV of RUDSICO-EAP. There is an existing sewerage system in central part of the town, which is not fully functional and most of the households are not connected with existing sewerage system. Due to lack of complete sewerage system, most of the households depend on septic tanks for disposal of sewage. Effluent from septic tanks and sullage is let off into open drains which ultimately collect in low laying areas and natural drains in the outskirts of the town.

Screening and assessment of potential impacts. ADB requires consideration of environmental issues in all aspects of the Bank's operations, and the requirements for Environmental Assessment are described in ADB's SPS (2009). As per the Government of India environmental impact assessment (EIA) Notification, 2006, this subproject does not require EIA study or Environmental Clearance. The potential environmental impacts of the subproject have been assessed using ADB rapid environmental assessment (REA) checklist for Sewerage. The potential negative impacts were identified in relation to preconstruction, construction and operation phases. This Initial Environmental Examination (IEE) addresses the infrastructure components designed under Makrana sewerage subproject.

Categorization. Environmental assessment has been conducted for the Makrana sewerage subprojects based on (i) preliminary detailed design, and (ii) most likely environmentally sensitive components. The environmental assessment used ADB's rapid environmental assessment (REA) checklists for sewerage works and "No Mitigation Scenario Checklist". The environmental assessment of the Makrana sewerage subprojects are not likely to have any significant adverse environmental impacts that are irreversible, diverse, or unprecedented. Potential impacts are mostly site-specific and few of them are irreversible. In most cases mitigation measures can be designed with uncomplicated measures commonly used at construction sites and known to civil works contractors.

Makrana sewerage subproject is classified as environmental category B as per the SPS as no significant impacts are envisaged. Accordingly, this Initial Environmental Examination (IEE) assesses the environmental impacts and provides mitigation and monitoring measures to ensure that there are no significant impacts as a result of the project.

Project Scope. The subproject is formulated to address gaps in water and sewerage infrastructure in a holistic and integrated manner. The main objective of the RUIDP Phase-IV is to improve water efficiency, security, and provide safe sewage collection and with the on-going investments in sewage treatment, this will have an important effect on public health and environment. Investments under this subproject include: (i) Construction of 1 nos. of STP of 7.70 MLD with SBR technology in the existing campus of STP with proposed to construct Construction of one treated effluent storage reservoir (TESR) of 800 KL, Treated Effluent Elevated Reservoir (TEER) 400 KL (22 m staging) within the campus (ii) 2 Nos. sewage pumping station (SPS) one near Jhalra Pond (2.30 MLD capacity) and another near Sheetla

⁵ Includes supervisory control and data acquisition system, hydraulic model, geographic information system, and drinking water and treated wastewater quality monitoring system.

Mata Seva Samiti (2.10MLD capacity) are designed (iii) Laying of 95.04 km sewer in town including 11.61 km trenchless method (iv) Raising Main for pumping the sewage-1600 m (v) House sewer connection (8000 nos.) (vi) Electrical and Mechanical works. (vii) construct one nos of CRMC in the designed SPS campus Near Jhalara Pond (viii) Operation and Maintenance of sewerage system-10 years.(ix) Faecal sludge and Septage management (FSSM) to provide low costs sanitation where sewer network is not an immediate requirement for population on outskirts and scattered habitation till laying of sewer line.

Description of the Environment. Subproject components are in Makrana town of Nagaur district and in its immediate surroundings which were converted into urban use for many years ago, and there is no natural habitat left at these sites. The project sites are in Government lands (for structures) and in existing road right-of-way (ROW) for pipe laying. There are no protected areas, wetlands, mangroves, or estuaries in or near the project locations. Soils are deep, and do not require cutting of rocks for pipe laying. The climate of Makrana is dry and hot in summers and cold in winters. Rainfall is low in Makrana. As per the seismic zoning map of India, Makrana located in low damage risk zone (Zone II). The area is less prone to earthquakes as it is located on relatively stable geological plains.

Potential Environmental Impacts and Mitigation Measures. In this draft IEE, negative impacts were identified in relation to location, design, construction and operation of the improved infrastructure. Environmental impacts as being due to the project design or location were not significant as various measures are already included in site planning and preliminary design. There are no environmentally or archeologically sensitive areas within Makrana town. The town is mostly surrounded by agricultural areas, and there are no sensitive areas like forests.

Designed STPs sites are located away from habitations and surrounded by agricultural lands, therefore no impacts envisaged. Designed SBR technology is advanced, treats sewage in a compact aerobic process, therefore issue due to bad odour is minimal. It is designed to design the STPs to stringent discharge standards suggested by CPCB. Following the Rajasthan Sewerage and Wastewater Policy, 2016, treated effluent from STPs will be reused in various feasible purposes, and a Reuse plan will be prepared during the detailed design. Various measures are suggested for safe reuse of wastewater and sludge. Excess / surplus of treated effluent will be disposed into water channels/drains, which are either dry or carry untreated wastewater at present. No impacts envisaged.

Potential impacts during construction are considered significant but temporary and are common impacts of construction in urban areas, and there are well developed methods to mitigate the same. Except laying of sewer, all other construction activities will be confined to the selected sites and the interference with the general public and community around is minimal. In these works, the temporary negative impacts arise mainly from construction dust and noise, hauling of construction material, waste and equipment on local roads (traffic, dust, safety etc.), mining of construction material, occupational health and safety (OHS) aspects. Sewer laying works will be conducted along public roads in an urban area congested with people, activities and traffic. Therefore these works may have adverse, but temporary impacts arising mainly from the disturbance of residents, businesses and traffic due to construction work; safety risk to workers, public and nearby buildings due to deep trench excavations in the road; access impediment to houses and business, disposal of large quantities of construction waste etc. These are all general impacts of construction in urban areas and there are well developed methods of mitigation that are suggested in the EMP. Trenchless method will be adopted for sewers deeper than 3.5 m and also at main road crossings in traffic areas.

Once the new system is operating, the facilities will operate with routine maintenance, which should not affect the environment. Improved system operation will comply with the operation and maintenance manual and standard operating procedures to be developed for all the activities.

Potential impacts during operations are considered that relates to the Occupational Health and Safety requirements of operating STP such as the handling and maintenance of chemicals and testing and verification of treated effluent to environmental standards per Central Pollution Control Board. Sludge management should be compliant with the requirements of the Solid Waste Management Rule 2000 and its amendment. Other solid waste disposal should be at designated disposal sites. Dumping at vacant land is not allowed per Solid Waste Management Rule 2000 and its amendment.

Environmental Management. An Environmental Management Plan (EMP) has been developed to provide mitigation measures to reduce all negative impacts to acceptable levels, along with the delegation of responsibility to appropriate agency. Various design related measures are already included in the project design. During construction, the EMP includes mitigation measures such as (i) selection of construction methodology (ii) proper planning of sewer works to minimize the public inconvenience; (iii) barricading, dust suppression and control measures; (iv) traffic management measures for works along the roads and for hauling activities; (v) provision of walkways and planks over trenches to ensure access will not be impeded; and (vi) finding beneficial use of excavated materials to extent possible to reduce the disposal quantity. EMP will guide the environmentally-sound construction of the subproject. EMP includes a monitoring program to measure the effectiveness of EMP implementation and include observations on- and off-site, document checks, and interviews with workers and beneficiaries. A copy of the updated EMP/ SEMP shall always be kept on-site during the construction period. The EMP shall be made binding on all contractors operating on the site and will be included in the contractual clauses. Non-compliance with, or any deviation from, the conditions set out in this document shall constitute a failure in compliance. To monitor the operation stage performance, there will also be longer-term surveys to monitor treatment efficiency of STP (raw and treated sewage quality), sludge at STPs. Mitigation and monitoring measures, along with the project agency responsible for such actions, form part of the Environmental Management Plan. The estimated implementation cost of the EMP is INR 29110017/- (Two Crore Ninety One Lakhs Ten Thousand Seventeen only).

This draft IEE and EMP will be included in the bid and contract documents to ensure compliance with the conditions set out in this document. The contractor will be required to submit to PIU, for review and approval, an updated EMP / site-specific environmental management plan (SEMP) including (i) designed sites/locations for construction work camps, storage areas, hauling roads, lay down areas, disposal areas for solid and hazardous wastes; (ii) specific mitigation measures following the approved EMP; and (iii) monitoring program as per EMP. No works can commence prior to approval of SEMP. A copy of the EMP/approved SEMP will always be kept on site during the construction period.

Implementation Arrangements. Government of Rajasthan's Local Self Government Department (LSGD) acting through the Rajasthan Urban Drinking Water, Sewerage and Infrastructure Corporation (RUDSICO) will be the Project Executing Agency. The project management unit (PMU) is housed in RUDSICO's division for externally aided projects (EAP). There will be two Zonal Offices in Jaipur and Jodhpur, and project implementation units (PIUs) in each project town/Urban Local Body (ULB). PMU will be responsible for submitting environmental assessment and monitoring reports to ADB, monitoring of safeguards

compliance, addressing safeguards issues, providing support and guidance to PIUs. The PIUs will be responsible for day-to-day monitoring of EMP implementation, information disclosure, consultations and other field-level activities. PMU has appointed a Project Officer for Environment and each PIU will deputize Assistant Safeguard Officers (ASOs). The PMU Environment Project Officer will be assisted by specialists from Project Management and Capacity Building Consultants (PMCBC) and Construction Management and Supervision Consultants (CMSC).

Consultation, Disclosure and Grievance Redress. The stakeholders were involved in developing the IEE through discussions on-site and a public consultation workshop at city level, after which views expressed were incorporated into the IEE and in the planning and development of the project. Apart from on-site public consultations, a stakeholder meeting of City Level Committee (CLC) was held and CLC has appreciated and approved the subproject. The IEE will be made available at public locations and will be disclosed to a wider audience via the ADB and RUDSICO-EAP websites. The consultation process will be continued and expanded during project implementation to ensure that stakeholders are fully engaged in the project and can participate in its development and implementation. A grievance redress mechanism (GRM) is described within the IEE to ensure any public grievances are addressed quickly.

Monitoring and Reporting. The PMU, PIU and consultants will be responsible for monitoring and reporting. During construction, results from internal monitoring by the DBO contractor will be reflected in their monthly EMP implementation reports to the PIU. PIU with the assistance of CMSC, will monitor the compliance of Contractor, prepare a quarterly environmental monitoring report (QEMR) and submit to PMU. The PMU will oversee the implementation and compliance and will submit Semi-Annual Environmental Monitoring Reports (SEMR) to ADB. ADB will post the environmental monitoring reports on its website. Monitoring reports will also be posted RUDSICO-EAP/PMU websites.

Conclusions. The citizens of the Makrana will be the major beneficiaries. The subproject is primarily designed to improve environmental quality and living conditions of Makrana town through provision of sewerage system. The benefits arising from this subproject include: (i) better public health particularly reduction in waterborne and infectious diseases; (ii) reduced risk of groundwater contamination; (iii) reduced risk of contamination of treated water supplies; and, (iv) reduced dependence on fresh water resource due to reuse of treated wastewater, and (vi) improvement in quality of water bodies due to disposal of treated effluent meeting disposal standards.

The subproject is unlikely to cause significant adverse impacts. The potential impacts that are associated with design, construction and operation can be mitigated to standard levels without difficulty through proper engineering design and the incorporation or application of recommended mitigation measures and procedures. Based on the findings of the IEE, there are no significant impacts and the classification of the project as category "B" is confirmed. The subproject is not covered by the GOI EIA Notification (2006).

Recommendations. The following are recommendations applicable to the subproject to ensure no significant impacts:

- Obtain all statutory clearances at the earliest time possible and ensure conditions/provisions are incorporated in the detailed design.
- Obtain CTO for existing STP as corrective action plan

- Include this IEE in bid and contract documents.
- Update and implement the asbestos management plan per site-specific conditions.
- Update and implement the recommendations from the biodiversity assessment report.
- Ensure that sludge management protocols are compliant with environmental regulations (Solid Waste Management Rules 2000 and its amendments) and solid waste disposal should have a designated site (dumping on vacant lot is not allowed);
- Conduct safeguards induction to the contractor upon award of contract;
- Strictly supervise EMP implementation.
- Ensure contractor appointed qualified EHS officers prior to start of works.
- Documentation and reporting on a regular basis as indicated in the IEE;
- Continuous consultations with stakeholders.
- Timely disclosure of information and establishment of grievance redressal mechanism (GRM);
- Involvement of contractors, including subcontractors, in first-level GRM;
- Commitment from PMU, PIUs, project consultants, and contractors to protect the environment and the people from any impact during project implementation.

I. INTRODUCTION

A. Background

1. Rajasthan Secondary Towns Development Sector Project (RSTDSP), the fourth phase of investment projects financed by Asian Development Bank (ADB) and implemented by the Rajasthan Urban Drinking Water Sewerage and Infrastructure Corporation Limited-Externally Aided Projects (RUDSICO), previously known as Rajasthan Urban Infrastructure Development Project (RUIDP). RSTDSP will support the ongoing efforts of the Government of Rajasthan (GOR) towards improving the water and wastewater services in about 14 towns.⁶ RSTDSP seeks to improve WSS services in secondary towns with populations between 20,000-115,000 through a sector loan modality. The project is aligned with the following impact(s): access to potable, affordable, reliable, equitable, and environmentally sustainable drinking water supply in all urban areas of Rajasthan improved;⁷ and health status of urban population, especially the poor and under-privileged improved.⁸ The project will have the following outcome: urban service delivery in secondary towns of Rajasthan improved. There are three outputs.

- (i) **Output 1:** Water supply infrastructure in project towns improved with climate-resilient and inclusive features. By 2027: (i) about 1,350 kilometers of water supply pipelines will be commissioned through a district metered area approach for effective NRW management, (ii) about 100,000 households will be connected to an improved water supply system (including at least 95% BPL households) with 100% functional meters allowing for the introduction of volumetric billing, (iii) 3 new water treatment plants will be commissioned with total capacity of at least 28 million liters per day and (iv) 2 water treatment plants will be rehabilitated.
- (ii) **Output 2:** Sanitation systems in project towns improved with climate-resilient, cost-effective and inclusive features.⁹ By 2027: (i) about 1,300 kilometers of sewers will be constructed, (ii) 19 STPs with co-treatment of wastewater and fecal sludge and with a total capacity of about 80 million liters per day will be commissioned and 3 existing STPs will be upgraded to meet current effluent standards, (iii) about 103,000 new household connections (including at least 95% BPL households) to sewer system will be installed, (iv) 1 fecal sludge treatment plant with total 10 kilo liters per day capacity will be commissioned, and (v) agreements for reuse of wastewater mainly for industry or agriculture will be signed in at least 5 project ULBs.
- (iii) **Output 3:** Institutional and human capacities strengthened for service improvements, gender equality and sustainability. Under the sector project: (i) at least 500 women will gain professional experience through an internship program at RUDSICO, (ii) about 500 staff and 500 elected representatives of project ULBs, including 80% of eligible women, will report increased knowledge on O&M

⁶ Secondary towns under consideration are Abu Road, Banswara, Didwana, Fatehpur, Khetri, Kuchaman, Laxmangarh, Ladnu, Mandawa, Makrana, Pratapgarh, Ratangarh, Sardarshahar, and Sirohi

⁷ Government of Rajasthan. 2018. *Rajasthan: Urban Water Supply Policy*. Jaipur.

⁸ Government of Rajasthan. 2016. *State Sewerage and Wastewater Policy*. Jaipur.

⁹ Climate resilient and inclusive features included are: improvements in the distribution system to reduce losses; rainfall water harvesting; energy-efficient pumps; solar panels at project facilities; pressure control mechanisms in the water system to help avoid losses through pipe bursts; and wastewater reuse for productive uses.

of WSS services, CWIS, financial sustainability and GESI action plan implementation, (iii) about 500 girls will report enhanced knowledge in conducting water audits in schools and households, and (iv) data platforms will be established in all project towns.¹⁰

2. A series of subprojects will be implemented under the Project, with each subproject providing improvements to water supply or sanitation (on-site and off-site) or both in a project town. Makrana town sewerage subproject is one of the subprojects designed under RSTDSP. At present no proper sewerage system exists in the town, the existing system is not capable to cater sewer for entire town. Most of the households depend on septic tanks for disposal of sewage. Effluent from septic tanks and sullage water is let off into open drains which ultimately collect in low lying areas and natural drains in the outskirts of the town. It is therefore designed to improve sanitation in the town. For sanitation, sewerage will be limited to the core areas and fecal sludge management will be improved for areas not served by sewers. ADB requires the consideration of environmental issues in all aspects of the Bank's operations, and the requirements for environmental assessment are described in ADB's Safeguards Policy Statement (2009). Accordingly, this initial environmental examination (IEE) has been conducted to assess the environmental impacts and provide mitigation and monitoring measures to ensure that there are no significant impacts because of the subproject.

B. Purpose of Initial Environmental Examination Report

3. ADB requires the consideration of environmental issues in all aspects of the Bank's operations, and the requirements for environmental assessment are described in ADB's Safeguard Policy Statement (SPS), 2009. The potential environmental impacts of the subproject have been assessed using ADB Rapid Environmental Assessment (REA) Checklist for sewerage treatment (Appendix 1). The potential negative impacts were identified in relation to pre-construction, construction and operation of the improved infrastructure, and results of the assessment show that the subproject is unlikely to cause significant adverse impacts. Thus, this initial environmental examination (IEE) has been prepared in accordance with ADB SPS requirements for environment category B projects.

4. The Makrana sewerage subproject is designed for implementation under the design-build-operate (DBO) modality, where in which the design is carried out by the selected bidder based on the feasibility / preliminary project report prepared prior to bidding. Thus, this IEE is based on the preliminary project report prepared by RUDSICO-EAP (PMU). The IEE was based mainly on field reconnaissance surveys and secondary sources of information. No field monitoring (environmental) survey was conducted, however, the environmental monitoring program developed as part of the environmental management plan (EMP) will require the contractors to establish the baseline environmental conditions prior to commencement of civil works. The results will be reported as part of the environmental monitoring report and will be the basis to ensure no degradation will happen during subproject implementation. Stakeholder consultation was an integral part of the IEE.

5. This IEE will be updated and finalized during detailed design stage to reflect change in scope of works, change in location of component and change in cost due to addition or

¹⁰ Includes supervisory control and data acquisition system, hydraulic model, geographic information system, and drinking water and treated wastewater quality monitoring system.

subtraction of components which can change the environmental impacts. The revised IEE shall supersede the earlier version of IEE and shall be contractually applicable to the contractor after approval from PMU and ADB.

6. The implementation of the subprojects will be governed by Government of India and Rajasthan and other applicable environmental acts, rules, regulations, and standards. Environmental safeguards will be followed in accordance with the ADB SPS 2009. During the design, construction, and operation of the project the borrower/client will apply pollution prevention and control technologies and practices consistent with international good practice, as reflected in internationally recognized standards.

C. Report Structure

7. This report contains the following eleven (11) sections and the executive summary at the beginning of the report:

- (i) Executive Summary
- (ii) Introduction
- (iii) Description of the Project
- (iv) Analysis of alternatives
- (v) Policy, Legal and Administrative Framework
- (vi) Description of the Environment
- (vii) Anticipated Environmental Impacts and Mitigation Measures
- (viii) Public consultation and information disclosure
- (ix) Grievance Redress Mechanism
- (x) Environmental management plan
- (xi) Conclusions and Recommendations

II. DESCRIPTION OF THE PROJECT

A. Makrana Town

8. Makrana is a town and a municipality in Nagaur district of Rajasthan state in India. Makrana is located at 27.05°N & 74.72°E and at average elevation 408 m (1339 ft) above MSL. The municipal area of the city is about 12.19 km². It is a Tehsil head quarter of Nagaur district. It is located about 100 km from district head quarter Nagaur, 135 km from State capital Jaipur and 90 km from Ajmer by road. Nearest railway station is Makrana which is within the city. Nearest Airport is Sanganer (Jaipur) which is about 137 km away from Makrana.

B. Present Status of Water Supply and Sewerage

9. **Water Supply:** Source-present the main source of treated water is Nagaur lift canal. The treated water from Nagaur lift canal project is being delivered at Budshu road Pump house, from there treated water is pumped to 2 CWRs situated at Joosri road and Ex. En. Office in Makrana town to supply the treated water among the consumers of town.

10. The treated water allocation from Nagaur Lift Canal Project (NLWSP) is as follows:

- (i) 2015- 16.54 MLD
- (ii) 2030- 21.88 MLD
- (iii) 2045- 26.75 MLD

11. **Distribution pipeline system:** There are 10 Service Reservoirs (9 ESRs+1GSR) with 33 Water supply Distributaries zone. 11 zones are being fed with service reservoirs and rest zones by direct boosting. Approximately 280 km various type and size of pipeline as distribution main in 40 nos. wards of Nagar parishad in Makrana and adjoining peripheral habitations.

- (i) **Storage:** There are 10 nos. of service reservoir having total capacity of 8830 kL, water supply is maintained in 11 nos. of zones through these 10 storages (9 ESR and 1 GLSR at Matabhar). In addition to the three CWRs are also available at Joosari road H/W, Xen office H/W and Jen Office H/W, having capacity of 1800 kL, 2000 kL and 150 kL, respectively.

12. **Water** is supplied for one and half hour on daily basis at 90 to 100 lpcd. Water supply is currently intermittent. Water supply is currently intermittent. Current water supply is ~10 MLD from Nagaur Lift Water Supply Project and will be increased to 135 lpcd after full commissioning water supply scheme. Water allocation for town is 26.75 MLD for year 2045.

13. **Sewerage.** Project town have partial sewerage system executed under UIDSSMT (seven city project) funded by Government of India. Under this project 72 km sewerage collection system with 6.0 MLD STP (SBR) constructed and commissioned with sewer property connections by ULB. 64% population of town has been benefited. Presently in the balance area, wastewater from kitchens & bathrooms is discharged into storm water drains culminating finally to the Nallah or on ground, which pollutes the environment and contaminates the ground water. Open defecation is not uncommon. As the balance area of town does not have any sewerage system and effluent finds its way into the open drains. In the absence of safe disposal and treatment system of sewage, the people of uncovered area are facing unhealthy and unhygienic environment. Therefore, public representatives are also demanding facilities of sewerage system in uncovered area on priority basis. After execution of sewerage system in the uncovered area by providing underground sewer pipeline network followed by sewerage treatment plant, the public of uncovered area will get relief from unhealthy and unhygienic environment. Environment audit report of existing STP is given in Appendix 26.

C. Sewerage Infrastructure Proposed in Makrana under RSTDSP

14. **Sewerage Works.** Under RSTDSP, it is designed to develop a sewerage system in Makrana town to collect, treat, and dispose/reuse the domestic wastewater safely. This is being provided in a combination of underground sewerage system including treatment facility, and Fecal Sludge and Septage Management (FSSM) system in areas that are not fully developed at present and not feasible to provide sewer network. About 88% of the total base year population (2021) is designed to be covered by sewerage system, while the rest 12% will be covered by FSSM. The objectives of the designed sewerage works are:

- (i) Construction of sewerage network, including house sewer connection and collection of wastewaters from point of generation.
- (ii) Construction of energy efficient and mechanized Sewage Treatment Plant and electromechanical machinery;
- (iii) Septage management and decentralized wastewater treatment systems in suitable areas;
- (iv) Provision for reuse of treated effluent etc.
- (v) To ensure 100 % house service connections for wastewater collection.

- (vi) To ensure sustainability of the project by implementing a comprehensive asset management plan focusing on an integrated approach to operation and maintenance to minimize lifecycle costs.
15. The sewer system will be designed as a separate sewer system that carries only the domestic/municipal wastewater. The open drain system that exists in the town will cater to storm runoff. No industrial wastewater will be allowed into the sewers. This subproject complies with the environmental subproject selection criteria (Appendix 2) agreed between the government and the ADB.
16. Sewage treatment. It is designed to develop Sequential Batch Reactor (SBR) - based sewage treatment facility that will treat the incoming sewage to stringent discharge standards specified in this IEE and included in the bid documents. SBR is a cyclic activated sludge treatment process and provides highest treatment efficiency possible in a single step biological process. One treatment plants of capacity 7.70 MLD.
17. **Reuse of treated effluent.** The Rajasthan State Sewerage and Wastewater Policy, 2016, promotes the reuse of treated sewage for non-potable applications, and to make sewerage projects environmentally sustainable. This policy:
- (i) aims to ensure improved health status of urban population, specially the poor and under privileged, through the provision of sustainable sanitation services and protection of environment.
 - (ii) promotes the reuse and provides guidance on the same
 - (iii) prioritizes reuse in irrigation (agriculture, forestry, and landscaping), followed by fish farming, industry and non-potable domestic reuse.
 - (iv) requires monitoring of treated wastewater quality, soil quality etc.,
 - (v) prohibits artificial recharge of aquifers using treated wastewater, and promotes construction of storage tanks to store treated wastewater to facilitate reuse
 - (vi) prescribes that the detailed project report (DPR) of a sewerage project should clearly define the best reuse option specific to the town and prepare a Reuse Action Plan part of the DPR duly following the water quality norms and legal implications
 - (vii) suggests use of sludge produced from the treatment as fertilizer and soil conditioner after processing.
18. Excerpts on reuse from Rajasthan state Sewerage and Wastewater Policy is provided in Appendix 12.
19. To further the implementation of the Policy, to promote the reuse and provide guidance to the stakeholders, the Local Self Government Department (LSGD) is currently in the process of publishing "Guidelines for Reuse of Treated Wastewater in Rajasthan 2019. These guidelines:
- (i) promote the use the treated wastewater and envisages to maximize the collection and treatment of sewage generated and reuse of treated wastewater on a sustainable basis, thereby reducing dependency on freshwater resources.
 - (ii) promotes the use of treated wastewater as an economic resource.
20. Under the subproject, following the State Policy, treated effluent will be reused in applications such as agriculture, horticulture, development of urban forestry and industry as

appropriate. In Makrana, there are a lot of marble cutting industries nearby the STP site, which are desirous to reuse this treated effluent in various activities in marble industries and MOU has been made with Marble Stone Cutter Association and Municipal Council, Makrana (refer Appendix 28). A Treated Effluent Reuse Plan will be prepared by the DBO Contractor during the detailed design phase as envisage by the State Policy, and reuse modalities will be firmed up. To facilitate reuse and supply of treated effluent, A treated effluent storage reservoir (TESR), effluent pumping station and a treated effluent elevated reservoir (TEER) are designed at the STP in the subproject. Total storage capacity of TESR and TEER at each STP is 15% of respective STP treatment capacity. Treated effluent will be chlorinated and prior to its entry into TESR/TEER. Appendix 19 provides the Guidelines for Sewerage System Operations, Reuse of Treated Effluent and Sludge from STP for Beneficial Purposes

21. Discharge of treated wastewater. The excess / surplus treated wastewater that is not reused will be discharged into nearby water pond, being used for this purposed at present and necessary facilities like pipelines and pumping requirements, will be developed.

22. Sludge treatment and disposal. A Sludge Sump shall be provided to collect thickened sludge from SBR basins. Supernatant from the sump will be returned to inlet/equalization tank for treatment. Sludge from sump will be pumped to sludge thickener, and the thickened sludge will be pumped to mechanical sludge dewatering system (such as centrifuge). Dewatered sludge cake will further air dried in a sludge storage shed for 15 days and disposed in an identified site.

23. Operation and maintenance (O&M) of Sewerage system. The DBO contractor will operate and maintain the system for a period of 10 years after completion of construction and commissioning the new system. This will include the following:

- (i) sewage pumping system to pump sewage to STP including maintenance of entire system and maintaining the infrastructure (power charges to be paid by the Employer)
- (ii) sewage treatment plant (STP) including maintenance of entire system and maintaining the infra structure (power charges to be paid by the employer)
- (iii) Managing the sewerage network for collection of sewage including maintenance of entire system from property chambers up to disposal outfall of Sewage to STP
- (iv) Sampling treated effluent to ensure that it meets the guaranteed treatment parameters;
- (v) Provide house connections for collection of sewage from house properties on approval or sanction by Employer
- (vi) Contractor will provide continuous on-the-job trainings that will start from the day the contractor gets mobilized, and other capacity building programs by the contractor as important regular activities for staff of the Employer, PHED and Municipal Council / Corporation.
- (vii) Maintaining environmental norms at entire system components.

24. Fecal Sludge and Septage Management (FSSM). It has been proposed to implement non-sewer solution to some selected pockets of the towns through Fecal Sludge and Septage Management. These pockets/areas are having the population density less than the density required to generate the sewage in sufficient quantity for piped sewer network. However, sewer network has been designed including these areas so that in future whenever required sewer network can be laid. The Objective of Fecal Sludge Management (FSM) is to provide low costs sanitation where sewer network is not an immediate requirement and make its collection,

treatment and effluent management environment friendly. Town is having 47 municipal wards. There are total 12 wards namely 2, 3, 4, 5, 7, 11, 34, 41, 42, 43, 44 & 47 which are having the low density, unfavorable topography and safe disposal of waste water generation from these wards is also a major problem. Therefore town is partially covered under FSM. Areas covered under FSSM in Makrana town are shown in Figure 12. The following Table 2 shows coverage proposed with FSM area.

Table 2: Wards covered under FSSM in Makrana

Ward No.	Area		Projected Population	Density per hectare		Population proposed under FSM	% Coverage
	Total	Habitated		Total	Habitated		
	Ha.		2021	2021	2021	2021	2021
2	58.00	20.42	1980	34	97	198	10%
3	47.66	20.51	1616	34	79	242	15%
4	63.34	25.53	2882	45	113	432	15%
5	47.98	4.83	1836	38	380	367	20%
7	81.17	40.90	2418	30	59	484	20%
11	69.89	69.89	3403	49	49	170	5%
34	32.41	32.41	3864	119	119	77	2%
41	90.65	74.26	2625	29	35	105	4%
42	213.44	142.81	4927	23	35	2956	60%
43	43.29	25.11	2235	52	89	2235	100%
44	123.02	70.35	2813	23	40	1688	60%
47	153.41	74.86	2811	18	38	1405	50%
Total	1024.26	601.88	33410			10359	31%

25. Scope of works under FSSM in Makrana town is- Desludging of septage from household pits/ septic tank, transportation to STP, Disposal to designated unit in STP including operate and maintenance of the equipment with all accessories complete in all respect over the entire O&M period. Generally the following activities shall be carried out by the Contractor. The scope of work is broadly listed below and shall include, but not limited to the followings.

- (i) Supply, Trial run and commissioning of Truck mounted Desludging Equipment with all accessories, as per technical specification.
- (ii) Maintenance of equipments- Routine, Preventive and Break down maintenance
- (iii) Desludging from household pits/septic tanks at any location domestic/institutional/public within respective premises, transportation to STP and disposal to stipulated unit of STP.
- (iv) The equipment shall be a Truck Mounted Mobile Unit suitable for desludging, dislodging and removing obstructions and blockages from containments (pits/septic tanks/etc.) by a High Vacuum suctioning the Sludge/ slurry by Vacuum Suction System and discharging the collected sludge by Hydraulic Tipping of the Tank, alternatively through Blow-back Arrangement.

26. **Operation and maintenance (O&M) of FSSM.** Under the operation activity, the contractor shall attend to the household on instruction of ULB/client, access the accessibility of septic tank or pit, give prior notice to the household on date and time of desludging, mount the desludging machine at a suitable place which would not hamper or impact normal activity of other people or pedestrians, Use of required safety gears, desludging the containment with high power suction machine to the tank, complete desludging activity with safety and care,

transportation of the vehicle to STP, dispose off septage to Inlet chamber/screen chamber of STP, cleaning of the tank, and proper garaging of the vehicle at designated place.

D. Subproject Components

27. Table 3 shows the nature and size of the various civil works components of sewerage subproject in Makrana. Conceptual layout plans and alignments are shown in Figures 1 to Figure 12.

28. Subproject is designed for implementation under (Design-Build-Operate) modality, wherein which the successful bidder will design the water supply and sewerage systems and components (based on the feasibility / preliminary design / standards / guidelines provided in the bid document), construct, commission, and operate for 10 years, after which it will be transferred to Makrana Municipality. Therefore, at this stage, subproject is designed only in outline, and the details of components of the subproject provided in the table below are as finalized at this stage based on the preliminary designs and as included in the bid documents. This IEE is based on the subprojects and components detailed in the below table, and the IEE will be further updated during the detailed design phase. Geographical position coordinates of all project sites are given in Appendix 10.

Table 3: Proposed Subproject Components in Makrana

Infrastructure	Function	Description	Location
Sewerage			
Construction of one STP with treated effluent storage in Treated Effluent Elevated Reservoir (TEER), Treated Effluent Storage Reservoir (TESR).	Treatment of collected wastewater to meet stipulated discharge standards	Construction of a New STP of capacity of 7.7 MLD based on SBR (sequential batch reactor) technology with primary, secondary, tertiary treatment, Disinfection of treated wastewater for reuse – chlorination tank, sludge management (sludge collection, thickening, dewatering and disposal), Laboratory, and online testing facilities for BOD, COD, TSS etc.) Construction of Effluent Pumping Station (EPS) for reuse of treated effluent, Treated Effluent Elevated Reservoir (TEER) of 400 KL capacity and Treated Effluent Storage Reservoir (TESR) of 800 KL capacity	Within Existing STP campus Borawar Road near Railway line Latitude- 27° 2'21.80"N Longitude- 74°42'9.88"E
Construction of 2 Nos. Sewage Pumping Stations (SPS)	Sewer pumping stations (SPS) are used to move wastewater to higher elevations in order to allow transport by gravity flow until the sewage reaches treatment plant.	Construction of two SPSs- SPS-01. (2.30 MLD) SPS-02 (2.10 MLD)	SPS 01. at Jhalra Pond in Khasra No.-743, out of which 30x 30m land will be required for designed SPS. Latitude- 27° 1'48.63"N Longitude- 74°43'24.47"E

Infrastructure	Function	Description	Location
			SPS 02. at Sheetla Mata Seva Samiti in Khasra No.- 684/146/161, out of which 30x30m land will be required for designed SPS. Latitude- 27°3'21.73"N Longitude- 74°43'23.65"E
Rising Mains	For pumping of raw sewage from SPS to manholes, to lift the raw sewage from low areas, from where it reaches to STP	Laying of 1600 m. Rising Main for Pumping the Sewage. From SPS-1 at near Jhalra Pond (Node-6120 of Zone-3) to Node-75 of Zone-1 Approx. L = 800 m, D=250 mm DI K9 pipes. Rising Main for Pumping the Sewage. From SPS-2 at near Sheetla Mata Seva Samiti (Node-2230 of Zone-8) to Node-3230 of Zone-8 Approx. L = 800 m, D=200 mm DI K9 pipes	Existing ROW of roads under Municipal Council
Sewer network	Collect wastewater from houses and convey by a combination of gravity and pressure pumping to pumping station and ultimately to the STPs	Laying of 96.5 km sewer lines in Makrana town including 12 km of sewer network designed to be laid using trenchless technology, having depth more than 3.5 m	With available ROW of roads
House Sewer Connections	House connection for collection of sewage from house properties	New house sewer connections- 8000 Nos. during Design Build and 900 Nos. during O&M period	For entire town where sewerage work designed
Consumer relation Management Centre (CRMC)	Consumer relation Management Centre and SCADA system control for entire sewerage system	New CRMC -1 Nos.	1 nos. At the SPS site near Jhalra Pond
Fecal Sludge and Septage Management (FSSM)	Purpose of FSSM is to provide low costs sanitation where sewer network is not an immediate requirement which are having the low density, unfavorable topography and safe disposal of waste water generation from these wards is also a	Truck mounted tanker of 3500 liter capacity with Desludging Equipment. Total Population proposed to be covered under FSSM is 10359	In 12 wards as below- Ward nos. 2, 3, 4, 5, 7, 11, 34, 41, 42, 43, 44, 47

Infrastructure	Function	Description	Location
	major problem to make its collection, treatment and effluent management environment friendly		

E. Subproject Benefits

29. The subproject is primarily designed to improve environmental quality and living conditions of Makrana town through provision of improved sewerage. The benefits arising from this subproject include: (i) better public health particularly reduction in waterborne and infectious diseases; (ii) reduced risk of groundwater contamination; (iii) reduced risk of contamination of treated water supplies; and, (iv) improvement in quality of water bodies due to disposal of treated effluent meeting disposal standards.

F. Investment Program Implementation Schedule

30. The detailed design of this subproject has been completed. After the approval of detail design, bid will be prepared and tenders will be invited by RUIDP and the contract will be awarded after technical and financial evaluations of bids. Construction will take about 36 months for construction after the award of works. Dates for bids and works awards will be finalized by RUIDP in due course of time.

Figure 1: Designed Sewer Network Coverage – Makrana town

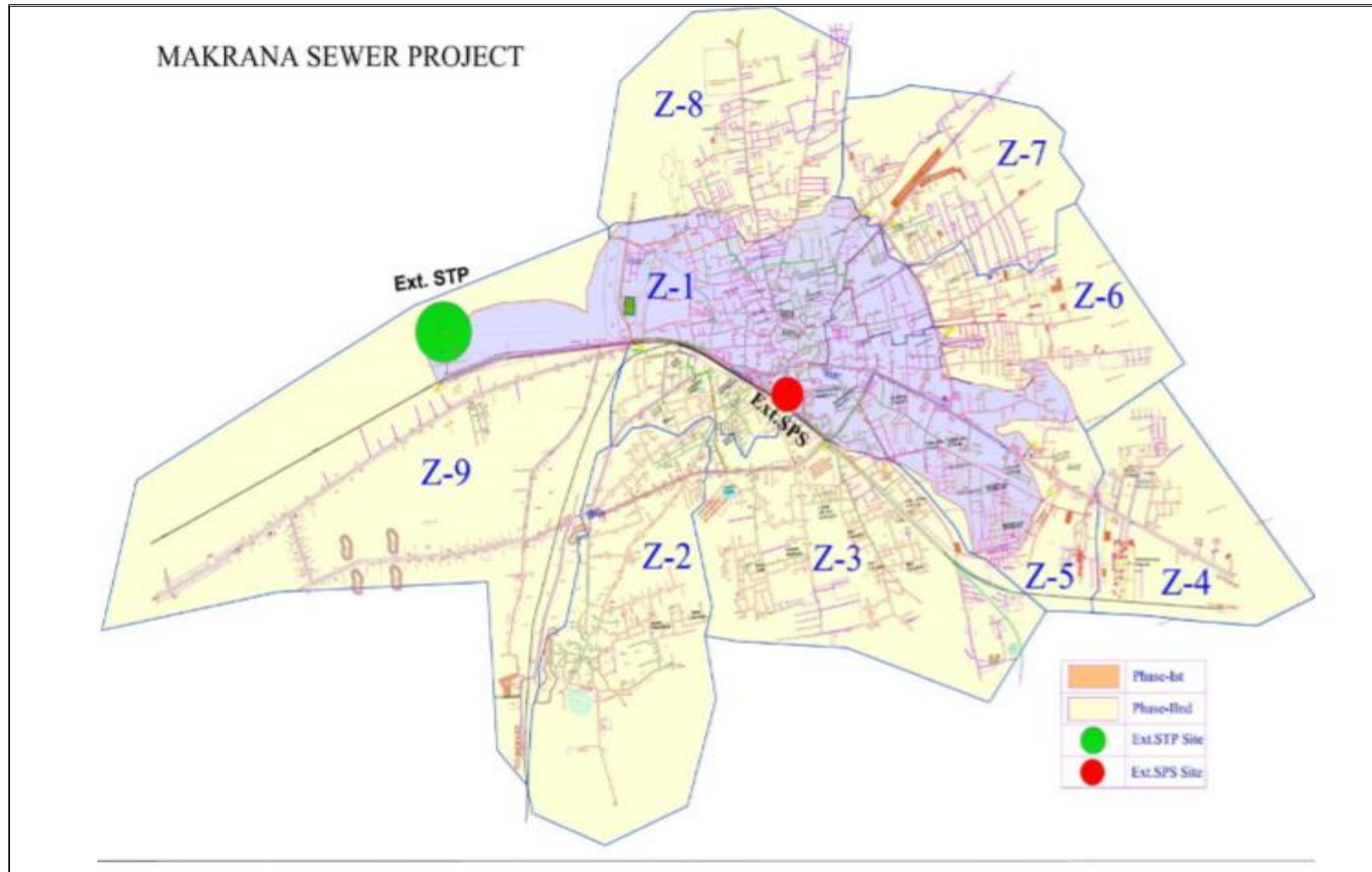


Figure 2: Layout Map showing Makrana Sewer Network Plan

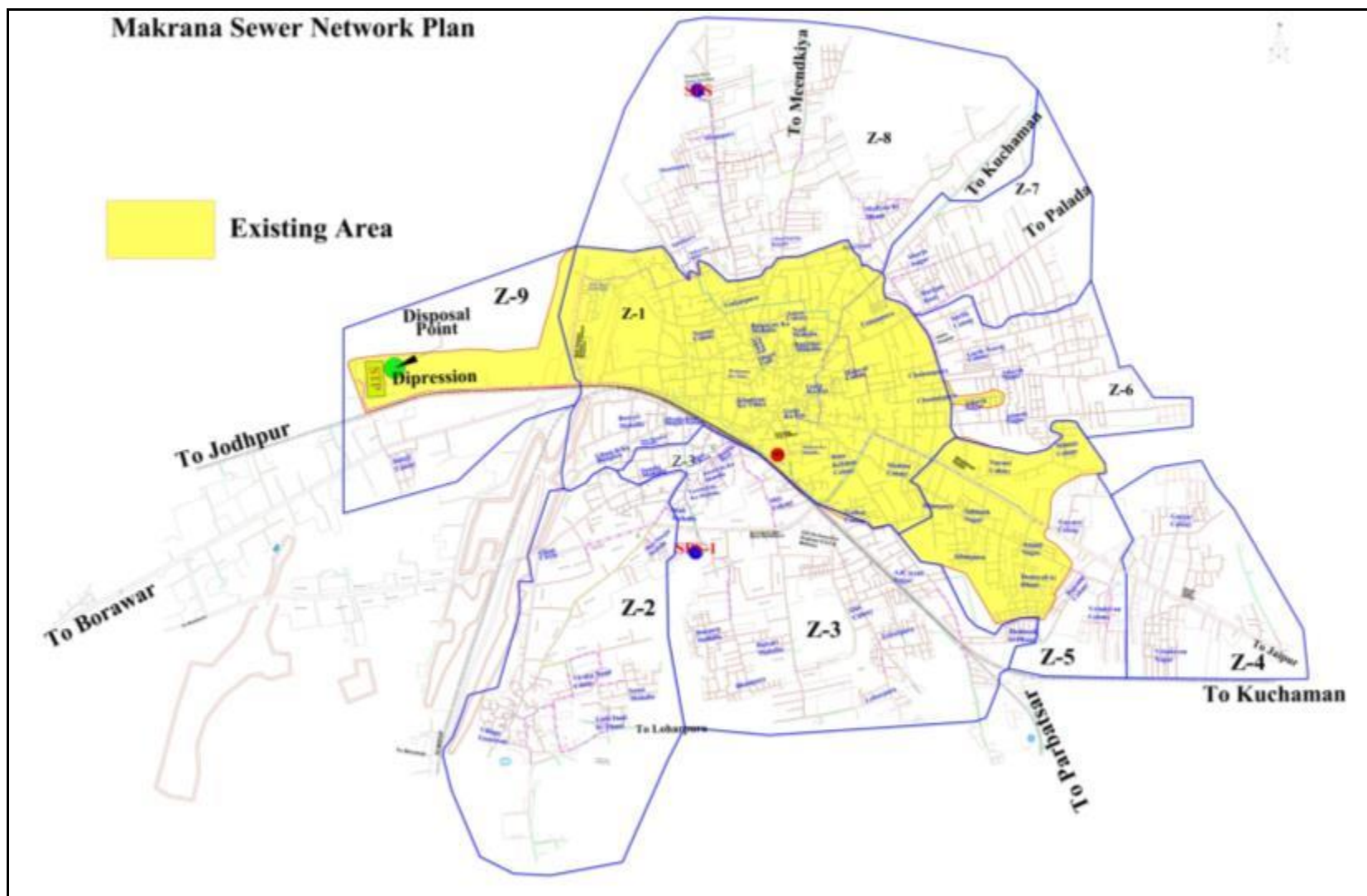


Figure 4: Schematic flow diagram for the designed SBR technology STP

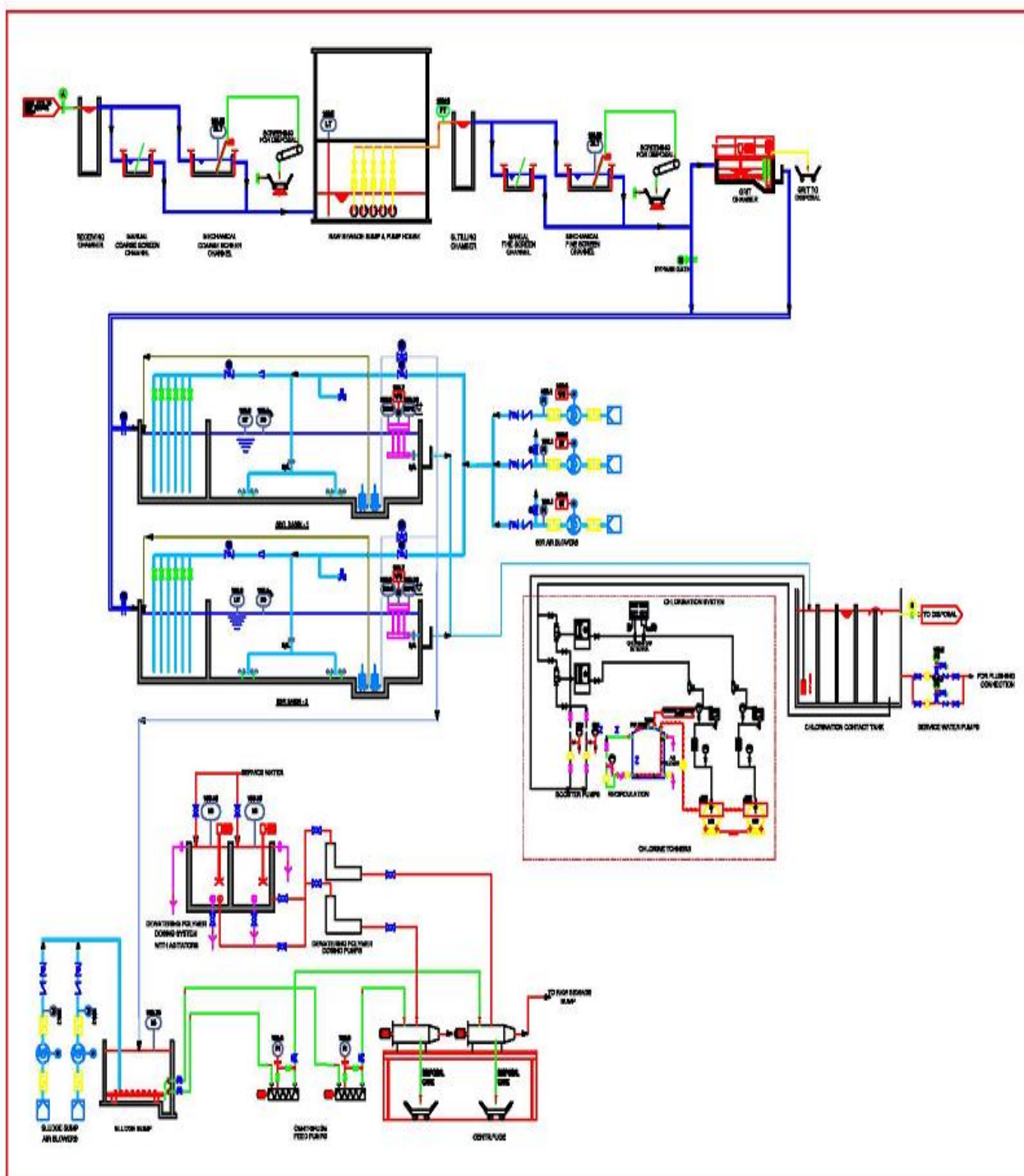


Figure 5: Layout Drawing of SPS-1

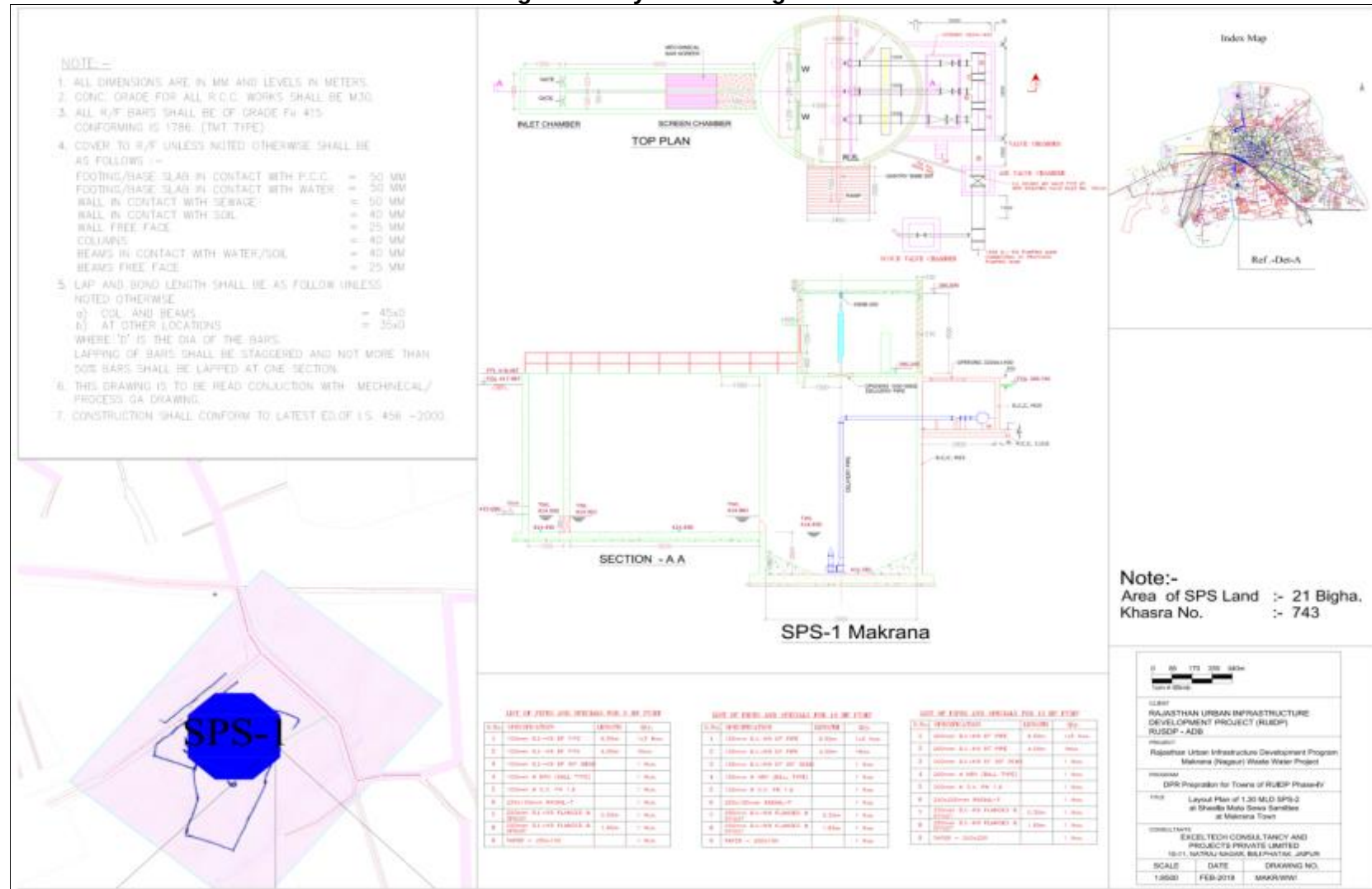


Figure 6: Layout Drawing of SPS-2

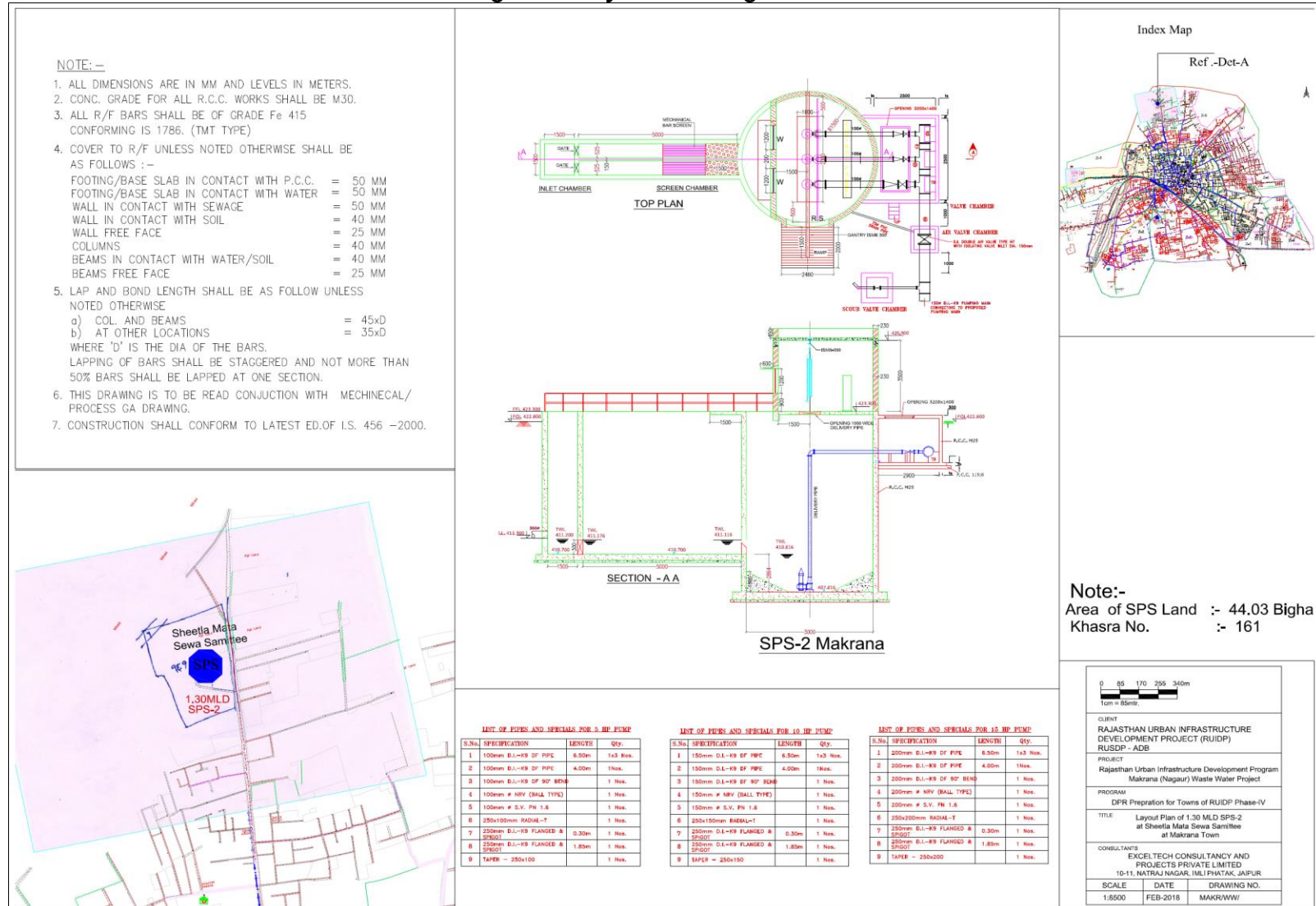


Figure 7: Google Earth Map Showing Subproject Locations

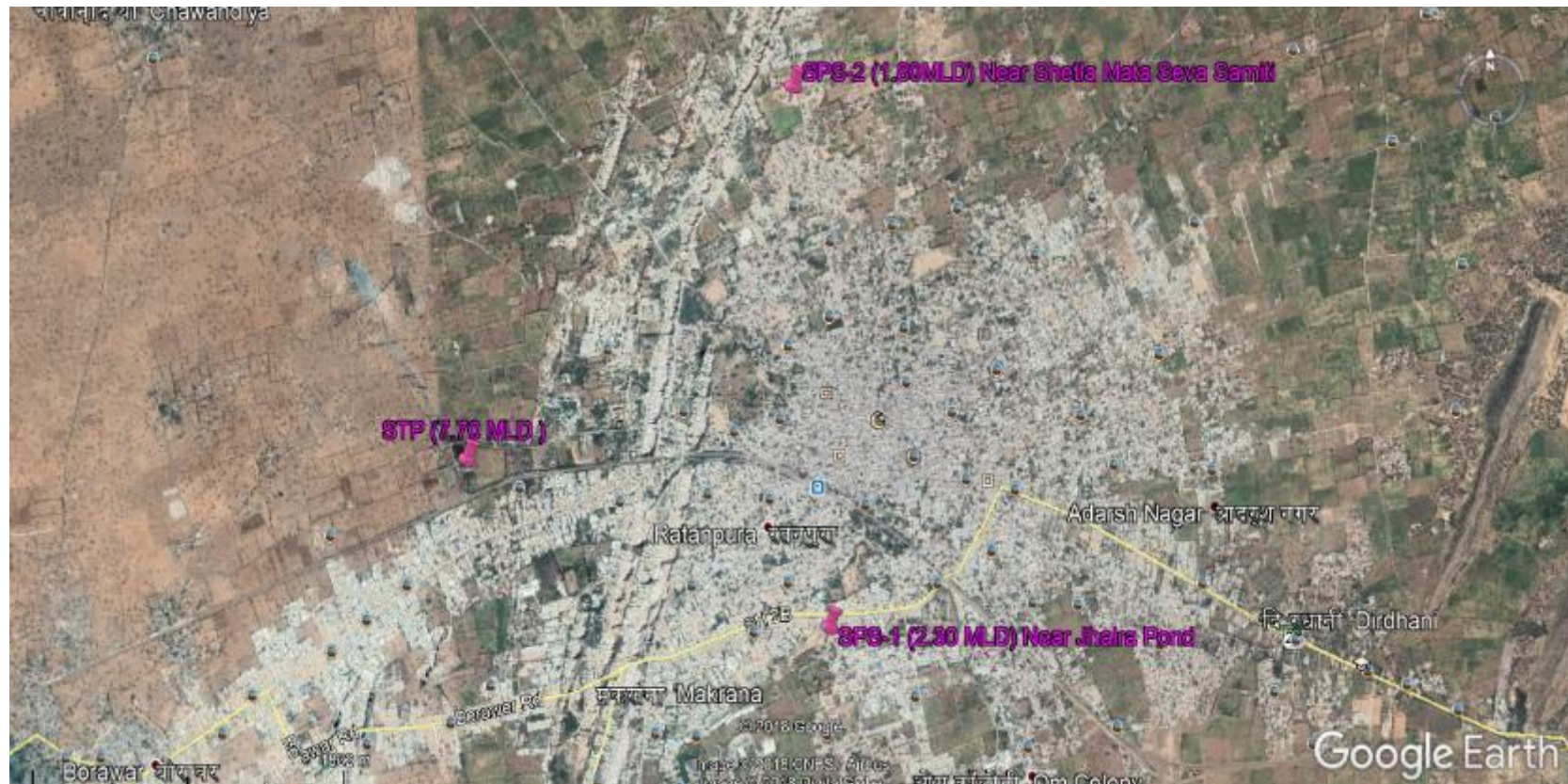


Figure 8: SPS-1 (2.30 MLD) near Jhalra Pond

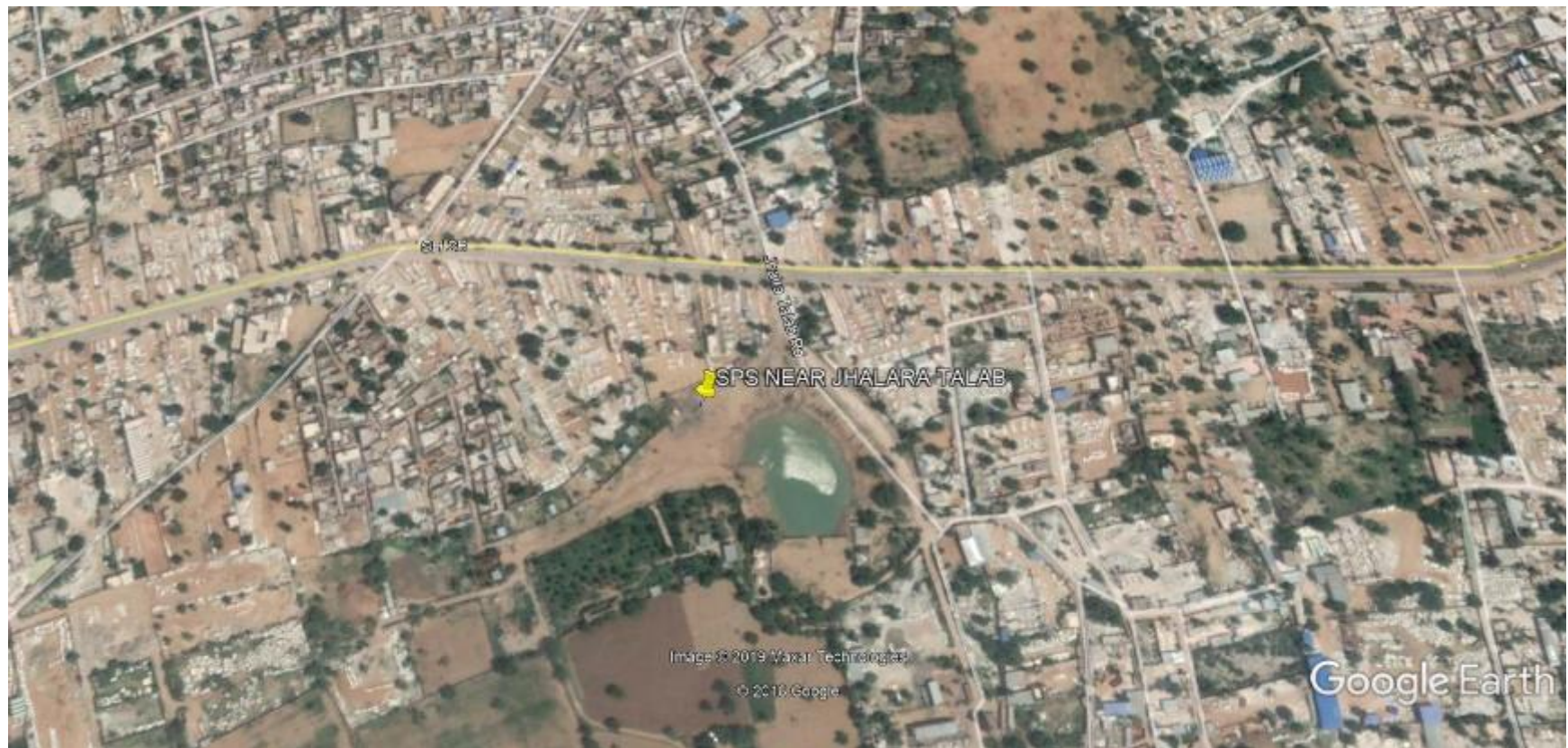


Figure 9: SPS-2 (2.1 MLD) Near Shetla Mata Seva Samiti

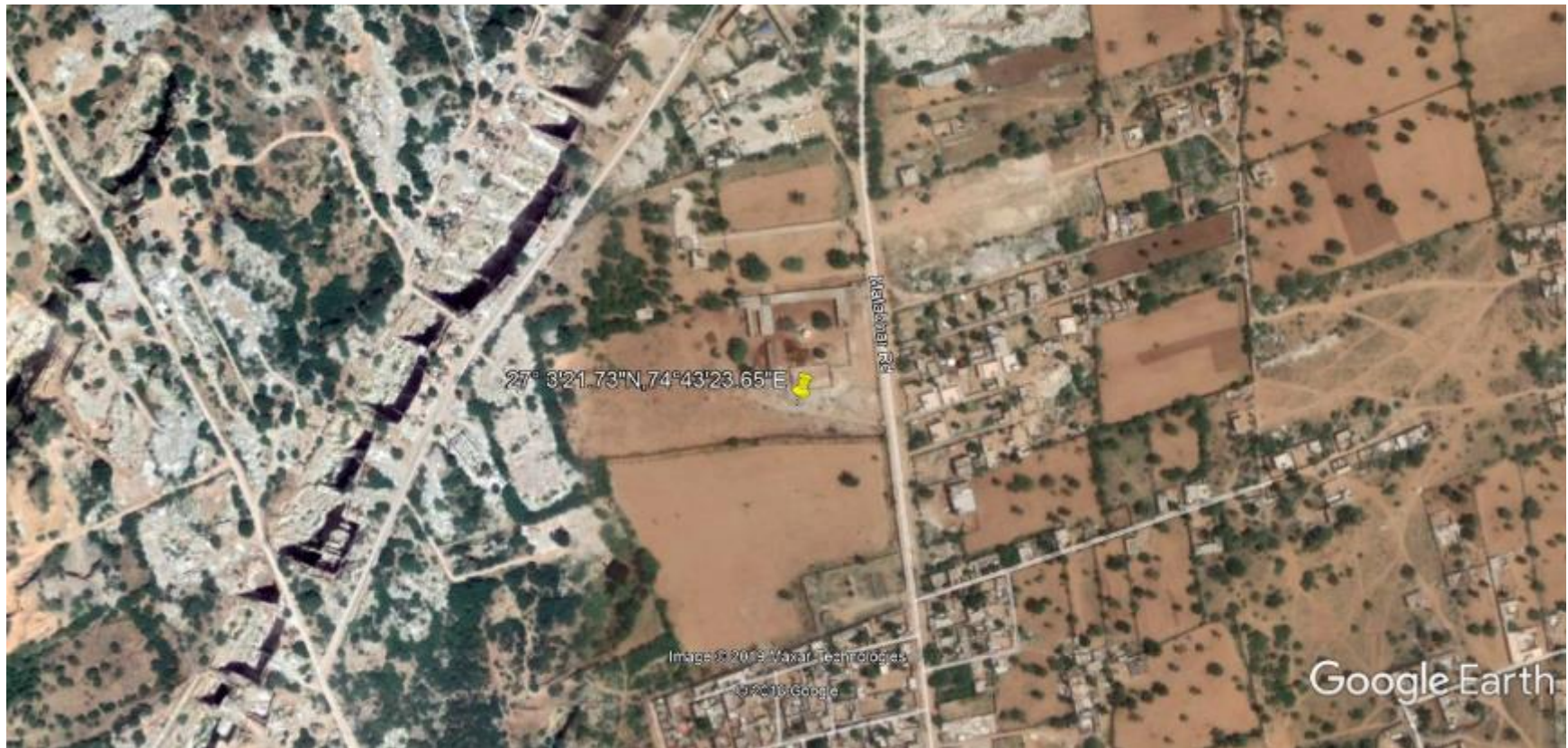


Figure 10: Survey of India Toposheet showing Subproject Locations in Makrana



Figure 11: STP Disposal location and distances of Sensitive receptors on Google Earth

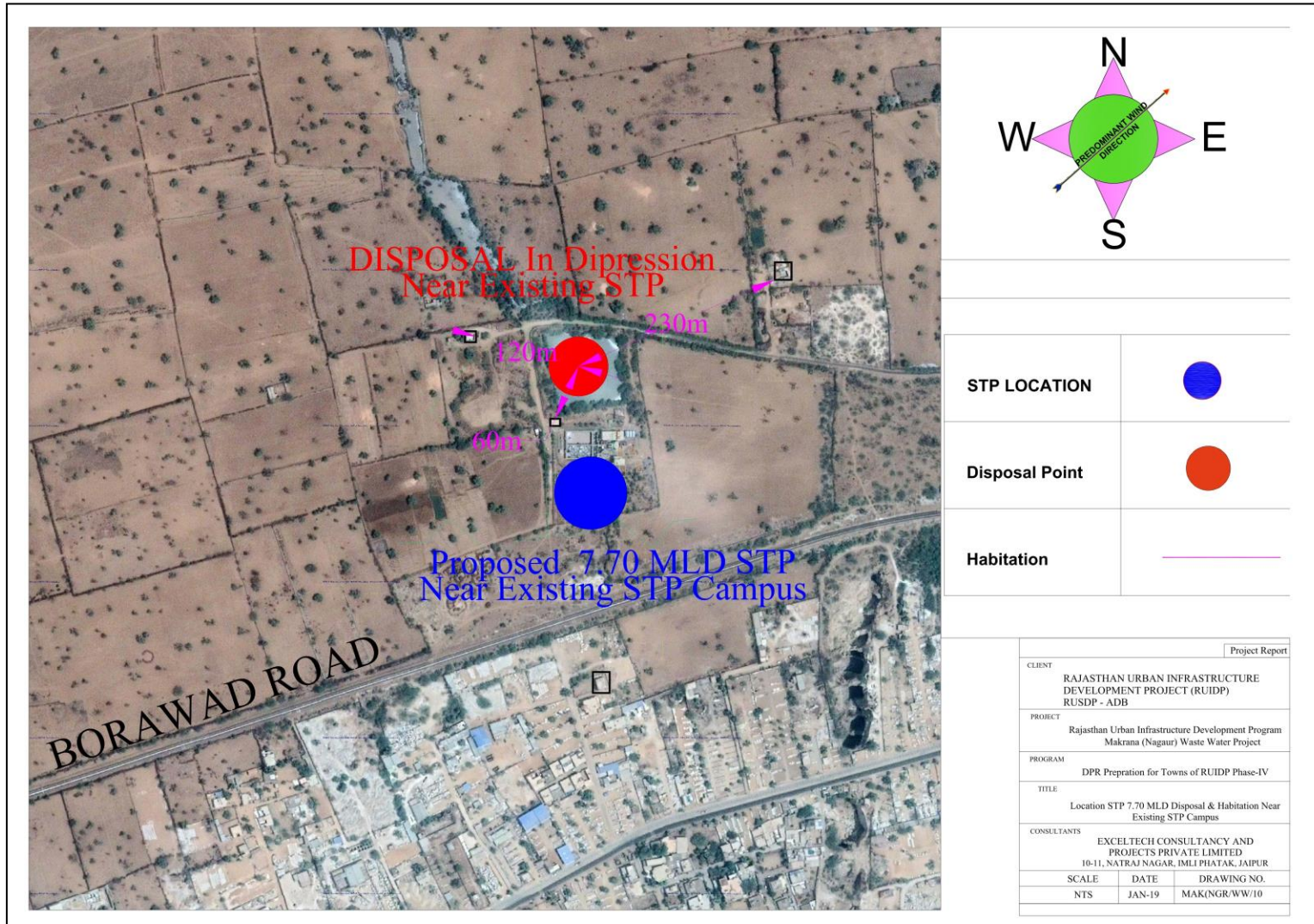
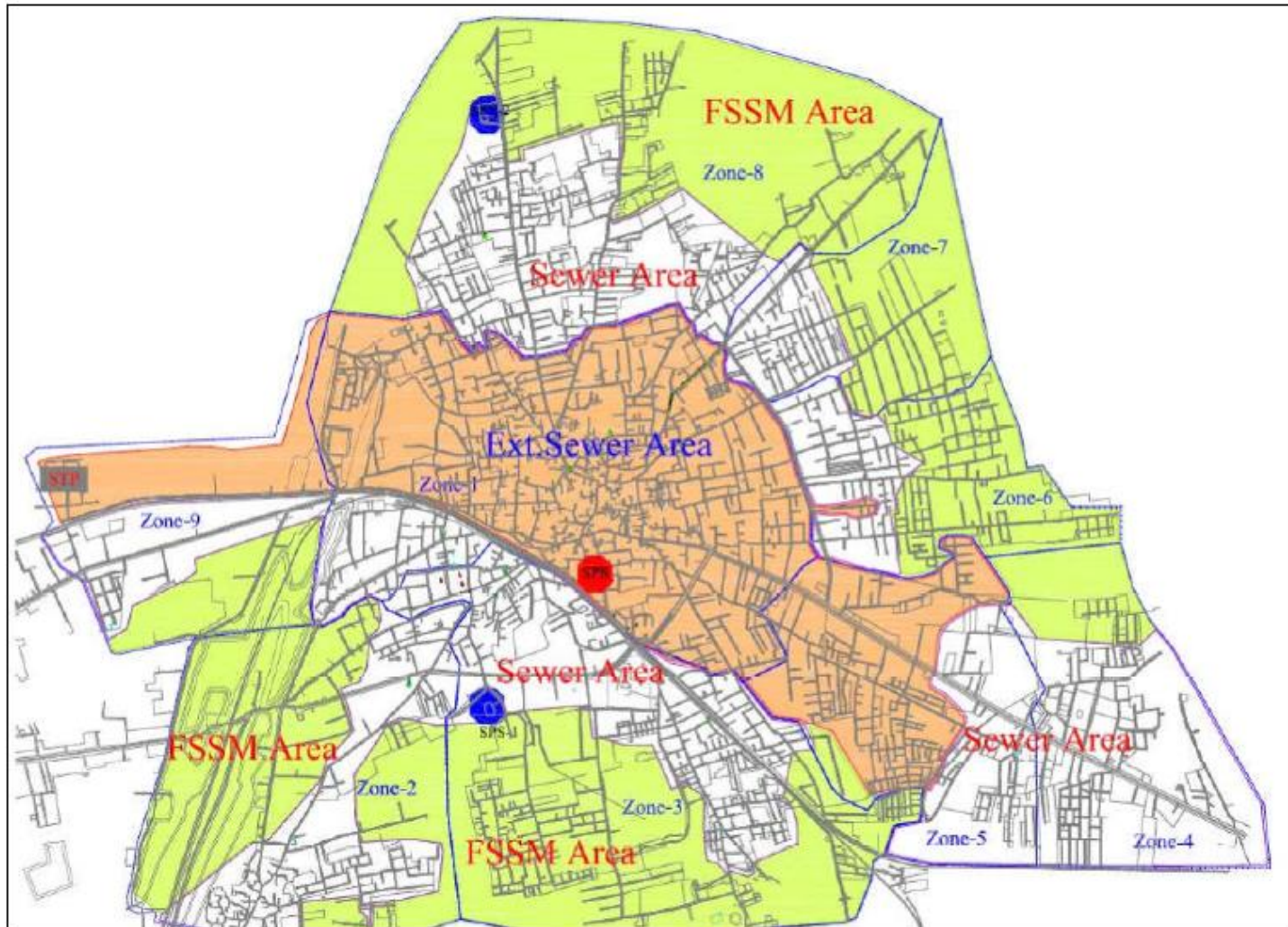


Figure 12: Layout Plan showing Sewer Network and FSSM areas proposed in Makrana



III. ANALYSIS OF ALTERNATIVES

31. The SPS requires an analysis of project alternatives to determine the best method of achieving project objectives (which is providing potable water to people, and safely collecting and disposing the human waste generated, in Makrana town, in this case) while minimizing environmental impacts. Alternative analysis provides opportunity to integrate environmental considerations into early stages of project (i.e. pre-feasibility or feasibility study), so that adverse environmental impacts can be avoided or minimized by various alternatives. It also provides opportunity to study various options vis a vis costs, provides a logical base, via transparent process, assist in decision making, gaining public support and ultimately in project approvals and timely implementation.

32. The designed sewerage subproject component in Makrana town include sewage collection network, transmission, treatment and treated wastewater reuse and disposal. Descriptions of various alternatives considered for critical components such as sewage treatment, treated wastewater disposal etc., are presented in the following Table 4:

Table 4: Analysis of Alternatives

1	Project Need- No Project Alternative																		
Type of Alternative	Sewage treatment technology																		
	At present 6.0 MLD STP and 69.86 km sewer line are operative in part of the town. Presently in the balance area, wastewater from kitchens & bathrooms is discharged into storm water drains culminating finally to the Nallah or on ground, which pollutes the environment and contaminates the ground water. Open defecation is not uncommon. As the balance area of town does not have any sewerage system and effluent finds its way into the open drains. In the absence of safe disposal and treatment system of sewage, the people of uncovered area are facing unhealthy and unhygienic environment. Therefore, public representatives are also demanding facilities of sewerage system in uncovered area on priority basis. After execution of sewerage system in the uncovered area by providing underground sewer pipe line network followed by sewerage treatment plant, the public of uncovered area will get relief from unhealthy and unhygienic environment.																		
Description of alternatives	Various secondary treatment technologies have been considered in the sewage treatment process after the primary treatment consisting of screening and grit removal. Secondary treatment is the critical process that removes the organic putrescible organic matters and brings down the BOD of the effluent to meet the discharge standards. Following process technologies considered: Waste Stabilization Ponds; Aerated Lagoons; Up Flow Anaerobic Sludge Blanket (UASBR) + FAL; Conventional Activated Sludge Process; and Cyclic Activated Sludge Process/Sequential Batch Reactor (SBR) A comparison of various treatment technologies is presented below in terms of merits of the process over key parameters like quality characteristics and land requirement: <table border="1"> <thead> <tr> <th>Item</th><th>Conventional Activated Sludge</th><th>Extended Aeration</th><th>UASB followed by Facultative Aerobic Lagoon</th><th>Cyclic Activated Sludge Process / SBR</th></tr> </thead> <tbody> <tr> <td>Performance (Typical)</td><td>Mostly stable</td><td>Mostly stable</td><td>Varying with temperature variations</td><td>Complete Stable</td></tr> <tr> <td>BOD</td><td><30 ppm</td><td><30 ppm</td><td><30 ppm</td><td><10 ppm</td></tr> </tbody> </table>				Item	Conventional Activated Sludge	Extended Aeration	UASB followed by Facultative Aerobic Lagoon	Cyclic Activated Sludge Process / SBR	Performance (Typical)	Mostly stable	Mostly stable	Varying with temperature variations	Complete Stable	BOD	<30 ppm	<30 ppm	<30 ppm	<10 ppm
Item	Conventional Activated Sludge	Extended Aeration	UASB followed by Facultative Aerobic Lagoon	Cyclic Activated Sludge Process / SBR															
Performance (Typical)	Mostly stable	Mostly stable	Varying with temperature variations	Complete Stable															
BOD	<30 ppm	<30 ppm	<30 ppm	<10 ppm															

	COD	<250 ppm	<250 ppm	<250 ppm	<100 ppm
	Suspended solids	<50 ppm	<50 ppm	<100 ppm	<10 ppm
	Total Nitrogen	No Treatment	No Treatment	No Treatment	<10 ppm
	Total Phosphorous	No Treatment	No Treatment	No Treatment	<2 ppm
	Coliform removal, %	60-90	60-90	-	99.99%
	Re-use Options	can only be used for low end usages like flushing and gardening tertiary treatment required for high and usages like construction water, industrial usages, cooling water etc.	can only be used for low end usages like flushing and gardening tertiary treatment required for high and usages like construction water, industrial usages, cooling water etc.	can only be used for low end usages like flushing and gardening tertiary treatment required for high and usages like construction water, industrial usages, cooling water etc.	Can be used for low end usages as well as for high end usages without any tertiary treatment.
	Land requirement (m ² /person)	0.1-0.18	0.08-0.15	0.2-0.25	0.035-0.07
	Process Power requirement (kWh/person/year)	12-15	16-19	4-5	6-8
	Sludge handling	Sludge needs digestion prior to drying on beds or use mech. devices	Digested sludge, dry on beds or use mech. devices	Digested sludge, dry on beds or use mech. Devices	Digested sludge, dry on beds or use mech. devices
	Equipment requirement (excluding screening and grit removal)	Aerators, recycle pumps, scrapers, thickeners, digester, dryers, gas equipment	Aerators, recycle pumps, sludge scrapers, (for large settlers)	Nil (gas collection optional)	Diffuse aeration system, recycle sludge and waste sludge pumps, decanters
	Operational characteristics	Skilled Operation required	Simpler than activated sludge	Simpler than activated sludge	Complete automatic operation by computer and PLC. Negligible manpower Intervention required
	Special features	Considerable equipment	BOD removal high, effluent	Minimal to negligible	Highest treatment

		and skilled operation required especially if gas collection and usage involved. Method considered mainly for large sized plants	nitrified relatively high-power requirement, favored for small and medium sized plants	power requirement of the system makes it an economical alternative if gas revenue is neglected land requirement is also relatively small but depends on type of past treatment adopted	efficiency with crystal quality power requirement is 50% of conventional technologies land requirement is less than 50% of conventional technologies														
Selected Alternatives	Selected processes: Sequential batch reactor (SBR) The genesis of selecting a suitable treatment process is primarily correlated with degree of treatment aimed to be achieved. In India, the latest court Order of April 2019 (NGT Order dated 30-04-2019) mandates all the civic authorities to adopt the treated sewage characteristics applicable are as shown in table below: <table><tr><th>Parameter</th><th>Standards</th></tr><tr><td>BOD, mg/l</td><td>10</td></tr><tr><td>TSS, mg/l</td><td>20</td></tr><tr><td>COD, mg/l</td><td>50</td></tr><tr><td>Nitrogen-Total, mg/l</td><td>10</td></tr><tr><td>Phosphorus- Total, , mg/l</td><td>1</td></tr><tr><td>Faecal Coliform (MPN/ 100 ml)</td><td>100 Desirable 230 (Permissible)</td></tr></table> SBR provides highest treatment efficiency possible in a single step biological process. The system is operated in a batch reactor mode this eliminates all the inefficiencies of the continuous processes. A batch reactor is a perfect reactor, which ensures 100% treatment. Separate modules are provided to ensure continuous treatment. The complete process takes place in a single reactor, within which all biological treatment steps take place sequence. The complete biological operation is divided into cycles. Each cycle is of 3 – 5-hour duration, during which all treatment steps take place.					Parameter	Standards	BOD, mg/l	10	TSS, mg/l	20	COD, mg/l	50	Nitrogen-Total, mg/l	10	Phosphorus- Total, , mg/l	1	Faecal Coliform (MPN/ 100 ml)	100 Desirable 230 (Permissible)
Parameter	Standards																		
BOD, mg/l	10																		
TSS, mg/l	20																		
COD, mg/l	50																		
Nitrogen-Total, mg/l	10																		
Phosphorus- Total, , mg/l	1																		
Faecal Coliform (MPN/ 100 ml)	100 Desirable 230 (Permissible)																		
2	Treated wastewater disposal																		
Type of Alternatives	Treated wastewater disposal – reuse applications																		
Description of alternatives	(i) Discharge of treated wastewater into ponds / on land (ii) Reuse the treated wastewater in non-potable uses Rajasthan is a water scarce region and receives low rainfall. Recognizing the importance of treated wastewater in reducing the demand on water, Sewerage and Wastewater Policy, 2016, of Rajasthan promotes the reuse of treated sewage for non-potable applications, and to make sewerage projects environmentally sustainable. This policy prioritizes reuse in irrigation (agriculture, forestry, and landscaping), followed by fish farming, industry and non-potable domestic reuse. Policy suggests construction of storage tanks to store treated wastewater to facilitate reuse. Policy prescribes that the detailed project report (DPR) should clearly define the best reuse option specific to the town and prepare a Reuse Action Plan part of the DPR following water quality norms and legal implications. Accordingly, it is designed to utilize the treated wastewater for non-potable uses. A																		

	detailed Reuse Action Plan will be prepared during the detailed design phase, and, implemented. It is also designed that the excess / surplus treated wastewater which is not being utilized in reuse will be discharge into local drains/streams and necessary facilities – pipelines and pumping facilities, will be developed. In Makrana, there are a lot of marble cutting industries nearby the STP site, which are desirous to reuse this treated effluent in various activities in marble industries and MOU has been made with Marble Stone Cutter Association and Municipal Council, Makrana (refer Appendix 28).
Selected Alternative	Reuse in non-potable applications and discharge excess/surplus into local pond/ drain
3	Project Locations
Description of alternatives	Location of two SPS (Near Jhalra Pond and near Sheetla Temple) are selected to utmost consideration to energy efficiency. Gravity flow systems have been adopted. The sites are selected considering no involuntary resettlement. STP location. Based on the technical feasibility of gravity flow system, sewerage system in Makrana is designed and optimized with one sewage treatment plant (STP). Site selection is guided by technical suitability, availability of government owned one existing STP and adequate vacant land is available within existing STP campus at Borawar road near railway line in Makrana Town and site is away from habitation. Disposal point is quite located about 0.6km north direction. Site selected for STP is away from habitation and surround by agricultural lands (nearest house is approx. 120m from designed STP site. Although a 100m distance away from habitation is desirable as far as possible, due to lack of suitable lands and also considering the selected superior and compact sewage treatment technology (SBR), the designed STP site are selected. Sewer lines. Sewer and water supply pipes are designed along the roads/streets in the town within the road right of way (ROW). In wider roads water pipes will be laid in the road shoulder beside the tarmac, and in narrow roads, where there is no space, pipes will be laid in the road carriage way by break opening the tarmac. Sewers will be mostly laid in the centre of the road, away from water pipes. There are existing asbestos cement pipes underground, the alignment will be fine tuned during the detailed design, to avoid existing AC pipe alignments as far as possible
4	Selection of Pipe Materials for Sewerage
Description of alternatives	Selection of pipe materials for Sewerage system: The appropriate choice of pipe material would undoubtedly make a remarkable contribution to the conventional centralized sewerage system. A sewerage system involves a series of conduits to be linked up for the conveyance of sewage from residential, commercial, and industrial areas, as well as rainfall or surface water. The sewage is transported under gravity (or via pumping facilities, when necessary) to a sewage treatment plant before discharging into water bodies. Consequently, high resistance to internal pressure is seldom required, and thus less expensive piping materials are used. The following pipe materials have been considered: a) Double Walled Corrugated (DWC) HDPE Pipe - DWC-HDPE pipes shall conform to IS 16098 part-2. Specifically, the double wall corrugated (DWC) High Density Polyethylene (HDPE) pipe is a new product designed to accommodate all the properties required for wastewater and drainage system. The DWC HDPE is a new technology for India. As the name suggests, the pipe is double layered. The inner wall is smooth while the outer wall is corrugated. Its properties offer advantages for the transportation of waste material while offering good overload force bearing properties. This technology ensures that when the pipe is laid underneath a road, there is no damage to the pipe from the traffic on the road. This pipe is designed for only gravity flow applications like sewage and drainage but it can still withstand an internal pressure of 2.5 kg/cm² which enables periodic flushing

and maintenance as required. Advantages and disadvantages of DWC pipe were considered during pipe design and list of comparison is as below-

<u>Advantage:</u>	<u>Disadvantages:</u>
Good resistance to corrosion attack. Relatively light weight Flexible Low frictional resistance Comprehensive range of fittings available Higher flexibility and flexural strength ensures its capabilities to sustain greater overburden as well as live load impact. Low, Maintenance, because of non-adherence of sewage elements on the chemically inert pipe surfaces, no chance of corrosion and zero to low damages	Compare to cost wise, costlier than other material In case of maintenance/replacement, getting new pipe for smaller quantity is difficult

- b) **Concrete Pipes-** Concrete pipes can be manufactured to any reasonable strength required by varying the wall thickness and the percentage of reinforcement and shape of the reinforcing cage. Concrete pipes are manufactured as non-pressure pipes with classes of NP2, NP3 and NP4. They are manufactured in sizes from 200 mm to 2000 mm. However, these pipes are subjected to corrosion where acid discharges into sewer or where velocities are not sufficient to prevent septic conditions or where the soil is highly acidic or contains excessive sulphates. Protective linings or coatings should be used inside and outside where excessive corrosion is likely to occur. The pipes may be manufactured vertical casting with sulphate resistant cement. Only high alumina cement lining should be given where the pipes are exposed to corrosive sewage or industrial wastes. Advantages and disadvantages of DWC pipe were considered during pipe design and list of comparison is as below-

<u>Advantages of Concrete Pipes</u>	<u>Disadvantages of concrete pipes</u>
Providing the required strength to the pipes may be relatively easier. With Socket and spigot ends the pipes could be installed with Elastomeric rubber joints at faster rate.	The pipes are heavier and require lifting arrangements especially for large dia. pipes. ➤ NP2 pipes are not suitable for sewers since three edge bearing strength of these pipes are much lower than NP3 and NP4 pipes. ➤ Lining with high alumina cement may be required to protect the pipe from corrosion.

- c) **PVC-U pipe-** For sewer house connections, joining to house chamber and network manholes PVC-U pipe has been adopted due to easy in handling, durability, and suitability for sewerage and easy in connection, in comparison to other pipes such as HDPE, CC and ceramic pipes available in market.

III. POLICY, LEGAL AND ADMINISTRATIVE FRAMEWORK

A. ADB Safeguard Policy

33. ADB Safeguard Policy Statement (SPS) requires that during the design, construction, and operation of the project necessary compliance to all applicable laws and international conventions / treaties along with pollution prevention and control technologies and practices consistent with international good practice, are ensured.

34. **Screening and Categorization with that of ADB SPS, 2009.** ADB uses a classification system to reflect the significance of a project's potential environmental impacts. A project's category is determined by the category of its most environmentally sensitive component, including direct, indirect, cumulative, and induced impacts in the project's area of influence. Each proposed project is scrutinized as to its type, location, scale, and sensitivity and the magnitude of its potential environmental impacts. Projects are assigned to one of the following four categories:

- (i) **Category A.** A proposed project is classified as category A if it is likely to have significant adverse environmental impacts that are irreversible, diverse, or unprecedented. These impacts may affect an area larger than the sites or facilities subject to physical works. An environmental impact assessment (EIA) is required.
- (ii) **Category B.** A proposed project is classified as category B if its potential adverse environmental impacts are less adverse than those of category A projects. These impacts are site-specific, few if any of them are irreversible, and in most cases mitigation measures can be designed more readily than for category A projects. An initial environmental examination (IEE) is required.
- (iii) **Category C.** A proposed project is classified as category C if it is likely to have minimal or no adverse environmental impacts. No environmental assessment is required although environmental implications need to be reviewed.
- (iv) **Category FI.** A proposed project is classified as category FI if it involves investment of ADB funds to or through a FI.

35. The environmental impacts of Makrana town sewerage subproject have been identified and assessed as part of the planning and design process. An environmental assessment using ADB's Rapid Environmental Assessment Checklist for Sewerage treatment (Appendix 1) was conducted, and results of the assessment show that the subproject is unlikely to cause significant adverse impacts. Thus, this IEE has been prepared in accordance with ADB SPS's requirements for environment category B projects

36. **Environmental Management Plan.** An EMP which addresses the potential impacts and risks identified by the environmental assessment shall be prepared. The level of detail and complexity of the EMP and the priority of the identified measures and actions will be commensurate with the Project's impact and risks.

37. **Environmental Audit of Existing Facilities.** ADB SPS requires an environmental audit, if a subproject involves facilities and/or business activities that already exist or are under construction, including an on-site assessment to identify past or present concerns related to impacts on the environment. The objective of this compliance audit is to determine whether actions were in accordance with ADB's safeguard principles and requirements for

borrowers/clients, and to identify and plan appropriate measures to address outstanding compliance issues.

38. **Public Disclosure.** The IEE will be put in an accessible place (e.g., local government offices, libraries, community centers, etc.), and a summary translated into local language for the project affected people and other stakeholders. The following safeguard documents will be put up in ADB's website so that the affected people, other stakeholders, and the public can provide meaningful inputs into the project design and implementation:

- (i) For environmental category A projects, a draft EIA report at least 120 days before Board consideration;
- (ii) Final or updated EIA and/or IEE upon receipt; and
- (iii) Environmental monitoring reports submitted by the Project Management Unit (PMU) during project implementation upon receipt.

39. **Consultation and Participation.** ADB SPS, 2009 require borrower to conduct meaningful consultation¹¹ with affected people and other concerned stakeholders, including civil society, and facilitate their informed participation. The consultation process and its results are to be documented and reflected in the environmental assessment report.

40. **Grievance Redress Mechanism.** ADB SPS, 2009 require borrowers to establish a mechanism to receive and facilitate resolution of affected people's concerns, complaints, and grievances about the subproject's performance. The grievance mechanism shall be scaled to the risks and adverse impacts of the subproject.

41. **Monitoring and Reporting.** Borrower shall monitor, measure and document the implementation progress of the EMP. If necessary, the borrower shall identify the necessary corrective actions, and reflect them in a corrective action plan. Borrower shall prepare and submit to ADB semi-annual environmental monitoring reports that describe progress with implementation of the EMP and compliance issues and corrective actions, if any. For subprojects likely to have significant adverse environmental impacts during operation, reporting will continue at the minimum on an annual basis until ADB issues a project completion report.

42. **Unanticipated Environmental Impacts.** Where unanticipated environmental impacts become apparent during subproject implementation, ADB SPS requires the borrower to update the environmental assessment and EMP or prepare a new environmental assessment and EMP to assess the potential impacts, evaluate the alternatives, and outline mitigation measures and resources to address those impacts.

43. **Occupational Health and Safety.** ADB SPS, 2009 requires the borrower¹² to ensure that workers¹³ are provided with a safe and healthy working environment, considering risks

¹¹ Per ADB SPS, 2009, meaningful consultation means a process that (i) begins early in the project preparation stage and is carried out on an ongoing basis throughout the project cycle; (ii) provides timely disclosure of relevant and adequate information that is understandable and readily accessible to affected people; (iii) is undertaken in an atmosphere free of intimidation or coercion; (iv) is gender inclusive and responsive, and tailored to the needs of disadvantaged and vulnerable groups; and (v) enables the incorporation of all relevant views of affected people and other stakeholders into decision making, such as project design, mitigation measures, the sharing of development benefits and opportunities, and implementation issues

¹² In case where responsibility is delegated to subproject contractors during construction phase, borrower shall ensure that the responsibilities on occupational health and safety are included in the contract documents.

inherent to the sector and specific classes of hazards in the subproject work areas, including physical, chemical, biological, and radiological hazards. Borrower shall take steps to prevent accidents, injury, and disease arising from, associated with, or occurring during the course of work, including: (i) identifying and minimizing, so far as reasonably practicable, the causes of potential hazards to workers; (ii) providing preventive and protective measures, including modification, substitution, or elimination of hazardous conditions or substances; (iii) providing appropriate equipment to minimize risks and requiring and enforcing its use; (iv) training workers and providing them with appropriate incentives to use and comply with health and safety procedures and protective equipment; (v) documenting and reporting occupational accidents, diseases, and incidents; and (vi) having emergency prevention, preparedness, and response arrangements in place.

44. Community Health and Safety. ADB SPS requires the borrower to identify and assess risks to, and potential impacts on, the safety of affected communities during the design, construction, operation, and decommissioning of the subproject, and shall establish preventive measures and plans to address them in a manner commensurate with the identified risks and impacts.

45. Physical Cultural Resources. Borrower is responsible for siting and designing the subproject to avoid significant damage to physical cultural resources. ADB SPS requires that such resources likely to be affected by the subproject are identified, and qualified and experienced experts assess the subproject's potential impacts on these resources using field-based surveys as an integral part of the environmental assessment process. When the designed location of a subproject component is in areas where physical cultural resources are expected to be found as determined during the environmental assessment process, chance finds procedures shall be included in the EMP.

46. ADB SPS, 2009 International Best Practice Requirements. ADB SPS, 2009 requires that, during the design, construction, and operation of the project, the executing agency shall apply pollution prevention and control technologies and practices that are consistent with international good practice, as reflected in internationally recognized standards such as the World Bank Group's Environment, Health and Safety Guidelines. (IFC's General EHS Guidelines¹⁴ and Sector Specific (Water and Sanitation) Guidelines).¹⁵ These standards contain performance levels and measures that are normally acceptable and applicable to projects. These standards contain performance levels and measures that are normally acceptable and applicable to projects. When Government of India regulations differ from these levels and measures, the PMU and PIUs will achieve whichever is more stringent. If less stringent levels or measures are appropriate in view of specific project circumstances, the PMU and PIUs will provide full and detailed justification for any designed alternatives that are consistent with the requirements presented in ADB SPS, 2009.

B. National and State Laws

¹³Including nonemployee workers engaged by the borrower/client through contractors or other intermediaries to work on project sites or perform work directly related to the project's core functions.

¹⁴<https://www.ifc.org/wps/wcm/connect/554e8d80488658e4b76af76a6515bb18/Final%2B-%2BGeneral%2BEHS%2BGuidelines.pdf?MOD=AJPERES>

¹⁵<https://www.ifc.org/wps/wcm/connect/e22c050048855ae0875cd76a6515bb18/Final%2B-%2BWater%2Band%2BSanitation.pdf?MOD=AJPERES>

47. The implementation of the subprojects will be governed by Government of India and State of Rajasthan and other applicable environmental acts, rules, regulations, and standards. These regulations impose restrictions on the activities to minimize or mitigate likely impacts on the environment. It is the responsibility of the project executing and implementing agencies to ensure subprojects are consistent with the legal framework, whether applicable international, national, state or municipal or local. Key standards include those related to drinking water quality, air quality, effluent discharge, and protected areas. Compliance is required in all stages of the subprojects including design, construction, and operation and maintenance.

48. **Environmental assessment.** The Government of India EIA Notification of 2006 (replacing the EIA Notification of 1994), sets out the requirement for Environmental Assessment in India. This states that Environmental Clearance (EC) is required for specified 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.

49. **Category A projects** require EC from the central Ministry of Environment, Forests and Climate Change (MoEFCC). The proponent is required to provide preliminary details of the project in the prescribed manner with all requisite details, after which an Expert Appraisal Committee (EAC) of the MoEFCC prepares comprehensive terms of reference (TOR) for the EIA study. On completion of the study and review of the report by the EAC, MoEFCC considers the recommendation of the EAC and provides the EC if appropriate.

50. **Category B projects** require environmental clearance from the State Environment Impact Assessment Authority (SEIAA). The State level EAC categorizes the project as either B1 (requiring EIA study) or B2 (no EIA study) and prepares TOR for B1 projects within 60 days. On completion of the study and review of the report by the EAC, the SEIAA issues the EC based on the EAC recommendation. The Notification also provides that any project or activity classified as category B will be treated as category A if it is located in whole or in part within 10 km from the boundary of protected areas, notified areas or inter-state or international boundaries.

51. None of the components of this water supply and sewerage system subproject falls under the ambit of the EIA Notification 2006, and, therefore EIA Study or EC is not required for the subproject.

52. **Applicable environmental regulations.** Besides EIA Notification 2006, there are various other acts, rules, policies and regulations currently in force in India that deal with environmental issues that could apply to infrastructure development. The specific regulatory compliance requirements of the subproject are shown in Table 5.

Table 5: Applicable Environmental Regulations

Applicable Law	Description	Requirement	Relevance to Project Phase
National Environment Policy (NEP), 2006.	NEP is a comprehensive guiding document in India for all environmental conservation programs and legislations by Central, State and Local Government. The dominant theme of this policy is to promote betterment of livelihoods without compromising or degrading the	RSTDSP should adhere to NEP principle of “enhancing and conservation of environmental resources and abatement of pollution”.	All phases of project

Applicable Law	Description	Requirement	Relevance to Project Phase
	environmental resources. The policy also advocates collaboration method of different stakeholders to harness potential resources and strengthen environmental management.		
Rajasthan State Environment Policy, 2010 including And Rajasthan Environment Mission and Climate Change Agenda for Rajasthan (2010-14)	Follows the National Environment Policy, 2006 and core objectives and policies are: -Conserve and enhance environmental resources; assure environmental sustainability of key economic sectors; and, improve environmental governance and capacity building - it recommends specific strategies and actions to address the key environmental issues: water resources, desertification and land degradation, forest and biodiversity, air quality, climate change: adoption and mitigation, mining, industry, tourism, energy, urban development, etc. - Establishment of Environment Mission under the chairpersonship of the Chief Minister and a Steering Committee under the chairpersonship of Chief Secretary, Government of Rajasthan Tasks force set up for six key areas	Project implementation should adhere to the policy aims of: conservation and enhancement of environmental resources, integration of environmental concerns into projects/plans, and capacity building in environmental management. Under water sector, major concerns, as the policy notes, are huge water losses and wastage, declining water availability, pollution. Relevant recommendations for the project include control of losses, integrated water resources management, control of raw water pollution¹⁸, reuse and recycling. Avoid/minimize use of forest lands. With reference to climate change adoption and mitigation following should be considered in the project: (i) diminishing flows in surface water bodies, and groundwater depletion, and revival traditional water bodies as water sources (lakes/tanks); (ii) equal stress on demand side management in water; and (iii) minimize energy use - design energy	All phases of project

Applicable Law	Description	Requirement	Relevance to Project Phase
		efficiency systems.	
EIA Notification, 2006	The EIA Notification of 2006 set out the requirement for environmental assessment in India. 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 require Environmental Clearance from the Ministry of Environment, Forest & Climate Change (MoEF&CC). 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.	Not applicable
Water (Prevention and Control of Pollution) Act of 1974, Rules of 1975, and amendments (1987)	Act was enacted to provide for the prevention and control of water pollution and the maintaining or restoring of wholesomeness of water, by Central and State Pollution Control Boards and for conferring on and assigning to CPCB/SPCBs powers and functions relating to water pollution control. Control of water pollution is achieved through administering conditions imposed in consent issued under provision of the Water (Prevention and Control of Pollution) Act of 1974. These conditions regulate the quantity and quantity of effluent, the location of discharge and the frequency of monitoring of effluents. Any component of the subproject having the potential to generate sewage or trade effluent will come under its purview. Such projects have to obtain Consent to Establish (CTE) under Section 25 of the Act from Rajasthan Pollution Control Board (RPCB) before starting implementation and Consent to Operate (CTO) before commissioning.	Sewage treatment plant (STP) will be constructed in the project therefore consents (CTE and CTO) are required from Pollution Control Board for STP. Online application can be applied in the RPCB website. http://environment.rajasthan.gov.in All the precautions to be taken to prevent any water pollution during construction and operation of STP and allied works. Municipal Council, Makrana should have valid CTE and CTO for existing STP of 6.0 MLD from Rajasthan State Pollution Control Board before start of construction	Construction and Operation

Applicable Law	Description	Requirement	Relevance to Project Phase
Air (Prevention and Control of Pollution) Act of 1981, Rules of 1982 and amendments.	This Act was enacted to achieve prevention, control and abatement of air pollution activities by assigning regulatory powers to Central and State boards for all such functions. The Act also establishes ambient air quality standards The projects having potential to emit air pollutants into the atmosphere have to obtain CTE and CTO under Section 21 of the Act from RPCB. The occupier of the project/ facility has the responsibility to adopt necessary air pollution control measures for abating air pollution.	For Sewage treatment plant (STP), no consents are required from Pollution Control Board under this act. The following will require CTE and CTO from RPCB: (i) Diesel generators; (ii) Batching Plant, hot mix plants; and (iii) Stone crushers, if installed for construction. All relevant forms, prescribed fees and procedures to obtain the CTE and CTO can be found in the RPCB website (http://environment.rajasthan.gov.in)	Construction and Operation
Biodiversity Act of 2002	This Act primarily addresses access to genetic resources and associated knowledge by foreign individuals, institutions or companies, to ensure equitable sharing of benefits arising out of the use of these resources and knowledge to the country and the people.	Not Applicable	Not Applicable
Wildlife Protection Act, 1972 and amendment 1991	This overarching Act provides protection to wild animals, birds, plants and matters connected with habitat protection, processes to declare protected areas, regulation of wildlife trade, constitution of state and national board for wildlife, zoo authority, tiger conservation authority, penalty clauses and other important regulations.	Not applicable – none of the project components are located in or near protected areas.	Not Applicable
Forest (Conservation) Act, 1980	The Forest (Conservation) Act prohibits the use of forest land for non-forest purposes without the approval of Ministry of Environment Forests and Climate Change (MoEFCC), Government of India	Not applicable; none of the components of the subproject are located in forest.	Not Applicable
Environment (Protection) Act, 1986 and CPCB Environmental Standards like National Ambient Air Quality	Emissions and discharges from the facilities to be created or refurbished or augmented shall comply with the notified standards	Appendix-4 provides applicable standards for ambient air quality, Emission Limits for New DG Sets, Stake Height Requirement for DG Sets	Construction and Operation

Applicable Law	Description	Requirement	Relevance to Project Phase
Standards 2009.		Contractor is required to keep all his vehicles maintained and control all the construction activities so that ambient air quality remains within prescribed limit Appendix- 4 also provides vehicle exhaust emission norms.	
Noise Pollution (Regulation and Control) Rules, 2000 amended up to 2010	Rule-3 of the Act specifies ambient air quality standards in respect of noise for different areas/zones.	Appendix-6 provides applicable noise standards.	Construction and Operation
Environmental Standards (ambient and discharge).	Emissions and discharges from the facilities to be created or refurbished or augmented shall comply with the notified standards	Appendix – 5 provides applicable standards for ambient air quality, emission limit and emission stack height requirement for diesel generators The STP is designed to meet the proposed standards.	Construction and operation
The Building and Other Construction Workers (BOCW) Act 1996 and Rajasthan Building and Construction Workers Rules 2009	Employer shall- • Provide and maintain, at suitable point, sufficient quantity of wholesome drinking water, such point shall be at least 6 meters away from any washing areas, urinals or toilets • Provide sufficient urinals and latrines at convenient place, easily accessible by workers • Provide free of charge, temporary living accommodations near to work sites with separate cooking place, bathing and lavatory facilities and restore the site as pre-conditions after completing the construction works • Provide crèche with proper accommodation, ventilation, lighting, cleanliness and sanitation if more than fifty	Contractors are required to follow all the provisions of BOCW Act and Rajasthan BOCW Rules. Salient features of Rajasthan BOCW Rules are- Chapter-III, section 17- Registration of establishments Chapter-VIII, section 61- Hours of works, intervals or rest and spread over, overtime Section 62- weekly rest Section 63- night shift Section 67- registers of workers Section 68- Muster roll, wages register Section 70- latrine and urinal facilities Chapter XI- Safety and	Construction

Applicable Law	Description	Requirement	Relevance to Project Phase
	female workers are engaged • Provide first aid facilities in all construction sites For safety of workers employer shall provide- • Safe access to site and work place • Safety in demolition works • Safety in use of explosives • Safety in operation of transporting equipment and appoint competent person to drive or operate such vehicles and equipment • Safety in lifting appliance, hoist and lifting gears • Adequate and suitable lighting to every work place and approach • Prevention of inhalation of dust, smoke, fumes, gases during construction works and provide adequate ventilation in work place and confined space • Safety in material handling and stacking/un stacking • Safeguarding the machinery with fly-wheel of moving parts • Safe handling and use of plants operated by compressed air • Fire safety • Limit of weight to be lifted by workers individually • Safety in electric wires, apparatus, tools and equipment • Provide safety net, safety sheet, safety belts while working at height (more than 1.6 mtrs as per OSHA) • Providing scaffolding, ladders and stairs, lifting appliances, chains and accessories	Health Section 78- fire protection Section 79- emergency action plan Section 80- fencing of motors Section 81- lifting and carrying of weight Section 82- H&S policy Section 83- dangerous and harmful environment Section 84- Overhead protection Section 88- eye protection Section 89- PPEs Section 90- electrical hazards Section 97- use of safety helmets and shoes Chapter XIII- lifting appliances and gears Chapter XV- transport and earth moving equipment Chapter XVI- concrete works Chapter XVII- demolition works Chapter XVIII- Excavation and tunneling Chapter XX- ladders and step ladders Chapter XXII- structural frame and formworks Chapter XXIV- Medical facilities and first aid box	

Applicable Law	Description	Requirement	Relevance to Project Phase
	where required - Safety in pile works, concrete works, hot asphalt, tar, insulation, demolition works, excavation, underground construction and handling materials - Provide and maintain medical facilities for workers Any other matters for the safety and health of workers		
Motor Vehicles Act, 1988	No person will be allowed to drive a motor vehicle unless he holds a valid driving license issued to him authorizing him to drive the vehicle	Valid and appropriate (LMV/HMV) driving license of operators and drivers is required to operate or drive vehicle and equipment at construction site	Construction
The Petroleum Rules, 2002	All due precautions will be taken at all times to prevent escape of petroleum into any drain, sewer, river or watercourse or over any public road or railway line.	Do not allow any escape of diesel, lubricants in to drain or any nearby water course.	Construction
State Sewerage and Waste Water Policy, Department of Local Self Government, Govt. of Rajasthan	Rajasthan State Sewerage and Waste Water Policy-2016 states that- - Treated wastewater effluent is considered a water resource and is added to the water stock for reuse. - Priority shall be given to agricultural reuse of treated effluent for unrestricted irrigation. Treated effluent shall be priced and sold to end users at a price covering at least the operation and maintenance costs of delivery.	All efforts shall be taken for reuse of treated effluent, although responsibility lies on municipal body, RUIDP will provide technical assistance and guidance to municipal body for reuse of treated effluent. (Concerned pages of this policy are attached as Appendix-13).	Operation
Rajasthan Municipalities Act 2009 (as amended in 2010)	Municipal Authority has responsibility and power to provide effective sewerage system in the municipal limits	Property connection for sewer can be done by order of Municipal authorities.	Construction
Gas Cylinder Rules 2004	These rules deal with Filling, possession, import and transport of cylinders, Safety relief devices, Marking on cylinders, Markings on valve, Identification colours,	All the safety in storage, transportation, handling, usage, maintenance, repairing of gas cylinders and other precautions	Construction and Operation

Applicable Law	Description	Requirement	Relevance to Project Phase
	Labeling of cylinders, Restriction on delivery or dispatch of cylinders, repairing of cylinders, Prohibition of employment of children and intoxicated persons, Prohibition of smoking, fires, lights and dangerous substances, General precautions, Special precautions against accidents, Competent person to be in-charge of operations, Handling and use, Restrictions on filling, Loading, unloading and transport of cylinders, Storage of cylinders, ownership and record keeping etc.	should be taken and record should be kept maintained.	
Wetlands (Conservation and Management) Rules, 2017	The Rules specify activities which are harmful and prohibited in the wetlands such as industrialization, construction, dumping of untreated waste and effluents, and reclamation. The Central Government may permit any of the prohibited activities on the recommendation of Central Wetlands Regulatory Authority.	Not applicable as subprojects components are not located in or near to designated wetland area.	Not Applicable
Ancient Monuments and Archaeological Sites and Remains Act, 1958 and Ancient Monuments and Archaeological Sites and Remains (Amendment and Validation) Act, 2010.	The Act designates areas within 100 meters (m) of the "protected monument/area" as "prohibited area" and beyond that up to 200 m as "regulated area" respectively. No "construction" is permitted in the "prohibited area" and any construction activity in the "regulated area" requires prior permission of the Archaeological Survey of India (ASI).	Not applicable - there are no protected monuments / places of archeological / historical places in or near Makrana Town In case of chance finds, the contractor/ PIU will be required to follow a protocol as defined in the Environmental Management Plan (EMP)	Not Applicable
Contract Labor (Regulation and Abolition) Act, 1970; The Inter-State Migrant Workmen (Regulation of Employment and Conditions of Service) Act, 1979	Provides for welfare measures to be provided by the Contractor to contract labor and in case the Contractor fails to provide, the same are required to be provided by the Principal Employer by Law. The principal employer is required to take Certificate of Registration and the Contractor is required to take a License from the designated Officer. The Act is applicable to the establishments or Contractor of principal employer if they employ 20 or more contract labor. The inter-state migrant workmen, in an establishment to which this Act becomes applicable, are required	Applicable to all construction works in the project Principle employer (RUDSICO-EAP) to obtain Certificate of Registration from Department of Labour, as principle employer Contractor to obtain license from designated labor officer Contractor shall register with Labor Department, if Inter-state migrant workmen are engaged Adequate and	Construction and operation

Applicable Law	Description	Requirement	Relevance to Project Phase
	to be provided certain facilities such as housing, medical aid, traveling expenses from home up to the establishment and back, etc.,	appropriate amenities and facilities shall be provided to workers including housing, medical aid, traveling expenses from home and back, etc., Appendix 8 provides applicable labor laws including amendments issued from time to time applicable to establishments engaged in construction of civil works.	
The Child Labour (Prohibition and Regulation) Act, 1986	Prohibits employment of children below 14 years of age in certain occupations and processes Employment of child labor is prohibited in building and construction Industry.	No child labour shall be employed	Construction and operation
Minimum Wages Act, 1948	Minimum wages fixed by appropriate Government as per provisions of the Act if the employment is a scheduled employment. Construction of buildings, roads and runways are scheduled employment.	Applicable to all construction works in the project All construction workers should be paid not less than the prescribed minimum wage	Construction and operation
Workmen Compensation Act, 1923	Provides for compensation in case of injury by accident arising out of and during the course of employment.	Compensation for workers in case of injury by accident	Construction and operation
Equal Remuneration Act, 1979	Provides for payment of equal wages for work of equal nature to male and female workers and not for making discrimination against female employees in the matters of transfers, training and promotions etc.	Equal wages for work of equal nature to male and female workers	Construction and operation
The Prohibition of Employment as Manual Scavengers and Their rehabilitation Act 2013	Prohibition of insanitary (dry types) latrines and employment and engagement of manual scavenger Rehabilitation of persons retracted from manual scavenger works Prohibition of persons from engagement or employment for hazardous cleaning of sewers and septic tanks	No dry latrines should be constructed at any site, only flush type latrines should be made. Any person employed as manual scavenger, he should retract from this work and engaged in other work in same wages. No person. Local authority or any agency	Construction

Applicable Law	Description	Requirement	Relevance to Project Phase
		shall engage or employ, either directly or indirectly, any person for hazardous cleaning (without proper precautions and providing safety aids) of a sewer or a septic tank. Provide proper PPEs and safety equipment before entering in to manhole of sewers.	
Solid Waste Management Rules, 2016	Responsibility of Solid Waste Generator (i) Segregate and store the waste generated in three separate streams namely bio-degradable, non biodegradable and domestic hazardous wastes in suitable bins and handover segregated wastes to authorized waste pickers or waste collectors as per the direction or notification by the local authorities from time to time; (ii) store separately construction and demolition waste, as and when generated, in his own premises and shall dispose off as per the Construction and Demolition Waste Management Rules, 2016; and No waste generator shall throw, burn or bury the solid waste generated by him, on streets, open public spaces outside his premises or in the drain or water bodies.	Contractor to follow all the rules during construction works.	Construction and Operation
Construction and Demolition Waste Management Rules, 2016.	(i) Every waste generator shall segregate construction and demolition waste and deposit at collection centre or handover it to the authorized processing facilities (ii) Shall ensure that there is no littering or deposition so as to prevent obstruction to the traffic or the public or drains. (iii) Large generators (who generate more than 20 tons or more in one day or 300 tons per project in a month) shall submit waste management plan and get	Contractor to follow all the rules during construction works.	Construction

Applicable Law	Description	Requirement	Relevance to Project Phase
	appropriate approvals from the local authority before starting construction or demolition or remodeling work, (iv) Large generators shall have environment management plan to address the likely environmental issues from construction, demolition, storage, transportation process and disposal / reuse of C & D Waste. (v) Large generators shall segregate the waste into four streams such as concrete, soil, steel, wood and plastics, bricks and mortar, Large generators shall pay relevant charges for collection, transportation, processing and disposal as notified by the concerned authorities;		
Hazardous Waste Rules 2016	Responsibilities of the occupier for management of hazardous and other wastes.- (1) For the management of hazardous and other wastes, an occupier shall follow the following steps, namely:- (a) prevention; (b) minimization; (c) reuse, (d) recycling; (e) recovery, utilization including co-processing; (f) safe disposal. (2) The occupier shall be responsible for safe and environmentally sound management of hazardous and other wastes. (3) The hazardous and other wastes generated in the establishment of an occupier shall be sent or sold to an authorized actual user or shall be disposed of in an authorized disposal facility. (4) The hazardous and other wastes shall be transported from an occupier's establishment to an authorized actual user or to an authorized disposal facility in accordance with the provisions of these rules. (5) The occupier who intends to get its hazardous and other wastes treated and	Contractor to comply all the requirements of this Act during construction works.	Construction and Operation

Applicable Law	Description	Requirement	Relevance to Project Phase
	disposed of by the operator of a treatment, storage and disposal facility shall give to the operator of that facility, such specific information as may be needed for safe storage and disposal. (6) The occupier shall take all the steps while managing hazardous and other wastes to- 6 (a) contain contaminants and prevent accidents and limit their consequences on human beings and the environment; and (b) provide persons working in the site with appropriate training, equipment and the information necessary to ensure their safety.		
International conventions and treaties			
Ramsar Convention, 1971	The Ramsar Convention is an intergovernmental treaty that provides the framework for national action and international co-operation for the conservation and wise use of wetlands and their resources. India is one of the signatories to the treaty. The Ramsar convention made it mandatory for the signatory countries to include wetland conservation in their national land use plans.	There are no Ramsar sites in Makrana. Not applicable to Makrana sewerage subproject.	-
Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES), 1973	India is a signatory of this convention which aims to control international commercial trade in endangered species.	Not applicable in this project as no endangered species of wild fauna and flora is found in project areas.	-
Montreal Protocol 1992	India is a signatory of this convention which aims to reduction in the consumption and production of ozone-depleting substances (ODS), while recognizing differences in a nation's responsibilities. Ozone depleting substances are divided in two groups Chloro fluorocarbons (CFCs) and Hydro chlorofluoro carbons (HCFCs).	Not applicable in this project as no ODS are involved in construction works.	-
Basel Convention	India is a signatory of this	Contractor to follow the	-

Applicable Law	Description	Requirement	Relevance to Project Phase
on Trans-boundary Movement of Hazardous Wastes, 1989.	convention which aims to reduce trans-boundary movement and creation of hazardous wastes	provisions of Hazardous Waste Rules, 2016 for storage, handling, transport and disposal of hazardous waste emerged during construction works.	
Convention on Migratory Species of Wild Animals (CMS), 1979 (Bonn convention)	CMS, also known as Bonn convention, was adopted in 1979 and entered into force on 1 November 1983, which recognizes that states must be the protectors of migratory species that live within or pass through their national jurisdictions, and aims to conserve terrestrial, marine and avian migratory species throughout their ranges. Migratory species threatened with extinction are listed on Appendix I of the Convention. CMS Parties strive towards strictly protecting these species, conserving or restoring the places where they live, mitigating obstacles to migration and controlling other factors that might endanger them. Migratory species that need or would significantly benefit from international cooperation are listed in Appendix II, and CMS encourages the Range States to conclude global or regional agreements.	Not applicable to this project as no migratory species of wild animals are reported in the project areas.	-

53. Clearances/ Permission to be obtained prior to start of construction: Table 6 shows the list of clearances/permissions required for project construction. This list is indicative and the contractor should ascertain the requirements prior to start of the construction, and obtain all necessary clearances/permission prior to start of construction.

Table 6: Clearances and permissions required for Construction activities

Sl. No.	Construction Activity	Statute under which Clearance is Required	Implementation	Supervision
1	Land for Project Activity	Allotment and Approval for specific land use	ULB	RUIDP (PMU)
2	Tree Cutting	State Forest Department/ Revenue (Tehsildar)	PIU	PMU
3	Approval for use of Railway Right of Way (ROW). Use	North Western Railway Division and other Utility Agencies, if	PIU and Contractor	PMU

Sl. No.	Construction Activity	Statute under which Clearance is Required	Implementation	Supervision
	of Construction Area	required		
4	Approval for use of City Roads, Use of Construction Area	ULB and other Utility Agencies such as PHED, BSNL etc.	PIU and Contractor	PMU
5	Hot Mix Plants, Crushers and Batching Plants & DG set	Consent to Establish (CTE) and Consent to Operate (CTO) from Rajasthan Pollution Control Board (RPCB)	Contractor	PIU
6	Material Sourcing -Approval for sourcing stones and sand from quarries and sand mining and borrow areas	Permission from District Collector / State Department of Mines & Geology	Contractor	PIU
7	New Quarries, Sand Mining and Borrow Areas	Environmental Clearance under EIA Notification, 2006	Contractor	PIU
8	Establishment of construction camps	Allotment and approval for specific land use	Contractor	PIU
9	Construction and Operation of new STP including discharge of treated effluents and disposal of sludge	Consent to Establish (CTE) and Consent to Operate (CTO) from Rajasthan Pollution Control Board (RPCB)	Contractor and PIU	PMU
		CTO for existing STP	ULB and PIU	PMU
10	Storage, Handling and Transport of Hazardous Materials	Hazardous Wastes (Management and Handling) Rules, 2016 Manufacturing, Storage and Import of Hazardous Chemicals Rules, 1989 from RSPCB	Contractor	PIU
11	Traffic Diversion during construction / Temporary Traffic Diversion Measures including use of alternate roads	District traffic police	Contractor	PIU
12	Construction Waste and Demolition Debris Disposal	Approval from Municipal Council for disposal site is required per Construction and Demolition Waste Management Rules 2016	Contractor	PIU
13	Labour License for overall Construction Activity	Labour Commissioner, Government of Rajasthan	Contractor	PIU
14	Use of Vehicles and Equipment- Pollution Under Control (PUC) Certificate	As per Motor Vehicle Rules, 1989	Contractor	PIU

54. PMU will ensure all necessary regulatory clearances and approvals are obtained prior to commencement of works. Respective PIUs, with support of project consultants and DBO contractors, are responsible for obtaining the clearances/permits and ensuring conditions/specifications/provisions are incorporated in the subproject design, costs, and implementation. The PIUs shall report to PMU the status of compliance to clearances/permits as part of the regular progress reporting.

IV. DESCRIPTION OF THE ENVIRONMENT

A. Physical Resources

1. Location, Area & Connectivity

55. Makrana is a town and a municipality in Nagaur district of Rajasthan state in India. Makrana is located at 27.05°N & 74.72°E and at average elevation 408 m (1339 ft) above MSL. The municipal area of the city is about 12.19 Sq. Km. It is a Tehsil head quarter of Nagaur district. It is located of 100 Km from district head quarter Nagaur, 135 Km from State capital Jaipur and 90 km from Ajmer by road. Nearest railway station is Makrana which is within the city. Nearest Airport is Sanganer (Jaipur) which is about 137 km away from Makrana.

56. Makrana one of the biggest Tehsil in Nagaur District. Makrana is famous for the white stone and marble taken from the mines around it. Makrana marble was used in construction of the TajMahal. Makrana is a large town and has many marble outcrops. Most of the residents in Makrana earn their livelihood from mining marble. Location map of District Nagaur showing Makrana is given in Figure 13 below:

Figure 13: Location Map of District Nagaur showing Makrana Town



2. Topography, Soils and Geology

57. Nagaur district forms a part of the Great Thar desert and is covered mainly by Aeolian sands masking the hard rocks. The various rock types of the district belong to the Delhi Super Group, the Erinpura Granite, the Malani igneous Suite and the Marwar Super Group and the palana formation. The rocks of the Alwar group are well exposed in the Eastern part of the

district and comprise arkose, grit, and schist. The rocks of the Delhi Super Group have been intruded by the Sendra.

58. Thick gypseous beds of the district provide reserves of about 953 million tons from Dhankoria, Bhadwasi, and Nagaur deposits. Extensive deposits of China clay are found in Khajwana area. Lignite occurrences have been reported from around Merta Road.

59. Makrana lies in the middle of the Aravalli Range, and these mountains are the source of its fame as a marble producer.

60. **Soil characteristics:** Four types of soils have been reported in the district viz, clay, clay loam, sandy loam and sandy soil. The general texture of the soil in the area is sandy loam to clayey loam which is further classified into “Barani” or unirrigated and “Chahi” or irrigated soil. A part of Nagaur tehsils and south-eastern part of Merta tehsils has deep sandy loam, while red loamy soil exists elsewhere in the Merta tehsils except on the banks of river Luni, Light loamy soil occurs in Parbatsar tehsils away from hill ranges. A longitudinal belt from Didwana to Nawa extending up to Sambhar Lake has the characteristics of alkaline soil. Distribution of different types of soils is shown in the following Table 7:

Table 7: Soil types of Nagaur District

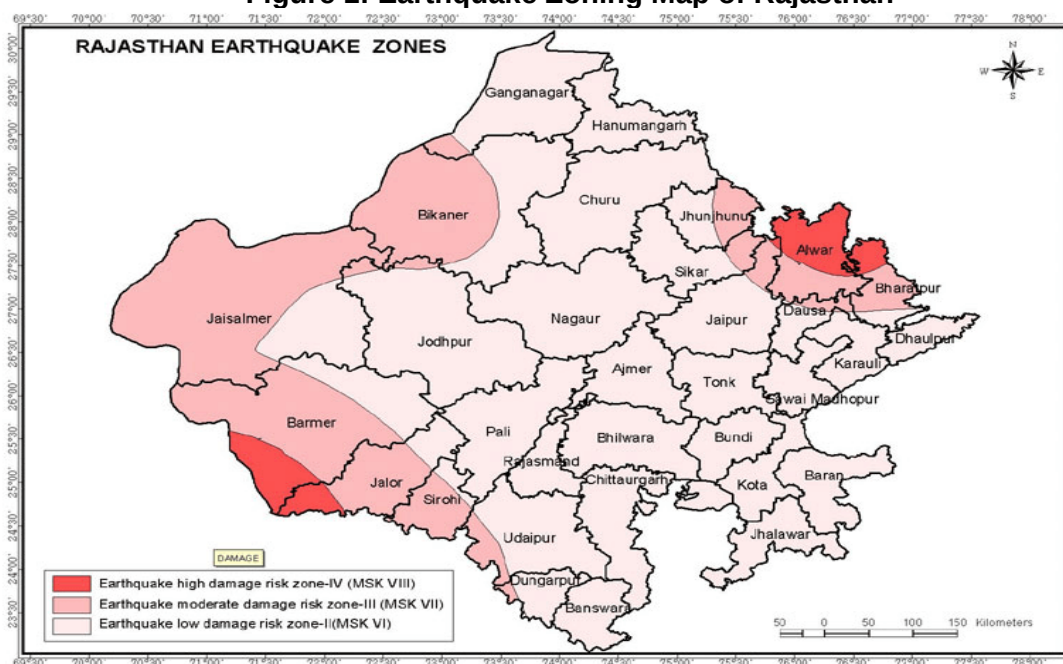
S. No.	Soil type	Area (hec)	Block
1	Clay	22840	Nagaur, Jayal, Merta, Riyan, Parbatsar
2	Clay Loam	134450	Nagaur, Kuchaman, Jayal, Riyan, Merta, Degana, Makrana, Ladnun, Parbatsar, Mundwa, Didwana
3	Sandy Loam	472905	Makrana, Ladnu, Parbatsar, Mundwa, Didwana, Nagaur, Kuchaman, Jayal, Riyan, Merta, Degana
4	Sandy	565705	Nagaur, Khuchaman, Jayal, Riyan, Merta, Degana, Makrana, Ladnun, Parbatsar, Didwana.

Source: CGWB, Nagaur, 2009.

61. Soil of Makrana is saline sodic because of high pH value and excess sodium presence. The agricultural field near these marble mines and stone crushers areas show poor growth and yield of crops and vegetable crops were noticed.

3. Seismology

62. In view point of seismicity, District Nagaur lies in a stable zone. In the seismic zoning map of India, the district comes in a Zone-II (Least Active). Sesmic zoning map of Rajasthan is given in Figure 14 below:

Figure 1: Earthquake Zoning Map of Rajasthan

4. Climatic Conditions

63. The climate of Makrana is hot and dry. The maximum temperature during summer months rises up to 45°C quiet frequently and during winter months temperature goes down up to 5°C. The mean annual rainfall is around 191mm and takes place between July- Septembers. Winds blow manly in April to September from south west & from October to March from North East in summers humidity is lowest i.e. 20-25%.

5. Surface Water

64. No surface water resource in the Nagaur district has been reported except a few salt lakes. There is salt lake (Sambhar Lake) at south west of Didwana having an area of 777 hectare The Nawa tehsil also shares a part of well-known Sambhar Lake in Jaipur district. There are eight (8) numbers of ponds in the district. Out of these 5 are in Degana and 3 in Parbatsar blocks. River Luni is a non-perennial river, it rises near Pushkar in Ajmer district and after passing over the western slopes of the Aravali, it crosses Nagaur district in the south and flows through it towards the west for nearly 37 km. before entering into Pali

6. Groundwater

65. Chemical quality of ground water in Nagaur district is generally brackish to saline with few pockets having fresh water with E.C. less than 2000 micro mhos/cm at 25°C. Then there are some areas suffering from high fluoride. The ground water quality is brackish to saline from east of Merta to Degana and from Didwana to Nagaur via Jayal block in the central, western, northwestern part of the district. In this big pocket E.C. of ground water is more than 3000 micro mhos/cm at 25°C. There are some pockets namely eastern part of Rian southern part of Degana, major part of Parbatsar, north and northeastern part of Kuchaman, western and northwestern part of the Merta block, major part of Mundawa, Kuchera- Khanwar-Gagawana

area of Jayal block, south eastern part of Didwana, northern and south western part of Ladnun block, where the E.C. of ground water is within 3000 micro mhos/cm at 25°C. There are two salt lake area where ground water having E.C. more than 10000 micro mhos.

66. Ground water in the alluvium is in general better in quality than that found in the sandstones of Nagaur and Palana series, and Meta sediments. The fluoride content of ground water in Nagaur district varies from less than 1 ppm to 10 ppm. In a longitudinal belt extending from Manasar in Nagaur blocks to Indawar in Merta block the fluoride is more than 4 ppm. There is another big pocket in the south-eastern part of the district covering parts of Parbatsar, Makrana and Degana blocks where the fluoride is much over 4 ppm and the area is called Banka-patti (fluoride affected area) (Source: Draft IEE, Nagaur, 2013).

7. Air Quality

67. Ambient air quality in Rajasthan is monitored by Rajasthan State Pollution Control Board. However, at present there is no monitoring station in Makrana City or Nagaur. However, few monitoring in past have been done in Nagaur District by RUIDP and it was observed that ambient air quality in district Nagaur is well within the permissible limits. But as these monitoring locations in Nagaur far from Makrana so it is not having worth to consider it as air quality for Makrana City.

68. Baseline air quality monitoring of Makrana City is not done during initial design phase and shall be done during SIP period by contractor and shall be updated in IEE.

69. Traffic and marble mining activities are the major sources of air pollution in Makrana City. Being dry area with low rainfall and sandy soil, particulate matters in Makrana city may be higher especially during dry and wind-blown day.

70. Air quality monitoring shall be conducted in the pre-construction phase (SIP period) by the contractor and shall be updated in IEE.

8. Noise Quality

71. As there are Mining industries and other activities, which create high noise in Makrana City, the main source of noise pollution in the city area is mining and traffic. Baseline ambient noise quality monitoring of Makrana City is not done during initial design phase and shall be done during SIP period by contractor and shall be updated in IEE.

72. Environmental monitoring for ambient air, noise and water quality has not been conducted during design period. Baseline Monitoring shall be done during SIP period by contractor and shall be updated in IEE.

B. Ecological Resources

73. The flora of the district is not rich owing to its geographical situation and scanty rainfall. The south-eastern areas including a part of the northern tehsil of Ladnun and Didwana are much greener than the northwest region of district. Khejri trees are commonly found in the district. The leaves are used as fodder. It also gives gum. Apart from commercial value, this tree is considered holy. The tree also plays an important role in checking soil erosion. The other common species found in the district are babul, neem, shisham, peepal, rohira, kalsi, dhangood,

akra and rohira trees provide timber & is used for making furniture. Dhangood is generally used for making cots. A common shrub-phog provides building material from its roots & twigs.

74. Wild Animals such as chinkaras and black bucks which are rarely seen in this area are protected species under the Rajasthan Wild Animals and Birds Protection Act (1951). Among the small game, only titars are found. Other fauna of the district consists of deer, hare, jackal, pig, wild cat and birds. The common birds fluttering in the district include bulbul, suganchiri, and mor (peacocks).

75. On the review of available information, no rare or endangered species of flora and fauna prescribed by IUCN or WPC, 1972 are found along the project areas. Biodiversity Assessment was done through Integrated Biodiversity Assessment Tool (ibat) and report is attached as Appendix 9. As per this assessment, though some species of near threatened (NT), endangered (EN), critically endangered (CR) and Vulnerable (VU) are reported in Nimbahra but project sites being in urban and developed areas, none of these are reported in project area.

76. The district of Nagaur is poor in forest resources. The total area under including hills is reported to be 240.92 km², which is 1.3 percent of total geographical area of the district. Scanty rainfall and other geographical constraints account for this. The western part of the district is divided of natural vegetation cover except for herb and grass which grows on low sand dunes. However, the south-eastern part of the district and part of the northern tehsil of Ladnun and Didwana have much greater greenery as compared to north-west part of the district

C. Economic Development

1. Land use

77. Out of the total municipal area of 3600Ha. only 1920 Ha. area is urbanized. Out of this urbanized area, 1185 Ha. is developed and rest of the area is either hilly, agriculture or reservoir. Out of the total developed area, 469 Ha. is under residential use and around 129 ha is under commercial use. Industrial area is of around 284 ha. 407 Ha. of the urbanized area is under mining. Present land use is presented in Table 8 below:

Table 8: Details of Land Use

S. No.	Land use	Area	Developed Area	Urbanized Area
		Hectare	%	%
1	Residential	469	39.57	24.43
2	Commercial	129	10.89	6.72
3	Industrial	284	23.97	14.79
4	Govt. & Semi Govt. Office	8	0.68	0.42
5	Recreation	3	0.25	0.15
6	Public & Semi-public	77	6.50	4.01
7	Circulation	215	18.14	11.20
	Sub Total (Developed Area)	1185	100	61.72
8	Open area	314		16.35
9	Agriculture, Nursery & Garden	9		0.47
10	Reservoir	5		0.26
11	Excavation	407		21.20
	Total (Urbanized Area)	1920		100

Source: Makrana Master Plan, 2010.

2. Industry & Agriculture

78. Makrana is a large town in Nagaur district, with a deposit of 56 million tonnes of marble and 40,000 labourers working in 900 mines in the several ranges of the Aravallis. Makrana is the main centres of marble in Rajasthan. Calcitic in nature, Makrana marble is regarded as the oldest, and finest in quality. The present rate of marble production from Makrana is 19.20 million tonnes per year with an annual revenue of rupees (INR) 10036 crore (ten million). Makrana has per capita income is INR 50,000, higher than national average of INR 46,000 and the richest municipality in Rajasthan.

79. Makrana is source of employment to more than 100,000 people from about 200 surrounding villages. The Victoria Memorial of Kolkata, the TajMahal in Agra, the RaudatTahera in Mumbai and the Jain Temple of Dilwara in southern Rajasthan are built from Makrana marble. Some other monuments where Makrana marble has been used are the Haji Ali Dargah of Mumbai, the Jain Temple of Mysore, and the Ambedkar Park of Lucknow.

3. Infrastructure

80. **Water Supply.** Source: At Present the main source of treated water is Nagaur lift canal. The treated water from Nagaur lift canal project is being delivered at Budshu road Pump house, from there treated water is pumped to 2 CWRs situated at Joosri road and Ex. En. Office in Makrana town to supply the treated water among the consumers of town.

81. The treated water allocation from Nagaur Lift Canal Project (NLWSP)

- (i) 2015- 16.54 MLD
- (ii) 2030- 21.88 MLD
- (iii) 2045- 26.75 MLD

82. **Existing System:** The details of existing components are given below:

- (i) **Distribution pipeline system:** There are 10 Service Reservoirs (9 ESRs+1GSR) with 33 Water supply Distributaries zone. 11 zones are being fed with service reservoirs and rest zones by direct boosting. Approximately 280 km various type and size of pipeline as distribution main in 40 nos. wards of Nagar parishad in Makrana and adjoining peripheral habitations.
- (ii) **Storage:** There are 10 nos. of service reservoir having total capacity of 8830kL, water supply is maintained in 11 nos. of zones through these 10 storages (9 ESR and 1 GLSR at Matabhar). In addition to the three CWRs are also available at Joosari road H/W, Xen office H/W and Jen Office H/W, having capacity of 1800 kL, 2000 kL and 150 kL, respectively.
- (iii) **Present Production/Existing Supply:** At present only 8.00 MLD water is being drawn as given in following table 9:

Table 9: Water Source for the Project

S. No.	Name of Source	Treated Water obtain at H/W at UWSS Makrana	Present production (KLD)		
			Yield (KLH)	Pumping hours	Daily production
1	Nagaur lift canal from Budshu Road pump house of the project.	Joosari Road H/W	280	16	4480

S. No.	Name of Source	Treated Water obtain at H/W at	Present production (KLD)		
2	Nagaur lift canal from Budshu Road pump house of the project.	Xen Office H/W	220	16	3520
			Total Production = 800KLD (8.0 MLD)		

83. Thus, the total Production for UWSS Makrana at present approximately only 8.0 MLD against the requirement of 18.71 MLD. Accordingly, frequency of water supply is 72-96 Hrs with the rate of 43 LPCD, in case of disturbance of power supply and breakage of pipe line it is increased.

84. **Sewerage.** At present 6.0 MLD STP and 69.86 km sewer line are operative in part of the town. The plant has been in operation for the last two years and no upgradation / rehabilitation is envisaged for the existing 6.0MLD STP. Presently in the balance area, waste water from kitchens & bathrooms is discharged into storm water drains culminating finally to the Nallah or on ground, which pollutes the environment and contaminates the ground water. Open defecation is not uncommon. As the balance area of town does not have any sewerage system and effluent finds its way into the open drains. In the absence of safe disposal and treatment system of sewage, the people of uncovered area are facing unhealthy and unhygienic environment. Therefore, public representatives are also demanding facilities of sewerage system in uncovered area on priority basis. After execution of sewerage system in the uncovered area by providing underground sewer pipe line network followed by sewerage treatment plant, the public of uncovered area will get relief from unhealthy and unhygienic environment.

85. **Solid Waste Management.** Solid Waste Management in Makrana is done by Nagar Parishad through door to door waste collection. Solid waste management in town is done through 20 SW collection and transport tipper and 2 tractor, SW is collected manually from houses and dumped open at Manglana road, in the allotted land fill site through open and crude dumping without any segregation.

86. **Power Supply.** Thermal power is the main source of energy from conventional sources in Rajasthan, contributing nearly 90% of the electricity, compared to hydropower, which produces the remainder. State-level companies (Rajya Vidyut Utpadan Nigam Ltd, RVUN; and Rajya Vidyut Prasaran Nigam Ltd, RVPN) are responsible for power generation and transmission respectively, and distribution is provided by three regional companies the Ajmer Vidyut Vitaran Nigam Limited (AVVNL), Jaipur Vidyut Vitaran Nigam Limited (JVVNL) and Jodhpur Vidyut Vitaran Nigam Limited (JDVVNL). Presently, total power availability/ installed capacity of RVUN in the State is 17281 MW as on Dec. 2016, including 5957.35 MW installed capacity of RVUN power stations as on 31.12.2016. In addition, RVUN is also managing and operating two Inter State Hydel Power Stations with installed capacity of 271MW. Over 26% of total power generation (conventional and non-conventional) comes from non-conventional sources like wind, solar and biomass etc.

87. Ajmer Vidyut Vitran Nigam Ltd, (AJMER DISCOM) supply electricity in Nagaur district. Power supply to Makrana is from 132KV Grid power station by Overhead cables carried on metal and concrete poles, mainly located in public areas alongside roads. Town is facing supply issues and 1-3 power cut is observed in town.

88. Transport: The town is served by railroads and other forms of transportation, serving as a key junction between Jaipur (125km via jobner in East of Makrana), Parbatsar (27km via Manglana Road in South of Makrana) and Jodhpur (256 km in South West of Makrana).

D. Socio Cultural Resources

1. Demography

89. According to the 2011 census of India, Makrana had a population of 94,487 souls. Males constitute 48,745 of the population and females 45,742. Makrana has an average literacy rate of 64% which is higher than the state average of 66.11%: Male literacy is 74%, and female literacy is 53%. In Makrana, 17.63% of the population is under 6 years of age group. Sex Ratio in the town is also higher than the state ratio which is 940 against state average of 928. Sex Ratio of child is 926 compared to Rajasthan state average of 888. The major regional languages spoken are Marwari, Hindi, English, Urdu and Rajasthani.

90. The town has been growing steadily since 1951. The growth of the town has been phenomenal during 1971-1981 when there was an influx of population of immigrants to this town. However, thereafter also the growth was not stable. The average decadal increase is 39.49%. However the last decadal (2001-2011) growth is only 2.87%, vide the Table 10 below:

Table 10: Decadal Population Growth Rate of Makrana City

Census Year	Population	Increase in Population	Growth rate (%)
1951	13943		
1961	17270	3327	23.86%
1971	23243	5973	34.59%
1981	40663	17420	74.95%
1991	59714	19051	46.85%
2001	91853	32139	53.82%
2011	94487	2634	2.87%
Average Increase		13424	39.49%

2. History, Culture and Tourism

91. Makrana was a princely state in British India. It is home to some of the world's most renowned white marble sites, from which the Taj Mahal, Victoria Memorial of Kolkata, Birla Temple of Jaipur and Jain Temple of Dilwara in Southern Rajasthan were built. It is said that the 1800 artisans who settled Makrana originally came from a coastal strip in the south of Sindh and Balochistan, in Pakistan and Iran, also called Makrana. These artisans came to India to build the Taj Mahal.

E. Environmental Settings of Investment Program Component Sites

92. The subproject includes construction of 1 no. STP, 2 nos. SPS, laying of sewer lines in the municipal area of Makrana town. Sewers will be laid along the roads/streets in the town within the road right-of-way (ROW). In wider roads pipes/sewers will be laid in the road shoulder beside the tarmac, and in narrow roads, where there is no space, sewers will be laid in the road carriage way by break opening the tarmac. Roads in some part of the town are narrow. Roads are lined both sides with open drains. In narrow roads sewers will be laid in the middle of the road, which may affect the traffic. Bigger diameter trunk sewers will be laid along the main

roads, which are wide and have adequate space. No tree cutting is anticipated as there is adequate space to lay the sewer pipelines in those roads.

93. Proposed site of construction of STP is in ward no.1 in the premises of existing STP (6 MLD) which is sufficiently away from city area and surrounded by agricultural lands. There are no habitations near to designed STP site. As per preliminary survey 30 trees (planted recently by contractor of existing STP), shrubs and bushes are present at site, therefore tree cutting may be required during construction of STP. During final design (SIP), contractor is required to avoid tree cutting as much as possible and re-plantation to be done in the ratio of 1:3 as per RUIDP policy. No wild fauna is found in these areas. STP will be constructed on available vacant land within existing STP campus.

94. Treated effluent shall be reused for beneficial purposes for which proposal of Construction of one treated effluent storage reservoir (TESR) of 800 KL, Treated Effluent Elevated Reservoir (TEER) 400 KL (22 m staging) within campus has been taken. Contractor will propose the best methods of reuse of treated effluent and sludge as per guidelines of CPHEEO (guidelines are attached as Appendix-13) and best international practices in consultation with RUIDP and Municipal Council and submit a plan in RUIDP for approval. Excess or unused treated effluent shall be stored in to adjacent treated water reservoir in STP campus from where it will be used in nearby agricultural and other activities.

95. Two numbers of SPSs will be constructed in available vacant municipal government lands near Sheetla Mata Seva Samiti Temple and near Jhalra Pond, where there are some habitation exist and proper public information will be required before construction works. Some trees exist in these sites. Municipal Council, Makrana will make the arrangements to provide encumbrance free lands for both the SPSs as per requirements. Further assessment will be needed after land allotment and demarcation (A letter regarding availability of land for designed sewerage work (including 2 SPS and one STP) by Municipal Council, Makrana is given in Appendix 27).

96. The sludge from the SBR process is composed of both inorganic and organic materials, large concentration of some plant nutrients and much smaller concentrations of numerous trace elements and organic chemicals. Hence, the sludge can be put to good use when applied on land. Under the project, the sludge reuse plan shall be developed and implemented by the Contractor in consultation with the Municipality authorities who shall be guided by the RUIDP and the PMCBC experts, as well.

Table 11: Site Environmental Features

S. No.	Subproject Component	Environmental Features of the Site	Photographs
1	Construction of STP 7.7 MLD Treated Effluent Elevated Reservoir, Treated Effluent Storage Reservoir, Effluent Pumping station	The STP will be constructed within existing STP campus with SBR technology, TEER, TESR will be constructed in same campus near Borawar Road near Railway Line. Designed site of construction of STP is in the premises of existing STP (6 MLD) which is sufficiently away from city area and surrounded by agricultural lands. There are no habitations near to designed STP site. As per preliminary survey approx. 30 trees (planted recently by contractor of existing STP), shrubs and bushes are present at site, therefore tree cutting may be required during construction of STP. No wildlife reported from the area so far. The designed site well connected with Road. Details of designed map of STP on google of designed STP is given in Figure 11.	
2	Sewage Pumping Station – 2 Nos.	Sewage pumping station is proposed near Jhalra Pond. Adequate space is available for proposed SPS. Site is having undulating to flat vacant land (not under any productive use) is available of municipal govt. land. No trees exist at the proposed site. The proposed site is well connected with road. There are no sensitive receptors or habitation in nearby vicinity. No wildlife reported from the area so far. Details of Map of SPS site is given on google is given in Figure 8.	

S. No.	Subproject Component	Environmental Features of the Site	Photographs
		Sewage Pumping Station is proposed near Sheetla Mata Temple. A flat vacant land (not under any productive use) is available. No trees exist at the proposed site except few shrubs and bushes at site. The proposed site is well connected with Road network. There are no sensitive receptors or habitation in nearby vicinity. Details of Map of SPS site is given on google is given in Figure 9.	
3	Sewer networks	Laying of pipes is proposed within ROW of existing city roads, where there are several utilities such as electricity, telecommunications, water posts etc. As per preliminary surveys, no tree cutting is required. Some vendors exist in areas where pipe laying is proposed.	
4	Discharge point	Discharge location for treated effluent from STP is approx. 60 m away in existing pond, where treated effluents from existing STP is being discharged and nearby farmers take this water through their individual pumps and pipes for use in agriculture. This pond is in government land. Google map showing location of discharge point is given in Figure 15.	

Figure 15: Discharge point Map and coordinates



Coordinates of Discharge Point in Makrana- Latitude: 27° 2'25.43"N, Longitude: 74°42'9.85"E

V. ANTICIPATED ENVIRONMENTAL IMPACTS AND MITIGATION MEASURES

A. Introduction

97. Potential environmental impacts of the proposed infrastructure components are presented in this section. Mitigation measures to minimize/mitigate negative impacts, if any, are recommended along with the agency responsible for implementation. Monitoring actions to be conducted during the implementation phase is also recommended to reduce the impact.

98. Screening of potential environmental impacts are categorized into four categories considering subproject phases: location impacts and design impacts (pre-construction phase), construction phase impacts and operations and maintenance phase impacts.

- (i) **Location impacts** include impacts associated with site selection and include loss of on-site biophysical array and encroachment either directly or indirectly on adjacent environments. It also includes impacts on people who will lose their livelihood or any other structures by the development of that site.
- (ii) **Design impacts** include impacts arising from Investment Program design, including technology used, scale of operation/throughput, waste production, discharge specifications, pollution sources and ancillary services.
- (iii) **Pre-construction impacts:** During preconstruction site should be free from any of the encroachment & site selection of construction work camps, stockpile areas, storage areas, and disposal areas & site selection of sources of materials.
- (iv) **Construction impacts** include impacts caused by site clearing, earthworks, machinery, vehicles and workers. Construction site impacts include erosion, dust, noise, traffic congestion and waste production.

- (v) **O&M impacts** include impacts arising from the operation and maintenance activities of the infrastructure facility. These include routine management of operational waste streams, and occupational health and safety issues.

99. Screening of environmental impacts has been based on the impact magnitude (negligible/moderate/severe in the order of increasing degree) and impact duration (temporary/permanent).

100. This section of the IEE reviews possible project-related impacts, in order to identify issues requiring further attention and screen out issues of no relevance. ADB SPS (2009) require that impacts and risks will be analyzed during pre-construction, construction, and operational stages in the context of the project's area of influence.

101. The ADB Rapid Environmental Assessment Checklist in sewerage has been used to screen the project for environmental impacts and to determine the scope of the IEE.

102. In the case of this project (i) most of the individual elements are relatively small and involve straight forward construction and operation, so impacts will be mainly localized and not greatly significant; (ii) most of the predicted impacts are associated with the construction process, and are produced because that process is invasive, involving excavation and earth movements; and (iii) being located in an urban area, will not cause direct impact on biodiversity values.

103. The project will be in properties held by the local government and access to the project location is through public rights-of-way and existing roads hence, land acquisition and encroachment on private property will not occur.

B. Location Impacts

104. Location impacts of new STP (7.70 MLD).STP of 7.70 MLD designed near Borawar Road in the premises of existing STP (6 MLD). Vacant land is available in the premises of existing STP of Municipal Council, Makrana. Some neem and babool trees of various ages present at designed site. During design phase efforts will be required to save the trees as much as possible. In unavoidable conditions, if trees are needed to be cut, prior approval from concerned authorities is required for required tree cutting activities and compensatory plantations in the ratio of 1:3 should be done as per RUIDP Policy. There is no habitation and wild fauna exist in vicinity of designed site, therefore no adverse environmental impact is envisaged. The point of discharge is marked on Figure 15 in Google Map. Disposal will be on vacant government land of low lying nature, to ensure that the discharges flow along the natural drains. Treated effluent of existing STP is being disposed at this point creating pond, from where nearby farmers take the water for use in agriculture.

105. **Locations impacts of SPS near Jhalara Pond.** One SPS is designed near Jhalra Pond, which is a government land and under possession of municipal council, Makrana. There are some trees present at site. Cremation ground (Shamshanghat) is also present beside the designed site; on the other site some marble industries are also present. Jhalra pond is very old pond and not in any use now a days and remains filled during rainy days only. During preliminary impact assessment no impact is envisaged and further Impact assessment will again be required after land allotment and shall be updated in IEE during SIP by contractor with consultation with ESS of supervision consultant. All the efforts should be taken to save tree cutting and if tree cutting is necessary, mitigation measures shall be taken during construction

works. During construction care should be taken so that no construction debris fall into the pond. Rejuvenation of the pond for storage of rain water during monsoon (rainwater harvesting) and Plantation around the periphery should be included in the scope of contractor. This will improve the overall environmental condition.

106. **Location impacts of SPS near Shetla Mata Seva Samiti Temple.** Vacant government land is available near Shetla Mata Seva Samiti Temple for the construction of one SPS under jurisdiction of Municipal Council, Makrana. Land availability letter of Municipal Council, Makrana is given in Appendix 27. Land is vacant and contains some trees and also being utilized for agriculture and other activities by Temple and nearby habitants.

107. Mitigation measures to avoid smell and visual pollution shall be taken in consideration during design in Service Improvement Plan preparation period by DBO contractor. Dense plantation in the periphery of STP campus shall be done to avoid adverse impacts on aesthetics and reduce any foul odour. Consultations have been carried out in the designed STP and SPS locations and response of people are positive (Appendix 20).

108. **Location impacts of laying of Sewer Lines in the town:** Approximately, about 96.5 km laying of sewerlines in Makrana Town Roads is designed. Permission from Municipal Council will be required before start of excavation for pipe laying. No tree cutting is envisaged at this stage for pipe laying works. Further assessment will be required during SIP preparation and should be updated in revised IEE. Mitigation measures will be required for convenience and safety of road users and nearby residents during pipe laying works.

109. It has to be assured by contractor that desired consents from RPCB are obtained for construction of STP and treated effluent should meet the parameters as set by CPCB/RPCB. Contractor will also ensure compliances to all the conditions as mentioned in the CTE.

110. **Odour Nuisance from STP.** There are very less and scattered habitations near the proposed STP. There are several marble cutting units near the STP. Nearest habitation is approx 230 m from proposed STP, therefore odour nuisance will not be a problem for this STP. Technology proposed for STP is SBR, which is best technology in such conditions and minimum odour is evolved in this process, nevertheless following mitigation measures will be required to reduce foul smell from STP.

111. Provide a green buffer zone of 10-20 m wide all around the STPs with local varieties of trees in multi-rows. This will act as a barrier and visual screen around the facility and will improve the aesthetic appearance. Treated wastewater shall be used for plantation. Develop layout plan of STP such that odour generating units (such as sludge / solids handling facilities) are located away from the surrounding area with future development potential.

112. **Physical Cultural Resources.** There are several Physical and cultural resources near the project sites such as SPS and pipe laying sites. These include temples, schools, religious ponds mosques etc. Following mitigation measures will be required to reduce impacts on physical cultural resources situated near project sites:

- (i) Firm barricades should be provided during construction works all around the SPS site;
- (ii) Boundary wall of sufficient height with barbed wire fencing should be provided during operation phase so that no children/residents can enter in the SPS premises;

- (iii) Odour control system should be provided in SPS;
- (iv) Plantations should be provided if space available to reduce foul smell of sewer during operation;
- (v) No workers camps should be allowed during construction works at SPS site; and
- (vi) Entry should be restricted through provision of gate and guard during operation of SPS.

C. Design Impacts

113. **Design of the Proposed Components.** The Central Public Health and Environmental Engineering Organization (CPHEEO) manual suggests a design period of 15/30 years¹⁶ in general while designing the systems for water supply and sewerage components. It is designed to consider 2051 as the design year for all the components in order to maintain unanimity in the design period and design population. Accordingly, 2021 shall be the base year and 2036 the intermediate year to cross check the designs pertaining to intermediate demand. The rate of water supply has been taken as 135 lpcd for 100% population. Sewage generation is 85% of water supply (including 5% to account for infiltration).

114. One of the critical aspects in sewerage system operation is, change in raw sewage characteristics at inlet of sewage treatment plant may affect the process and output quality. STPs are designed for municipal wastewater, which does not include industrial effluent. Characteristics of industrial effluent widely vary depending on the type of industry, and therefore disposal of effluent into sewers may greatly vary the inlet quality at STP and will upset process and affect the efficiency. Although legally the disposal of effluent meeting certain standards is allowed into municipal sewers (refer Appendix 5), the monitoring of the same is not-practical. Though there is no such industrial development in the town, there may be few small-scale industries in the town with problematic water discharges, and therefore disposal of such wastewater into sewers will affect the treatment efficiency. Though there are no polluting industries in Makrana, which may discharge their effluent into sewers, nevertheless, following measures should be incorporated:

- (i) No industrial wastewater shall be allowed to dispose into municipal sewers
- (ii) No domestic wastewater from industrial units shall be allowed into municipal sewers
- (iii) Ensure that there is no illegal discharge through manholes or inspection chambers
- (iv) Conduct public awareness programs; in coordination with RPCB, issue notice to all industries for compliance
- (v) Conduct regular wastewater quality monitoring (at inlet and at outlet of STP) to ensure that the treated wastewater quality complies with the national effluent standards.

115. **Design of Sewage Treatment Plant:** The STP 7.7 MLD is based on SBR technology and is designed to meet the latest standards. It is designed to establish STP based on SBR (sequential batch reactor) process, followed by disinfection by chlorine. As the bid is DBO type, detailed design of the STP will be carried out by the contractor to the following specific discharge standards. Currently for STPs in India, the standards notified by Ministry of Environment, Forests and Climate Change (MOEF&CC) in 2017 (see column (4) in table below)

¹⁶ As per CPHEEO, pumps, motors, STP, storage reservoirs are to be designed for a life of 15 years.

are applicable. However, under RSTDSP, PMU has decided to base the STP design on discharge standards for STPs suggested by CPCB in 2015, which are more stringent. The strident standards also facilitate maximum utilization of treated wastewater for reuse in various purposes following the Sewerage and Wastewater Policy, 2016, of Rajasthan.¹⁷ It is also to be noted that, in April 2019, the National Green Tribunal (NGT) in one of its orders directed MOEFCC to reconsider stringent standards for STPs.

Table 12: Designed Raw and Treated Wastewater Characteristics for STP Design

S. No	Parameter	Proposed Discharge Standards for Makrana STP	MOEF&CC STP Discharge Standards, 2017	NGT discharge standards for STP, 30 April 2019#	IFC Guideline value for sewage discharge	WHO Guideline Value for safe use in agriculture
1	pH	6.5 – 9.0	6 – 9	5.5-9.0	6 - 9	6 – 9
2	Biochemical Oxygen Demand (BOD) (mg/l)	≤10	<30 <20 (metro cities)	<10	30	-
3	Chemical Oxygen Demand (COD) (mg/l)	≤50	-	50	125	-
4	Total Suspended Solids (TSS) (mg/l)	≤20	<100 and <50	<20	50	-
5	Total Nitrogen (mg/l)	<10	-	<10	10	-
6	Ammonical Nitrogen (mg/l)	<5	-	<5	-	-
7	Total Phosphorus (mg/l)	-	-	-	2	-
8	Fecal Coliform MPN/100 ml	100 (Desirable) and 230 (Permissible)	<1000	100 (Desirable) and 230 (Permissible)	-	<1000
9	Oil and grease, mg/l	-	-	-	10	-
10	Nematodes, number of eggs per litre	-	-	-	-	1

MOEF&CC= Ministry of Environment, Forest and Climate Change; CPCB = Central Pollution Control Board; IFC = International Finance Corporation, the World Bank Group

in April 2019, the National Green Tribunal (NGT) in one of its orders directed MOEFCC to reconsider the standards issued in 2015 for STPs.

116. Treated wastewater Reuse/disposal. Rajasthan is a water scarce region and receives low rainfall. Recognizing the importance of treated wastewater in reducing the demand on water, Sewerage and Wastewater Policy, 2016, of Rajasthan promotes the reuse of treated sewage for non-potable applications, and to make sewerage projects environmentally sustainable. Government of Rajasthan adopted this policy to ensure “improved health status of urban population, specially the poor and under privileged, through the provision of sustainable sanitation services and protection of environment”. To further promote the reuse and provide

¹⁷ “The use of treated wastewater in irrigation and industrial application shall be given the highest priority and shall be pursued with care. Effluent quality standards shall be defined based on the best attainable treatment technologies, and calibrated to support or improve ambient receiving conditions, and to meet public health standards for end users”.

guidance, Policy prioritized reuse in irrigation (agriculture, forestry, and landscaping), followed by fish farming, industry and non-potable domestic reuse. Policy requires monitoring of treated wastewater quality, soil quality etc., Policy prohibits artificial recharge of aquifers using treated wastewater, and promotes construction of storage tanks to store treated wastewater to facilitate reuse. Policy prescribes that the detailed project report (DPR) should clearly define the best reuse option specific to the town and prepare a Reuse Action Plan part of the DPR following water quality norms and legal implications. LSGD is currently in the process of publishing Guidelines for Reuse of Treated Wastewater in Rajasthan 2019 to promote the reuse and provide guidance to the stakeholders. Guidelines promotes the use the treated wastewater and envisages to maximize the collection and treatment of sewage generated and reuse of treated wastewater on a sustainable basis, thereby reducing dependency on freshwater resources.

117. Policy provided priority to reuse in agricultural for unrestricted irrigation. It suggests blending of treated wastewater with fresh water to improve quality where possible, and crops to be irrigated shall be selected to suit the irrigation water, soil type and chemistry. Policy requires monitoring of accumulation of heavy metals and salinity. It encourages farmers to use modern and efficient irrigation technologies, and to ensure protection of on-farm workers and crops. As a contingency measure, policy requires regular monitoring of treated water quality, and emergency alerts to users in any event of deterioration of quality. Policy prohibits use of treated wastewater for artificial recharge (Excerpts from Policy on Reuse is provided in Appendix 12).

118. **Reuse Options.** Following the Sewerage and Wastewater Policy, 2016, the draft Guidelines on Reuse provides the following reuse applications:

- (i) Agriculture, horticulture, irrigation
- (ii) Gardening in park
- (iii) Road washing and water sprinkling to reduce fugitive dust
- (iv) Industries including mining
- (v) Recreational ponds and lakes
- (vi) Social forestry
- (vii) Construction Activities
- (viii) Firefighting and other municipal uses
- (ix) Railway
- (x) Thermal power plants
- (xi) Cantonments
- (xii) Individual Users

119. During rainy season treated effluent will be disposed to nearby natural drain provision of pipe from STP to ultimate disposal point is already taken as per location agreed by Municipal Board and Employer Representative.

120. **Reuse Plan.** The State Policy require the Sewerage Detailed Project Report provide reuse options and strategy to implement reuse, and detailed Reuse Action Plan. As the Makrana sewerage subproject is designed under DBO, the Reuse plan will be prepared by the DBO contractor during the detailed design phase in consultation with the stakeholders in Makrana and reuse modalities will be firmed up. Subproject includes following components as part of the STP to facilitate reuse: disinfection of treated waste water, treated effluent storage reservoir (TESR), effluent pumping station and a treated effluent elevated reservoir (TEER). At STP 7.7 MLD with TEER and TESR. STP will have 22m staging and treated effluent pump house of required capacity 16 hrs pumping, which will mainly facilitate supply to reuse

application from TESR. Treated effluent will be chlorinated prior to its entry into TESR/TEER. Following needs to be considered in the preparation of reuse plan:

- (i) As part of the plan, identify potential reuse application in Makrana and establish quality criteria for each of the use.
- (ii) For applications that use treated wastewater directly (e.g., agriculture), the quality required for such application in safe manner considering health, environment and crop yield concerns shall be ensured;
- (iii) Prepare a reuse plan for agriculture/ horticulture, clearly indicating the limits (geographical / crops / type of application / type of soils etc.); adopt international good practice suggested by agencies like World Health Organization (WHO), Food and Agricultural Organization (FAO) of the United Nations.
- (iv) Plan should include awareness and training provisions and responsibilities; these can be conducted by concerned department (e.g., Agricultural Department, District Collectorate)
- (v) Carryout regular / online monitoring of critical quality parameters of treated wastewater to ensure that they meet the preset standards established for reuse

121. Use of treated wastewater for irrigation. Use of wastewater for irrigation is associated with some health risks – from germs in wastewater, which may contaminate food and spread disease, health risk to farm workers from worms (helminths) and nematodes and chemical risk is associated if industrial wastewater enter the sewers. If the wastewater with bacteriological contaminants are used for food crops like lettuce, tomato, which are eaten without peeling or cooking, it will present a greater health risk if precaution such as such washing with chlorinated water or storing for adequate time in normal temperature before use (at least 10 days). According to the WHO, effluent which is used to irrigate trees, industrial/commercial (not food, like cotton) and fodder crops, fruit trees, and pasture should have less than one viable nematode egg per liter. Effluent used for the irrigation of food crops, sports fields, public parks, should have and less than one viable nematode egg per liter and less than 1000 fecal coliforms per 100 milliliters. These shall be considered in the Reuse Plan that will be prepared during the detailed design and complied accordingly.

122. Use of treated wastewater in Industries. Another reuse option of treated wastewater from STP is to reuse in nearby industrial units. In Makrana, there are a lot of marble cutting industries nearby the STP site, which are desirous to reuse this treated effluent in various activities; such as stone cutting, washing, plantations and dust suppression etc, in marble industries and MOU has been made with Marble Stone Cutter Association and Municipal Council, Makrana (refer Appendix 28). DBO contractor is required to analyse all the alternatives for reuse options available in the town and prepare consolidated reuse plan during detail design stage.

123. Disposal of treated wastewater. Designed STP sites are located close dry water channels (drains) and the excess / surplus / unused treated wastewater will be discharge into this drain. As the wastewater is treated to stringent disposal standards, no notable impacts envisaged. Both the drains are mostly dry except during monsoon. They carry untreated wastewater from the surrounding areas town. The disposal of treated wastewater meeting the set quality standards, in fact, will improve the quality of water by dilution. There are no water intakes or abstraction points in the downstream proximity. STP sites are surrounded mostly by agricultural and barren lands. Considering the existing status of drains, and the degree of treatment, no significant impacts envisaged. Proper systems should be put in place at the designed STP to ensure that treated wastewater always meet the stipulated standards prior to

its disposal into drains. Any change / lowering of treatment efficiency during operation may lead to poor quality of wastewater and may further pollute the water body. It is therefore critical that STP treats the sewage as designed. Operation and maintenance of STP and change in incoming sewage quality will have impact on the treatment efficiency. This therefore requires monitoring:

- (i) Obtain of consent of RSPCB for discharge of treated wastewater into nearby drain
- (ii) Regularly monitor the treated wastewater quality at STP and ensure that it meets the discharge standards
- (iii) Monitor water quality periodically during operation phase as per the Environmental Monitoring Plan

124. **Sludge treatment and disposal.** Sewage sludge generally consists of organic matter, pathogens, metals and micro pollutants. The concentration of parameters such as metals can be influenced by input to the sewers system from industry. Since no industrial wastewater is allowed into sewers, it is unlikely that sludge contains heavy metals. Heavy metal concentration may not be ruled out completely as the chemicals used in treatment may potentially contains heavy metals, which will then leach into the sludge.

125. Subproject includes sludge management infrastructure in STP, including system for sludge collection, thickening, solar drying, and disposal at landfill/identified site. This includes a Sludge Sump to collect sludge from SBR basins; returning arrangement for supernatant from the sump to inlet/equalization tank for treatment; pumping sludge to sludge thickener and pumping thickened to mechanical sludge dewatering system (such as centrifuge). It also requires contractor to establish a shed where the dewatered sludge cake can be further air dried for 15 days. This is indicative sludge management system, and DBO contractor will design the system meeting these requirements. Bid indicates that “the sludge produced from the treatment process would be processed so it may be used as fertilizer and soil conditioner” and it requires DBO contractor “to conform to the regulations of public health and environment protection norms”. This follows the Sewerage and Wastewater Policy, 2016, which suggests “use of sludge produced from the treatment as fertilizer and soil conditioner after processing”.

126. The treatment and drying processes kill enteric bacteria and pathogens, and because of its high content of nitrates, phosphates and other plant nutrients the sludge is an excellent organic fertilizer for application to the land. Adequate drying is however necessary to ensure maximum kill of enteric bacteria. To achieve adequate drying minimum drying period (15 days) shall be ensured. The drying period, which will be varying depending on the season will be determined during operation and be followed. A sludge management plan will be developed by the DBO contractor during the detailed design phase. Proper sludge handling methods should be employed. Personal Protection Equipment should be provided to the workers.

127. Contractor will design the sludge management plan with best methods for reuse of sludge as per guidelines of CPHEEO (guidelines are attached as Appendix 13) and best international practices in consultation with PMU and Municipal Council. Properly dried sludge can be used as soil conditioner. Periodic testing of dried sludge will be conducted to ensure that it does not contain heavy metals that make it unsuitable for food crops. Tests shall be conducted to confirm the concentrations below the following standards. As there are no specific standards notified for sludge reuse, the compost quality standards notified under the Solid Waste Management Rules, 2016 have been adopted here. Rules stipulate that “In order to

ensure safe application of compost, the following specifications for compost quality shall be met”.

Table 131: Standards for Sludge Reuse as Manure

Standards for Composting. As there are no specific standards notified for sludge reuse, the compost quality standards notified under the Solid Waste Management Rules, 2016 (Schedule II A, Standards for Composting) have been adopted here. According to the standards “In order to ensure safe application of compost, the following specifications for compost quality shall be met, namely:			
Parameters	Units	Organic Compost (FCO 2009)	Phosphate Rich Organic Manure (FCO 2013)
Arsenic	mg/kg	10	10
Cadmium	mg/	5	5
Chromium	mg/kg	50	50
Copper	mg/kg	300	300
Lead	mg/kg	100	100
Mercury	mg/kg	0.15	0.15
Nickel	mg/kg	50	50
Zinc	mg/kg	1000	1000
C/N ratio	-	<20	<20:1
pH	-	6.5 – 7.5	(1:5 solution) maximum 6.7
Moisture, percent by weight, maximum		15.0 – 25.0	25.0
Bulk density	g/cm ³	<1	Less than 1.6
Total Organic Carbon, per cent by weight, minimum	percent by weight	12	7.9
Total Nitrogen (as N), per cent by weight, minimum	percent by weight	0.8	0.4
Total Phosphate (as P ₂ O ₅) percent by weight, minimum	percent by weight	0.4	10.4
Total Potassium (as K ₂ O), percent by weight, minimum	percent by weight	0.4	-
Odour		Absence of foul Odor	
Particle size		minimum 90% material should pass through 4.0 mm is sieve	minimum 90% material should pass through 4.0 mm is sieve
Conductivity, not more than	dsm-1	4	8.2

* compost (final product) exceeding the above stated concentration limits shall not be used for food crops. however, it may be utilized for purposes other than growing food crops.

FCO = Fertilizer Control Order, Department of Agriculture, Government of India.

128. In order to ensure the safe use of dried sludge, following should be followed:

- (i) Prepare a dried sludge utilization plan for Makrana with the help of Agriculture Department/CLC; plan should also include if any additional processing is required for sludge to use as soil conditioner.
- (ii) Plan should clearly various potential uses and demand in Makrana and surrounding.
- (iii) Establish usage limits, where required, (geographical / crops / type of application / type of soils etc.); adopt international good practice suggested by agencies like

World Health Organization (WHO), Food and Agricultural Organization (FAO) of the United Nations.

- (iv) Identify a landfill / suitable site for disposal of surplus dried sludge
- (v) Monitor sludge quality during operation phase as per the Environmental Monitoring Plan, ensure that it meets the quality parameters established by FCO
- (vi) In case of sludge not meeting the quality parameters, it shall not be used as soil condition, and shall be disposed at appropriate disposal site (if it falls under hazardous category, it shall be disposed as per the Hazardous Waste Management Rules, 2016).

129. Design of Sewer system-collection & conveyance. The sewerage system is designed as a separate system of sewage collection (*i.e.* caters only to domestic wastewater). There is considerable length of existing surface drains in the project area that can be used for disposal of storm runoff. The underground gravity sewers will carry sewage from households to trunk sewers and further to STPs. Accumulation of silt in sewers in areas of low over time, overflows, blockages, power outages, harmful working conditions for the workers cleaning sewers etc. are some of the issues that needs to be critically looked into during the sewer system design. A properly designed system is a must for system sustainability. Measures such as the following shall be included in sewer system design to ensure that the system provides the benefits as intended:

- (i) Limit the sewer depth where possible.
- (ii) Sewers shall be laid away from water supply lines and drains (at least 1 m, wherever possible);
- (iii) In all cases, the sewer line should be laid deeper than the water pipeline (the difference between top of the sewer and bottom of water pipeline should be at least 300 mm).
- (iv) If unavoidable, where sewers are to be laid close to storm water drains, appropriate pipe material shall be selected (stoneware pipes shall be avoided)
- (v) For shallower sewers and especially in narrow roads, use small inspection chambers in lieu of manholes;
- (vi) Design manhole covers to withstand anticipated loads & ensure that the covers can be readily replace if broken to minimize silt/garbage entry
- (vii) Ensure sufficient hydraulic capacity to accommodate peak flows & adequate slope in gravity mains to prevent buildup of solids and hydrogen sulfide generation
- (viii) Equip pumping stations with a backup power supply, such as a diesel generator, to ensure uninterrupted operation during power outages, and conduct regular maintenance to minimize service interruptions. Consider redundant pump capacity in critical areas.

130. Design of SPS. There are pond, temple, cremation area (Kabristan) etc. near the proposed SPS sites, therefore construction works may have impacts on these cultural activities. It is therefore required that during SIP, Contractor Design engineers should take following mitigation measures to reduce impacts due to SPS:

- (i) Incorporate in design, pumps of low noise.
- (ii) Provide dedicated power supply to SPS, if possible, otherwise DG set to be used during power failure, should be soundproof and having acoustic enclosures with low/permitted air emission standards.
- (iii) Firm barricades should be provided during construction works all around the SPS

- site.
- (iv) Boundary wall of sufficient height with barbed wire fencing should be provided during operation phase so that no children/residents can enter in the SPS premises.
- (v) Odour control system should be provided in SPS.
- (vi) Plantations should be provided if space available to reduce foul smell of sewer during operation.
- (vii) No workers camps should be allowed during construction works at SPS site
- (viii) Entry should be restricted through provision of gate and guard during operation of SPS.

131. Highest Flood Level (HFL) should be used as a basis while deciding on the SPS dimensions. Also, all the prevention methods including buffer capacity secondary tank and alternative power arrangements should be implemented so that sewage does not either leak during power outages or percolate into ground and pollute ground water or surface pond in the case of SPS located near the Jhalra Pond.

132. **Fecal Sludge and Septage Management (FSSM).** The designed FSSM will help the ULB to cover entire population with safe disposal of human excreta by serving areas which are not feasible to be provided with a sewerage system (FSSM map is provided in figure.12). Under the FSSM, fecal sludge / septage will be collected from the household level septic tanks using truck mounted mobile desludging equipment and transported to Sewage Treatment Plant (STP) for treatment. At this stage, the quantity of septage generated from this area is not available. This will be estimated during the detailed design phase, and number of mobile tankers required to collect the transport the septage to STP, frequency of collection depending on the size of septic tanks etc., will be worked out accordingly. IEE needs to be updated during the detailed design phase to reflect the final project design. Although handling, transportation and disposal into STP is completely mechanized, the system will however be operated by the workers, therefore proper precautions as workers will be dealing with highly harmful septage. Accessibility of septic tanks to mobile suction tankers to collect septage is critical for success of the septage management system. At STP, the septage will be mixed with the sewage and will be co-treated in the STP. Septage will be in concentrated and partially degraded form, and disposal of the same into STP inlet stream may upset the sewage treatment process, may generate bad odours, and may ultimately affect the quality of treated wastewater. Treatment process needs to be properly designed. Following measures are suggested for implementation:

- (i) Conduct detailed survey of the households to be covered with FSSM to design the system to suit the local conditions, such as type of septic tanks and their location in the houses
- (ii) Create awareness program on the FSSM from collection to treatment system that will be adopted
- (iii) Design the sewage treatment process duly considering mixing of septage
- (iv) Ensure that the FSSM system is completely mechanized no human touch, even accidentally, from collection at household to discharge into STP, and in periodic cleaning of tankers
- (v) Demarcate a proper area for cleaning of mobile tankers in STP premises, and ensure that the wastewater shall be discharged into STP
- (vi) Provide proper training to the workers, and staff in safe handling of FSSM tasks, provide all necessary personal protection equipment
- (vii) Ensure proper facilities for workers including showers, wash areas, toilets, drinking water, eating and resting places

- (viii) Conduct regular health checks
- (ix) Prepare Health and Safety Plan for FSSM

133. **Environmental Audit of Existing Sewerage System.** As per ADB SPS, 2009 environmental audit of existing sewerage project is done. This project consisted one STP of 6.0 MLD and one SPS of 5.6 MLD. New STP 7.0MLD is proposed in the available vacant land in the same campus of existing STP. Details audit report of existing sewerage system is given in Appendix 26. Following regulatory non-compliance is noted from environmental audit of existing sewerage infrastructure in town:

- (i) Existing STP of 6.0 MLD which is based on SBR technology and following latest parameters as per NGT order dtd. 30 April 2019, therefore up-gradation of this STP is not considered under RSDTSP. But validity of CTE of this STP from Rajasthan State Pollution Control Board is expired on dtd. 30 June 2016 and CTO is also not applied/taken. Therefore CTE/CTO for existing STP will be required by Municipal Council, Makrana through existing contractor.
- (ii) There are about 30 numbers of trees planted in the vacant area of the existing STP campus, where new STP is proposed, therefore compensatory plantation in the ratio of 1:3 will be required in the same campus or any other suitable place.

134. **Corrective Measures.** Municipal Council, Makrana should take CTE and CTO for existing STP of 6.0 MLD from Rajasthan State Pollution Control Board. During final design phase in RSTDP the DBO contractor should estimate the required number of trees to be cut for construction of new STP and proposals for compensatory plantations in the ratio of 1:3 should be taken in the final design.

D. Pre-construction Impacts

135. **Utilities.** Telephone lines, electric poles and wires, water lines within the designed project locations may require to be shifted in few cases. To mitigate the adverse impacts due to relocation of the utilities, the contractor, in collaboration with ULB will (i) identify the locations and operators of these utilities to prevent unnecessary disruption of services during construction phase; and (ii) instruct construction contractors to prepare a contingency plan to include actions to be done in case of unintentional interruption of services.

136. **Social and Cultural Resources.** Any work involving ground disturbance can uncover and damage archaeological and historical remains. For this project, excavation will occur in urban area and existing roads, so there is very less risk of impacts on any archeological and historical remains. Nevertheless, PIU will:

- (i) consult Department of Archaeology and Museums to obtain an expert assessment of the archaeological potential of the site;
- (ii) consider alternatives if the site is found to be of high risk;
- (iii) include state and local archaeological, cultural and historical authorities, and interest groups in consultation forums as project stakeholders so that their expertise can be made available; and
- (iv) Develop a protocol for use by the construction contractors in conducting any excavation work, to ensure that any chance finds are recognized, and measures are taken to ensure they are protected and conserved.

137. **Site selection of construction work camps, stockpile areas, storage areas, and disposal areas.** Priority is to locate these near the project location. However, if it is deemed necessary to locate elsewhere, sites to be considered will not promote instability and result in destruction of property, vegetation, irrigation, and drinking water supply systems. Residential areas will not be considered for setting up construction camps to protect the human environment (*i.e.* to curb accident risks, health risks due to air and water pollution and dust, and noise, and to prevent social conflicts, shortages of amenities, and crime). Extreme care will be taken to avoid disposals near forest areas, water bodies, swamps, or in areas which will inconvenience the community.

138. **Mitigation measures at SPS.** During pre-construction phase, for this SPS to avoid impacts during construction and operation phases, contractor should take following mitigation measures to reduce impacts due to designed SPS:

- (i) Construction and workers camps should not be established at SPS site.
- (ii) Workers should be made aware about the inconvenience caused to nearby school and habitations and mitigation measures and good practices to minimize/avoid these impacts.
- (iii) Planning should be done to finish the works quickly at SPS site to avoid prolonged disturbance to school and residents near the SPS site.
- (iv) No night works should be conducted at SPS site.
- (v) Only soundproof equipment should be used during construction such as DG sets etc. should be having acoustic enclosures and maintained so that no smoke should be emerged beyond prescribed limit. No disturbance in respect of noise and air pollution should be caused to nearby school and habitants.

139. **Site selection of sources of materials.** Extraction of materials can disrupt natural land contours and vegetation resulting in accelerated erosion, disturbance in natural drainage patterns, water logging and water pollution. To mitigate the potential environmental impacts, locations of quarry site/s and borrow pit/s (for loose material other than stones) would be assessed by PIU. Priority would be sites already permitted by Department of Mines and Geology. If new sites are necessary, these would be located away from population centers, drinking water intakes and streams, cultivable lands, and natural drainage systems; and in structurally stable areas. It will be the construction contractor's responsibility to verify the suitability of all material sources and to obtain the approval of Department of Mines & Geology and local revenue administration. If additional quarries will be required after construction is started, then the construction contractor shall use the mentioned criteria to select new quarry sites, with written approval of PIU.

E. Construction Impacts

140. The civil works for the subproject include earth work excavation for sewer trenches, sewer laying, construction manholes, shifting of public utilities and providing house service connections. Earth work excavation will be undertaken by machine (backhoe excavator) and include danger lighting and using side rails and barricades at every 100m, while sewer laying works will include laying sewer at required gradient, fixing collars, elbows, tees, bends and other fittings including conveying the material to work spot and testing for water tightness.

141. **Laying of Sewer Networks.** The maximum depth for sewers depends on the design, and in Makrana most of the sewers will be laid 1.2 to 2m below the ground, and some sewers will be laid deeper (>2m) and maximum depth will be 5m. Sufficient care will be taken while

laying so that existing utilities and cables are not damaged and pipes are not thrown into the trenches or dragged, but carefully laid in the trenches. To ease the execution and to avoid public inconvenience during execution and safety aspects for laying deeper sewers, it is proposed to lay sewer lines with trenchless method. The technology has been preferred on the roads having dense traffic with narrow widths having sewer. The trenchless sewer has also been proposed at important circles in the city where traffic density is more, in the streets where traffic diversion is not feasible, highway crossing, railway crossing etc. In general sewer network at depth more than 3.5 m will be laid through trenchless technology. Even if the depth of sewer is more than 3.5 m but ROW is more/open area & site condition is favourable sewer may be laid with open excavation to reduce trenchless laying.

142. Trenches deeper than 1.5 m will be protected by bracings to avoid collapse of trenches, and also to avoid any risk to surrounding buildings. Once they are laid, pipes will be joined as per specification and then tested for any cracks or leakages. The minimum working hours will be 8 hours daily, the total duration of each stage depends on the soil condition and other local features. The excess excavated soil shall be used for filling low lying area or stored/ dumped in approved debris disposal sites.

143. Although construction of these project components involves quite simple techniques of civil work, the invasive nature of excavation and the project locations in the built-up areas of the town where there are a variety of human activities, will result in impacts to the environment and sensitive receptors such as residents, businesses, and the community in general. The anticipated impacts are temporary and for short duration.

144. Physical impacts will be reduced by the method of working and scheduling of work, whereby the project components will be (i) constructed by small teams working at a time; (ii) any excavation done near sensitive area like school, religious places and house will be protected as per standard norms etc.

145. **Construction of STP and SPS.** Construction impacts are the common impacts of any construction works like site clearance, demolition of old structures, excavation, erection of building/structures, health and safety of workers and nearby residents etc. which can be mitigated as per the best practices prevailing in the country which includes but not limited to health and safety arrangements for workers and nearby habitants, operation and maintenance of construction equipment, minimize air, water and noise pollution due to construction works through adoption of mitigation measures etc. Contractor is required to adopt all the measures as per best practices and standards.

146. **Designed pipe line.** A detail survey is needed after finalization of alignment to access the feasibility of the alignment for need of any tree cutting, demolition of any structure, road and railway crossings, pipe laying in any private land, presence of any sensitive receptor along alignment, disturbance to public or business etc. Mitigation measures have been prepared for potential adverse impacts. Prior consent from land owners (if pipe laying is required in private land) and NOC from concerned departments (for pipe laying in roads, road/railway crossings etc.), prior to start of construction works, is required. To mitigate the impacts of disturbance to road users during pipe laying works on road, it is strongly recommended that contractor dig only those length of road, up to which extent he can lay pipe on the same day and can back fill the trench and restore the road up to motorable conditions. All the safety measures for work on road such as barricades, road signage, traffic assistance etc. is required to be adopted by contractor during construction works. Further, if night works are required (however unlikely, applicable only

in extreme conditions) all the mitigation measures to reduce impacts of disturbance to minimum level to nearby habitants and road users should be ensured by contractor.

147. Demolition works. In the initial stage of project planning it is accessed that there is requirement of demolition of old/abandoned structures (toilets) in proposed SPS site. For this and if any demolition works are required, proper work plan and mitigation measures will be required for demolition works. Structures to be demolished should be wetted through water sprinkling to reduce dust emission. Appropriate site for storage and disposal of demolished materials should be selected prior to start of demolition activities with prior permission/approval of PIU/ULB. All the safety measures should be adopted during demolition activities.

148. Storage and Disposal of excavated earth. A large quantity of soil will be excavated for pipe laying, construction of STP and SPS. Some part of this excavated soil will be reused for backfilling and/or surface leveling; rest of the soil will be needed to be disposed in other locations. Proper storage and disposal plan from contractor is required before start of the work. Prior permission from land owner/concerned authority for storage and disposal of excess earth is required. Prior to the commencement of works, Contractor will follow all the prescribed rules¹⁸ and shall identify a debris disposal site in consultation with the PIU/ULB and adhering to following criteria:

- (i) The site shall be selected preferably from barren, infertile lands. In case agricultural land needs to be selected, top-soil stripping, stacking and preservation should be undertaken prior to initiation of any activities.
- (ii) Debris disposal site shall be at least 200 m away from any surface water body.
- (iii) No residential areas shall be located within 200 m downwind side of the site.
- (iv) The site is minimum 250 m away from sensitive locations like hospitals, religious places, ponds/lakes or other water bodies.
- (v) The local governing body and community shall be consulted while selecting the site.
- (vi) Soil storage site should be properly demarcated by fencing and information board should be placed at entrance.
- (vii) At soil storage site soil should be covered by tarpaulin or regular water sprinkling should be done to reduce dust emission.
- (viii) At soil disposal site the disposed soil should be leveled on daily basis and no heap or mound should be left at end of the day.

149. Sources of Materials. Significant amount of gravel, sand, coarse aggregate, and cement will be required for this project. The construction contractor will be required to:

- (i) Use material sources permitted by government;¹⁹
- (ii) Verify suitability of all material sources and obtain approval of PIU; and
- (iii) Submit to PIU on a monthly basis documentation of sources of materials. If contractor is purchasing ready mix concrete, asphalt/macadam and aggregates from third party, contractor will assure that all the parties/ suppliers are having

¹⁸ Construction and Demolition Waste Management Rules 2016 and Solid Waste Management Rules (refer appendix-8)/Table-1.

¹⁹ CTE and CTO will be required for batching plant, hot mix plant, crushers etc. if specifically established for this project. If contractor is purchasing raw material or ready-mix concrete, asphalt/macadam and aggregates from third party, he has to be assured that third party is having CTE/CTO from RPCB and should collect the copy of these and submit to PIU/consultants.

CTE/CTO from RPCB and will collect the copy of these certificates and submit to PIU/consultants.

150. **Air Quality.** Emissions from construction vehicles, equipment, and machinery used for excavation and construction will induce impacts on the air quality in the construction sites. Anticipated impacts include dusts and increase in concentration of vehicle-related pollutants such as carbon monoxide, sulfur oxides, particulate matter, nitrous oxides, and hydrocarbons. These however will be temporary limiting to construction activities only. To mitigate the impacts, construction contractors will be required to:

- (i) Consult with PIU/Consultant on the designated areas for stockpiling of, soils, gravel, and other construction materials;
- (ii) Damp down exposed soil and any stockpiled material on site by water sprinkling;
- (iii) Use tarpaulins to cover sand and other loose material when transported by trucks;
- (iv) Clean wheels and undercarriage of haul trucks prior to leaving construction site
- (v) Don't allow access in the work area except workers to limit soil disturbance and prevent access by barricading and security personnel.
- (vi) Fit all heavy equipment and machinery with air pollution control devices which are operating correctly, DGs should have proper stake height as per norms;
- (vii) Ensure all the equipment are having PUC certificates.
- (viii) Do regular water sprinkling in dusty areas to reduce dust emission during works.
- (ix) Damp down the structures before demolishing to reduce dust emission.
- (x) Damp down on regular basis all the access ways.
- (xi) Maintain all the equipment and vehicles to reduce emission of smoke and keep pollution under control and keep records of periodic maintenance.
- (xii) Conduct ambient air quality monitoring periodically as per Environmental Management Plan EMP.

151. **Surface Water Quality.** Run-off from stockpiled materials and chemical contamination from fuels and lubricants during construction works can contaminate downstream surface water quality of the streams. These potential impacts are temporary and short-term duration only. However, to ensure that these are mitigated, construction contractor will be required to:

- (i) Prepare and implement a spoils management plan.
- (ii) Avoid constructing any construction camps and labour camps away from any water body and do not allow disposing any waste or sullage into any water body.
- (iii) Avoid stockpiling of earth fill especially during the monsoon season unless covered by tarpaulins or plastic sheets;
- (iv) Prioritize re-use of excess spoils and materials in the construction works. If spoils will be disposed, consult with PIU on designated disposal areas;
- (v) Install temporary silt traps or sedimentation basins along the drainage leading to the water bodies;
- (vi) Place storage areas for fuels and lubricants away from any drainage leading to water bodies; and provide impermeable lining under the storage yard of fuels and lubricants
- (vii) Dispose any wastes generated by construction activities in designated sites.
- (viii) Keep oil tray or pans under the DG set or during maintenance of mechanical equipment to avoid oil spillage resulting soil and water pollution, and
- (ix) Conduct surface quality monitoring according to the Environmental Management Plan (EMP).

152. Noise and Vibration Levels. Construction works will be conducted along the roads (for pipe laying) in Makrana urban area, where there are houses, schools and hospitals, religious places and small-scale businesses. The sensitive receptors are the general population in these areas. Increase in noise level may be caused by excavation, particularly breaking of cement concrete or bitumen roads, operation of construction equipment like concrete mixers, and the transportation of equipment, materials, and people. Vibration generated from construction activity, for instance from the use of pneumatic drills, will have impact on nearby buildings. This impact is negative but short-term, and reversible by mitigation measures. The construction contractor will be required to:

- (i) Plan activities in consultation with PIU so that activities with the greatest potential to generate noise are conducted during periods of the day which will result in least disturbance;
- (ii) Use road cutters instead of breaker/hammer for cutting the road before excavation for pipe laying on roads.
- (iii) Horns should not be used unless it is necessary to warn other road users or animals of the vehicle's approach;
- (iv) Minimize noise from construction equipment by using vehicle silencers, fitting jackhammers with noise-reducing mufflers, and use portable street barriers to minimise sound impact to surrounding sensitive receptor; and
- (v) DGs being used at site should have sound reducing enclosures, preferably silent DGs should be used at site;
- (vi) Maintain maximum sound levels not exceeding 80 decibels (dBA) when measured at a distance of 10 m or more from the vehicle/sand equipment.
- (vii) Identify any buildings at risk from vibration damage and avoiding any use of pneumatic drills or heavy vehicles in the vicinity;
- (viii) Consult the custodians of important buildings, cultural and tourism authorities and local communities in advance of the work to identify and address key issues, and avoid working at sensitive times, such as religious and cultural festivals.
- (ix) Provide all workers appropriate PPEs like ear plug/muff, working in high noise conditions;
- (x) Keep all vehicles and equipment in good conditions to avoid excessive noise generation;
- (xi) Provide noise barriers near sensitive receptors such as schools, hospitals & religious places, courts etc. and consult in advance with sensitive receptors about the working hours (specially schools, hospitals, offices, courts etc) and avoid noisy works in those hours;
- (xii) Avoid noisy works in nights in inhabited areas to avoid any disturbance to habitants; and
- (xiii) Consult in advance with habitants and inform them about the nature and duration of works.
- (xiv) Conduct noise monitoring according to the Environmental Management Plan (EMP).

153. Management Plan for Night works at Project Sites (if required). Following requirements should be fulfilled for construction works at night hours-(Appendix 17).

- (i) Night works should be avoided at construction sites specially in residential areas and should be performed only when day works are not possible due to excessive traffic/public/pedestrian movement, site of cultural or religious importance, where there is huge crowd during day hours or any other unavoidable circumstances.

- (ii) Contractor should plan for night works only after directions from PMU/PIU/DSC.
- (iii) Contractor should submit plan for night works for approval from PIU.
- (iv) PIU should ensure that prior written information should be given to local authorities such as district administration, Police/traffic police, line agencies concerned, residents welfare association/business association/vyaparmandal of the affected areas and their consents/permissions should be taken prior to start of night works.
- (v) PIU/DSC engineers should check and ensure that all the preparation as per management plan is done by contractor and contractor is having all the necessary equipment and materials for night works.
- (vi) Contractor is required to have following equipment/arrangements for night works-
 - Contractors should have hand held noise level meter for measurement of noise during night hours
 - Contractors should have hand held lux meter for the measurement of illumination during night hours
 - Preferably electrical connections is available for running equipment otherwise sound proof/super silent Diesel Generator set should be available
 - Sound level should not increase as per following:

Type of area of work	Maximum noise level dB(A)
Industrial	70
Commercial	55
Residential	45
Silence zone	40

- Illumination should be as follows:

Minimum illumination (lx)	Areas to be illuminated	Type of work activity
54	Illumination throughout the work area	General work area lighting and performance of visual tasks of large size, or medium contrast, or low require accuracy.
108	Illumination of work area and areas adjacent to equipment	Performance of visual tasks of medium size, or low to medium contrast, or medium required accuracy.
216	Illumination of task	Performance of visual tasks of small size, or low contrast or high required accuracy or fine finish.

- As far as possible ready mix concrete from batching plant to be used, otherwise the concrete should be prepared away from residential areas and brought to the site
- All the noise activity like hammering, cutting, crushing, running of heavy equipment should be done in day time and avoided in night time
- Workers engaged in night works should have adequate rest/sleep in day time before start of night works

- Worker engaged for night works should have previous experience of night works and should be physically fit for such works including clear vision in night
 - All the necessary provisions of traffic aids such as traffic signals, road signage, barricades, cautions boards, traffic diversion boards etc. should be available with fluorescent/retro-reflective arrangements.
 - Workers should be trained before start of night works about risks and hazards of night works and their mitigation measures and should be provided all the protective aids (PPEs) including fluorescent/retro-reflective vests.
 - Horns should not be permitted by equipment and vehicles, until it is an emergency situation;
 - Workers should not shout and create noise.
 - First aid and emergency vehicles should be available at site.
 - Emergency preparedness plan should be operative during night works.
 - Old persons and pregnant women and women having small kids should not work in night time.
 - All the vehicles and equipment being used at night works should have adequate type of silencers/enclosures/mufflers to reduce noise.
 - All the vehicles should be checked for working head lamps, tail lamps, inner lights etc. before start of night works.
- (vii) PIU/CMSC site engineers and contractors safety personnel should closely monitor the safety of works continuously and noise and illumination levels on hourly basis and maintain photographic and videographic records as well as register the observations and same is given in Appendix 24.
- (viii) Night works should be stopped early in the morning at least one hour before start of pedestrian/traffic movement.
- (ix) After completion of night works all the site should be cleaned and maintained obstruction free for day time movement of vehicles and pedestrians
- (x) Drivers and workers should be alert and responsive during night works:
- (xi) All the wages to workers working in night hours should be as per the applicable labour acts.
- (xii) Avoid any nuisance which may create problems to nearby habitants and work peacefully during night hours.
- (xiii) Night works should not be conducted near hospitals and during peak seasons such as peak tourist season, students' exam times etc.

154. **Landscape and Aesthetics.** The construction works does not envisage any cutting of trees, but it will produce excess excavated earth, excess construction materials, and solid waste such as removed concrete, wood, packaging materials, empty containers, spoils, oils, lubricants, and other similar items. Haphazard disposal of these will have negative impacts on landscape and overall aesthetics. These impacts are negative but are of short-term and reversible by mitigation measures. The construction contractor will be required to:

- (i) Prepare and implement spoils management plan;
- (ii) Avoid stockpiling of excess excavated soils;
- (iii) Coordinate with ULB for beneficial uses of excess excavated soils or immediately dispose to designated areas;
- (iv) Recover used oil and lubricants and reuse or remove from the sites;

- (v) Manage solid waste according to the following preference hierarchy: reuse, recycling and disposal to designated areas;
- (vi) Remove all wreckage, rubbish, or temporary structures which are no longer required; and
- (vii) Request PIU to report in writing that the necessary environmental restoration work has been adequately performed before acceptance of work.
- (viii) Minimize removal of vegetation and disallow cutting of trees;
- (ix) If tree-removal will be required, obtain tree-cutting permit from the Revenue Department; and
- (x) Plant three native trees for every one that is removed.

155. **Groundwater Quality.** Another physical impact that is often associated with excavation is the effect on drainage and the local water table if groundwater and surface water collect in the voids. Although, groundwater is much deeper than the proposed trenching depth, and rains are scarce and limited to very short duration during monsoon to ensure that water will not pond in pits and voids near project location, the construction contractor will be required to conduct excavation works in non-monsoon season to the maximum extent possible. These potential impacts are temporary and short-term duration only. However, to ensure that these are mitigated, construction contractor will be required to:

- (i) Prepare and implement a spoils management plan (Appendix-14);
- (ii) Avoid stockpiling of earth fill especially during the monsoon season unless covered by tarpaulins or plastic sheets;
- (iii) Prioritize re-use of excess spoils and materials in the construction works. If spoils will be disposed, consult with PIU on designated disposal areas;
- (iv) Install temporary silt traps or sedimentation basins along the drainage leading to the water bodies;
- (v) Place storage areas for fuels and lubricants away from any drainage leading to water bodies;
- (vi) Dispose any wastes generated by construction activities in designated sites; and
- (vii) Conduct surface quality water quality and ground water quality monitoring according to the Environmental Management Plan (EMP).

156. **Accessibility.** Excavation along the roads, hauling of construction materials and operation of equipment on-site can cause traffic problems. Potential impact is negative but short term and reversible by mitigation measures. The construction contractor will be required to:

- (i) Prepare and implement a Traffic Management Plan (Appendix-15).
- (ii) Plan transportation routes so that heavy vehicles do not use narrow local roads, except in the immediate vicinity of delivery sites;
- (iii) Schedule transport and hauling activities during non-peak hours;
- (iv) Locate entry and exit points in areas where there is low potential for traffic congestion;
- (v) Keep the site free from all unnecessary obstructions;
- (vi) Drive vehicles in a considerate manner;
- (vii) Coordinate with Traffic Police for temporary road diversions and for provision of traffic aids if transportation activities cannot be avoided during peak hours; and
- (viii) Notify affected sensitive receptors by providing sign boards informing nature and duration of construction works and contact numbers for concerns/complaints.

- (ix) Maintain sufficient access to houses and shopkeepers (commercial establishments) during pipe laying work through metal sheets and temporary bridges.

157. Wherever road width is minimal, there will be temporary loss of access to pedestrians and vehicular traffic (including 2-wheelers) during the laying of pipes. Under those circumstances, contractor shall adopt following measures:

- (i) Inform the affected local population 1-week in advance about the work schedule
- (ii) Plan and execute the work in such a way that the period of disturbance/ loss of access are minimum.
- (iii) Provide pedestrian access in all the locations until normalcy is restored. Provide wooden/metal planks over the open trenches at each house to maintain the access.

158. **Traffic diversion and/or road closure.** Laying of sewer simultaneously may significantly impact the traffic movement. This should be avoided as far as possible by proper planning of construction works. If traffic diversion and/or road closure is required for the designed works, prior consent from traffic department will be required and prior information to affected areas and public should be disseminated through consultations by CAPPC. Proper road signage and traffic aids should be provided at site. Excavation along the roads, hauling of construction materials and operation of equipment on-site can cause traffic problems. As the trenchless method adopted for sewers of more than 3.5 m deep avoiding open cut excavation, this will avoid large scale disturbances in the busy roads. Potential impact is negative but short term and reversible by mitigation measures. The construction contractor will be required to:

- (i) Plan water and sewer line works to minimize traffic disturbance / blockades; as the both water and sewer lines are to be laid in all the roads and streets in the town, work planning is crucial to minimize the inconvenience to public due to repeated excavations
- (ii) Prepare and implement a Traffic Management Plan (Appendix 15)
- (iii) Duly consider and select sections for trenchless method of pipelaying based on traffic conditions
- (iv) Locate entry and exit points in areas where there is low potential for traffic congestion;
- (v) Keep the site free from all unnecessary obstructions;
- (vi) Coordinate with Traffic Police for temporary road diversions and for provision of traffic aids if transportation activities cannot be avoided during peak hours;
- (vii) Notify affected sensitive receptors by providing sign boards informing nature and duration of construction works and contact numbers for concerns/complaints.
- (viii) Maintain sufficient access to houses and shopkeepers (commercial establishments) during pipe/sewer laying work through metal sheets and temporary bridges

159. **Socio-Economic-Income.** The project components will be located in government land and there is no requirement for land acquisition or any resettlement. Construction works will impede the access of residents to specific site in limited cases. The potential impacts are negative and moderate but short-term and temporary. The construction contractor will be required to:

- (i) Prepare and implement spoils management plan (Appendix-14);

- (ii) Leave spaces for access between mounds of soil;
- (iii) Provide walkways and metal sheets where required to maintain access across trenches for people and vehicles;
- (iv) Increase workforce in the areas with predominantly institutions, place of worship, business establishment, hospitals, and schools;
- (v) Consult businesses and institutions regarding operating hours and factoring this in work schedules; and
- (vi) Provide sign boards for pedestrians to inform nature and duration of construction works and contact numbers for concerns/complaints.
- (vii) Notify community/water users in advance about likely interruptions (if any) in water supply.
- (viii) Provide alternate sources of clean water until water supply is restored.
- (ix) Provide all mitigation measures as given in resettlement plan (RP) prepared for the project to mitigate impacts on vendors and shopkeepers.

160. **Socio-Economic–Employment.** Manpower will be required during the 36-months construction stage. This can result in generation of temporary employment and increase in local revenue. Thus potential impact is positive and long-term. The construction contractor will be required to:

- (i) During construction, labour will be deployed/hired from nearby villages. Local villagers/inhabitants will be given preferences and engaged as per their skills/expertise etc.
- (ii) All the raw material will be procure/source from local market to cut the cost of transportation.

161. **Occupational Health and Safety.** Workers need to be taken due care of the occupational hazards which can arise from working in height and excavation works. Potential impacts are negative and long-term but reversible by mitigation measures. The construction contractor will depute experienced EHS personnel and be required to:

- (i) Comply with all national, state and local labor laws (see Appendix 8);
- (ii) Following best practice health and safety guidelines: IFC's General EHS Guidelines,²⁰ WHO Interim Guidance (and its updates) on Water, Sanitation, Hygiene and Waste management for the COVID-19 virus (Appendix 29), and Sector Specific (Water and Sanitation) Guidelines;²¹
- (iii) Develop and implement site-specific occupational health and safety (OHS) Plan which will include measures such as: (a) excluding public from the site; (b) ensuring all workers are provided with and use personal protective equipment; (c) OHS Training²² for all site personnel; (d) documented procedures to be followed for all site activities; and (e) documentation of work-related accidents;

²⁰ <https://www.ifc.org/wps/wcm/connect/554e8d80488658e4b76af76a6515bb18/Final%2B-General%2BEHS%2BGuidelines.pdf?MOD=AJPERES>

²¹ <https://www.ifc.org/wps/wcm/connect/e22c050048855ae0875cd76a6515bb18/Final%2B-Water%2Band%2BSanitation.pdf?MOD=AJPERES>

²² Some of the key areas that may be covered during training as they relate to the primary causes of accidents include (i) slips, trips and falls; (ii) personal protective equipment; (iii) ergonomics, repetitive motion, and manual handling; (iv) workplace transport; and (v) legislation and responsibilities. Training can provide the foundations of competence but it does not necessarily result in a competent worker. Therefore, it is essential to assess staff competence to ensure that the training provided is relevant and effective. Supervision and monitoring arrangements shall be in place to ensure that training has been effective and the worker is competent at their job.

- (iv) Ensure that qualified first-aid is provided at all times. Equipped first-aid stations shall be easily accessible throughout the site;
- (v) Provide medical insurance coverage for workers;
- (vi) Secure all installations from unauthorized intrusion and accident risks;
- (vii) The project area experiences extreme temperature during summer months of April and May, which may affect the health of workers engaged in construction work. Contractor should take necessary measures during summers including the following:
 - a. Work schedule should be adjusted to avoid peak temperature hours (12–3 PM)
 - b. Provide appropriate shade near the workplace; allow periodic resting and provide adequate water.
 - c. Provide necessary medicine and facilities to take care of dehydration related health issues.
- (viii) Provide supplies of potable drinking water;
- (ix) Provide clean eating areas where workers are not exposed to hazardous or noxious substances;
- (x) Provide H&S orientation training to all new workers to ensure that they are apprised of the basic site rules of work at the site, personal protective protection, and preventing injuring to fellow workers;
- (xi) Provide visitor orientation if visitors to the site can gain access to areas where hazardous conditions or substances may be present. Ensure also that visitor/s do not enter hazard areas unescorted;
- (xii) Ensure the visibility of workers through their use of high visibility vests when working in or walking through heavy equipment operating areas;
- (xiii) Ensure moving equipment is outfitted with audible back-up alarms;
- (xiv) Mark and provide sign boards for hazardous areas such as energized electrical devices and lines, service rooms housing high voltage equipment, and areas for storage and disposal. Signage shall be in accordance with international standards and be well known to, and easily understood by workers, visitors, and the general public as appropriate; and
- (xv) Disallow worker exposure to noise level greater than 85 dBA for duration of more than 8 hours per day without hearing protection. The use of hearing protection shall be enforced actively.

162. Community Health and Safety. Hazards posed to the public, specifically in high-pedestrian areas may include traffic accidents and vehicle collision with pedestrians. Potential impact is negative but short-term and reversible by mitigation measures. The construction contractor will be required to:

- (i) Plan routes to avoid times of peak-pedestrian activities.
- (ii) Liaise with PIU in identifying risk areas on route cards/maps.
- (iii) Maintain regularly the vehicles and use of manufacturer-approved parts to minimize potentially serious accidents caused by equipment malfunction or premature failure.
- (iv) Provide road signs and flag persons to warn of on-going trenching activities.

The level of supervision and monitoring required is a management decision that shall be based on the risks associated with the job, the level of competence required, the experience of the individual and whether the worker works as part of a team or is a lone worker.

163. Central part of the town is characterized by narrow roads. Particularly, the areas located have very narrow roads with sharp turns and are accessible only to pedestrians. Besides impeding the access, the trench excavation and pipe laying will pose safety risks to pedestrians, and the people living in these areas. Though the width (<500 mm) and depth (<750 mm) of trench is minimal, it will pose safety risk, especially for children and elders. The construction contractor will be required to:

- (i) Provide prior information to the local people about the nature and duration of work
- (ii) Conduct awareness program on safety during the construction work
- (iii) Undertake the construction work stretch-wise; excavation, pipe laying and trench refilling should be completed on the same day
- (iv) Provide barricades, and deploy security personnel to ensure safe movement of people and also to prevent unnecessary entry and to avoid accidental fall into open trenches

164. **Establishment and Operation of Construction Camps and Workers Facilities.** It is likely that the contract may employ workers from outside project area, and therefore may provide temporary workers accommodation during the construction phase. Proper provision and maintenance of facilities is necessary for proper living conditions and avoid health, environment and safety issues. Workers camps may also have adverse impacts on surrounding communities. Operation of construction camps can cause temporary air and noise pollution from machine operation, water pollution from storage and use of fuels, oils, solvents, and lubricants. Potential impacts are negative but short-term and reversible by mitigation measures. The construction contractor will be required to:

- (i) Consult PIU before locating project offices, sheds, and construction plants;
- (ii) Minimize removal of vegetation and disallow cutting of trees;
- (iii) Provide drinking water, water for other uses, and sanitation facilities for employees;
- (iv) Provide temporary rest and eating area at all work sites
- (v) Ensure conditions of liveability at work camps are maintained at the highest standards possible at all times; living quarters and construction camps shall be provided with standard materials (as far as possible to use portable ready to fit-in reusable cabins with proper ventilation); thatched huts, and facilities constructed with materials like GI sheets, tarpaulins, etc., shall not be used as accommodation for workers; accommodation shall meet the IFC standards for workers accommodation²³ which include: provision of safe housing, availability of electricity, plumbing, water and sanitation, adequate fire protection and dormitory/room facilities; accommodation shall be in the range from 10 to 12.5 cubic meters (volume) or 4 to 5.5 square meters (surface) per worker, a minimum ceiling height of 2.10 m; a reasonable number of workers are allowed to share the same room – (standards range from 2 to 8 workers); workers with accompanying families shall be provided with a proper and safe accommodation (IFC benchmark standards for workers accommodation is provided in Appendix 16) Prohibit employees from poaching wildlife and cutting of trees for firewood;

²³

https://www.ifc.org/wps/wcm/connect/topics_ext_content/ifc_external_corporate_site/sustainability-at-ifc/publications/publications_gpn_workersaccommodation

- (vi) Train employees in the storage and handling of materials which can potentially cause soil contamination;
- (vii) Recover used oil and lubricants and reuse or remove from the site;
- (viii) Manage solid waste according to the following preference hierarchy: reuse, recycling and disposal to designated areas;
- (ix) Remove all wreckage, rubbish, or temporary structures which are no longer required; and
- (x) Report in writing that the camp has been vacated and restored to pre-project conditions before acceptance of work.

165. **Social and Cultural Resources.** For this project, excavation will occur at locations known not to have archaeological values, so there is a low risk of such impacts. Nevertheless, the construction contractor will be required to:

- (i) Strictly follow the protocol for chance finds in any excavation work;
- (ii) Request PIU or any authorized person with archaeological/historical field training to observe excavation;
- (iii) Stop work immediately to allow further investigation if any finds are suspected;
- (iv) Inform PIU/Consultant if a find is suspected and take any action they require ensuring its removal or protection in situ.
- (v) Adjacent to religious/historic sites, undertake excavation and construction work in such a way that no structural damage is caused to the building.

166. **Debris disposal.** Prior to the commencement of works, contractor shall identify a debris disposal site in consultation with the PIU and Consultant and prepare a disposal plan for approval from ULB and RUIDP. Contractor will follow all the prescribed rules²⁴ during construction and adhering to following criteria (including but not limited to):

- (i) The site shall be selected preferably from barren, infertile lands. In case agricultural land needs to be selected, top-soil stripping, stacking and preservation should be undertaken prior to initiation of any activities.
- (ii) The local governing body and community shall be consulted while selecting the site.
- (iii) Contractor shall prepare a construction and demolition waste management plan in pre-construction phase for safe disposal of construction and demolition wastes as per applicable rules and submit to Municipal Council through PIU for approval
- (iv) Debris disposal site shall be at least 200 m away from surface water bodies.²⁵
- (v) No residential areas shall be located within 100 m downwind side of the site.
- (vi) The site is minimum 250 m away from sensitive locations like hospitals, religious places, ponds/lakes or other water bodies.

F. Operation and Maintenance Impacts

167. Operation and Maintenance of the sewerage system will be carried out by DBO contractor for 10 years and then directly by Makrana Municipal Council. The system has a design life of 30 years, during which time, the system shall not require major repairs or

²⁴ Construction and Demolition Waste Management Rules 2016 (refer appendix 7)

²⁵ In the absence of site meeting the stipulated criteria, an alternate site can be selected specifying the reasons. In such a case, the construction camp management plan should incorporate additional measures specific to the site as suggested by the Construction Manager.

refurbishments and should operate with little maintenance beyond routine actions required to keep the equipment in working order. The stability and integrity of the system will be monitored periodically to detect any problems and allow remedial action if required. Any repairs will be small-scale involving manual, temporary, and short-term works involving regular checking and recording of performance for signs of deterioration, servicing and replacement of parts.

168. **Safe Disposal of Treated Effluent and Sludge from STP.** Treated wastewater is designed to be utilized in reuse applications following the Sewerage and Wastewater Policy 2016 of Rajasthan, and accordingly Reuse Plan will be prepared by the DBO contractor during the detailed design phase. As stated previously, subproject will be implemented under design-build-operate (DBO), and the successful bidder / DBO contractor will carry out detailed designs, therefore at present the subproject is designed in outline only. The treated wastewater if utilized for reuse purposes as per the Reuse Plan there will be no negative impacts, and in fact it will enhance environmental benefits in the form of water savings. Various measures to safeguard environment and health environment in utilizing the treated wastewater, including required quality for various process will be established in the reuse plan and will be implemented accordingly. All necessary safety, mitigation and monitoring measures as suggested in the reuse plan shall be implemented. The excess / surplus / unused wastewater, if any, will be discharged into local drains/streams. These run dry except during monsoon. It carries untreated wastewater from habitations along its course. Considering the existing status of streams, and the degree of treatment designed, no significant impacts envisaged. However, any change / lowering of treatment efficiency during operation may lead to poor quality of wastewater and affect the reuse. Mixing of industrial effluents in sewers may affect the inlet quality of sewage. It is therefore critical that STP receives the sewage with intended quality and treats the same to design discharge standards.

169. STP operational procedures will be firmed up during the detailed design phase, including the amount of automated or manual operation. It must be ensured that the facility is operated with standard operating procedures and only by trained staff. Ensuring uninterrupted power supply with back-up facility is a must. Standard operating procedures and operation manual will be prepared by the DBO contractor. Besides routine operation, this should cover all necessary items such as preventive maintenance, periodic maintenance and emergency maintenance, replacement of pumps, motors, and other electro-mechanical parts as per the design life to optimize energy use and system efficiency etc., Adequate resources – technical and financial, has been taken into consideration in the project design. Manual will also include safety awareness and mock drills for worker safety.

170. Subproject includes sludge management infrastructure in STP, including system for sludge collection, thickening, solar drying, and disposal at landfill/identified site. This includes a Sludge Sump to collect sludge from SBR basins; returning arrangement for supernatant from the sump to inlet/equalization tank for treatment; pumping sludge to sludge thickener and pumping thickened to mechanical sludge dewatering system (such as centrifuge). It also requires contractor to establish a shed where the dewatered sludge cake can be further air dried for 15 days. This is indicative sludge management system, and DBO contractor will design the system meeting these requirements and prepare sludge management plan. Bid indicates that “the sludge produced from the treatment process would be processed so it may be used as fertilizer and soil conditioner” and it requires DBO contractor “to conform to the regulations of public health and environment protection norms”. The norms for safe use of processed sludge as fertilizer and soil conditioner are already discussed in this IEE. This follows the Sewerage and Wastewater Policy, 2016, which suggests “use of sludge produced from the treatment as fertilizer and soil conditioner after processing”. A sludge disposal site will be identified during the

detailed design phase to dispose unutilized dried sludge in reuse applications. The updated IEE will include the details of disposal site. If the sludge is managed accordingly, there will be no impacts.

171. During the operation phase, it is necessary that the facility is operated by trained staff as per the standard operating procedures. Following measures are suggested for implementation / compliance during the operation phase:

- (i) Ensure that treated wastewater meets the established discharge standards all times; Conduct regular wastewater quality monitoring (at inlet and at outlet of STP) to ensure that the treated effluent quality complies with design standards;
- (ii) Ensure implementation of Reuse Plan, and ensure intended quality for each direct reuse
- (iii) Assess composition and characteristics of sludge from the first batch operation at the initial phases, and confirm the handling, management and disposal/reuse actions suggested in the management plan
- (iv) Conduct periodic testing of dried sludge/compost to check presence of heavy metals and confirming the concentrations to use as compost as specified in the Standards for Composting, Schedule II A, Solid Waste Management Rules, 2016, FCO = Fertilizer Control Order, 1985, amendments in 2009 and 2013. It shall not be used for food crops.
- (v) Ensure valid consent to operate (CTO) from RSPCB for operation of STP
- (vi) Ensure that all conditions/standards prescribed by RSPCB are complied duly
- (vii) Ensure that chlorinator facility is operated only by trained staff and as per the standard operating procedures; in case of any accident and/or maintenance activity, ensure that the staff follows documented procedures only
- (viii) Implement Emergency Response System (ERS) for the chlorine leakage; Guidelines and Emergency plan for handling and storing chlorine is attached as Appendix 19
- (ix) Ensure proper knowledge transfer, hands-on training to municipal staff engaged in STP operation has been provided by contractor prior to handover of facility;
- (x) Operate and maintain the facility following standard operating procedures of operational manual;
- (xi) Undertake preventive and periodic maintenance activities as required;
- (xii) Conduct periodic training to workers; ensure that all safety apparatus at STP including personal protection equipment are in good condition all times; and are at easily accessible and identifiable place; periodically check the equipment, and conduct mock drills to deal with emergency situations;
- (xiii) No wastewater from industrial premises (including domestic wastewater) shall be allowed to dispose into municipal sewers; monitor regularly and ensure that there is no illegal discharge through manholes or inspection chambers; conduct public awareness programs; in coordination with RSPCB.

172. There are also certain environmental risks from the operation of the sewer system, most notably from leaking sewer pipes as untreated fecal material can damage human health and contaminate both soil and groundwater. It will be imperative therefore that the operating agency establishes a procedure to routinely check the operation and integrity of the sewers, and to implement rapid and effective repairs where necessary. There is an occupation health risk to workers engaged in sewer maintenance activities. Following measures should inter alia be followed:

- (i) Establish regular maintenance program, including:
- (ii) Regular cleaning of grit chambers and sewer lines to remove grease, grit, and other debris that may lead to sewer backups. Cleaning should be conducted more frequently for problem areas.
- (iii) Inspection of the condition of sanitary sewer structures and identifying areas that need repair or maintenance. Items to note may include cracked/deteriorating pipes; leaking joints or seals at manhole; frequent line blockages; lines that generally flow at or near capacity; and suspected infiltration or exfiltration; and
- (iv) Monitoring of sewer flow to identify potential inflows and outflows
- (v) Conduct repairs on priority based on the nature and severity of the problem. Immediate clearing of blockage or repair is warranted where an overflow is currently occurring or for urgent problems that may cause an imminent overflow (e.g. pump station failures, sewer line ruptures, or sewer line blockages);
- (vi) Review previous sewer maintenance records to help identify "hot spots" or areas with frequent maintenance problems and locations of potential system failure, and conduct preventative maintenance, rehabilitation, or replacement of lines as needed;
- (vii) When a spill, leak, and/or overflow occurs, keep sewage from entering the storm drain system by covering or blocking storm drain inlets or by containing and diverting the sewage away from open channels and other storm drain facilities (using sandbags, inflatable dams, etc.). Remove the sewage using vacuum equipment or use other measures to divert it back to the sanitary sewer system.
- (viii) Prohibit/prevent disposal of wastewater/effluent from industrial units in the sewers; ensure regular checking to ensure no illegal entry of industrial wastewater into sewers
- (ix) Develop an Emergency Response System for the sewerage system leaks, burst and overflows, etc.
- (x) Provide necessary health and safety training to the staff
- (xi) Provide all necessary personnel protection equipment
- (xii) During cleaning/clearing of manholes and sewer lines great precautions should be taken for the safety of workers conducting such works.
- (xiii) As far as possible use remote / CCTV mechanism to identify/detect the problems in sewers and do not engage persons for this purpose
- (xiv) As far as possible use mechanized cleaning of manholes and sewers by using modern techniques and machines and do not engage persons for this purpose
- (xv) Ensure that maintenance staff and supervisors understand the risks; provide proper instructions, training and supervision.
- (xvi) Use gas detector to detect any hazardous or inflammable gas in confined areas like sewers /manholes prior to maintenance process
- (xvii) Provide suitable personal protective equipment that may include waterproof / abrasion-resistant gloves, footwear, eye and respiratory protection. Face visors are particularly effective against splashes. Equipment selection and a proper system for inspection and maintenance are important.
- (xviii) Provide adequate welfare facilities, including clean water, soap, nail brushes, disposable paper towels, and where heavy contamination is foreseeable, showers.
- (xix) For remote locations portable welfare facilities should be provided.
- (xx) Areas for storage of clean and contaminated equipment should be segregated and separate from eating facilities.
- (xxi) Provide adequate first-aid equipment, including clean water or sterile wipes for cleansing wounds, and a supply of sterile, waterproof, adhesive dressings.

- (xxii) Make effective arrangements for monitoring the health of staff.
- (xxiii) Keep emergency preparedness plan ready before starting the work of sewage system cleaning

173. Biological hazards are among the environmental risks that may adversely impact the health and wellness of the workers and the community. Breakouts of diseases such as diarrhea, flu or pandemics such as the coronavirus disease (COVID-19) shall be avoided. Designs and implementation of treatment systems shall ensure that disease-causing pathogens or viruses are disinfected and will not cause any health issues. The World Health Organization has released an interim guidance on Water, Sanitation, Hygiene and Waste Management for the COVID-19 virus (see Appendix 29). Measures on managing wastewater and fecal waste and keeping water supplies safe is critical to avoid the start or spread of any disease.

174. **Operation of FSSM.** About 10% of total households will be covered with FSSM system wherein which septage from individual septic tanks at houses will be collected via mobile / vehicle mount tankers with suction equipment, transport and discharged into STP for safe treatment and disposal. Although system will be completely mechanized, given the very harmful nature of septage, following precautionary measures shall be implemented:

- (i) Create awareness program on the FSSM in general public
- (ii) Implement Health and Safety Plan for FSSM
- (iii) Provide proper training to the workers, and staff in safe handling of FSSM tasks, provide all necessary personal protection equipment and ensure their usage;
- (iv) Ensure that the system is operated completely mechanically, with least involvement of workers; there shall be no direct contact of septage to any worker or staff
- (v) Ensure proper facilities for workers including showers, wash areas, toilets, drinking water, eating and resting places
- (vi) Conduct regular health checks
- (vii) Ensure that tankers cleaning is done mechanically, and in the demarcate area at STP, and the wastewater generated in the process shall be discharged into STP.

175. **Septic Tank Closure Plan:** An additional 40% of the households are connected to the new sewerage network coming up under the project. However, the existing septic tank system that is being used by the residents should be closed appropriately. This is to prevent the contamination of groundwater or surface water or land resulting from improperly closed septic tank system or septic tank failure. Effective and proper closure of septic tanks can be achieved when the sillage present in the system is emptied into a larger mobile tank which is later sent to the treatment plant for effective treatment. Later, the walls of the septic walls should be removed and disposed as construction debris appropriately. Subsequently, the empty septic tank pit should be filled with stone, coarse and fine sand material to complete the septic tank closure. Towards this, the ULB should establish a mechanism by which the household owners can hire recognized service providers to perform effective septic tank closures and the ULB can issue a closure permit after inspection.

176. Repair works could cause some temporary disruption of activities at locations of social and cultural importance such as schools, hospitals, churches, tourist sites etc., so the same precautions as employed during the construction period should be adopted. ULB needs to:

- (i) Identify any buildings at risk from vibration damage and avoiding any use of pneumatic drills or heavy vehicles in the vicinity;

- (ii) Complete work in these areas quickly;
- (iii) Consult the custodians of important buildings, cultural and tourism authorities and local communities in advance of the work to identify and address key issues and avoid working at sensitive times, such as religious and cultural festivals.

177. There are also certain environmental risks from the operation of the sewer system, most notably from leaking sewer pipes as untreated fecal material can damage human health and contaminate both soil and groundwater. It will be imperative therefore that the operating agency establishes a procedure to routinely check the operation and integrity of the sewers, and to implement rapid and effective repairs where necessary. There is an occupation health risk to workers engaged in sewer maintenance activities. Following measures should be followed:

- (i) Establish regular maintenance program, including:
 - Regular cleaning of grit chambers and sewer lines to remove grease, grit, and other debris that may lead to sewer backups. Cleaning should be conducted more frequently for problem areas.
 - Inspection of the condition of sanitary sewer structures and identifying areas that need repair or maintenance. Items to note may include cracked/deteriorating pipes; leaking joints or seals at manhole; frequent line blockages; lines that generally flow at or near capacity; and suspected infiltration or exfiltration; and
 - Monitoring of sewer flow to identify potential inflows and outflows
 - Conduct repairs on priority based on the nature and severity of the problem. Immediate clearing of blockage or repair is warranted where an overflow is currently occurring or for urgent problems that may cause an imminent overflow (e.g., pump station failures, sewer line ruptures, or sewer line blockages);
- (ii) Review previous sewer maintenance records to help identify "hot spots" or areas with frequent maintenance problems and locations of potential system failure and conduct preventative maintenance, rehabilitation, or replacement of lines as needed;
- (iii) When a spill, leak, and/or overflow occurs, keep sewage from entering the storm drain system by covering or blocking storm drain inlets or by containing and diverting the sewage away from open channels and other storm drain facilities (using sandbags, inflatable dams, etc.). Remove the sewage using vacuum equipment or use other measures to divert it back to the sanitary sewer system.
- (iv) Prohibit/prevent disposal of wastewater/effluent from industrial units in the sewers; ensure regular checking to ensure no illegal entry of industrial wastewater into sewers
- (v) Develop an Emergency Response System for the sewerage system leaks, burst and overflows, etc.
- (vi) Provide necessary health & safety training to the staff in sewer cleaning & maintenance
- (vii) Provide all necessary personnel protection equipment
- (viii) For personnel cleaning underground sewers there is a risk due to oxygen deficiency and harmful gaseous emissions (hydrogen sulphide, carbon monoxide, methane, etc.); provide for adequate equipment (including oxygen masks) for emergency use

178. It has to assured by contractor that desired consents from RPCB are obtained for operation of STP and treated effluent should meet the parameters as set by NGT/CPCB/RPCB.

Contractor will also ensure compliances to all the conditions as mentioned in the CTO Latest standards for discharge of effluent are given in Appendix 5. Municipal Council should have responsible supervision of the effluent discharge standards.

179. There is an occupation health risk to workers engaged in sewer maintenance activities. During cleaning/clearing of manholes and sewer lines great precautions should be taken for the safety of workers conducting such works. Therefore O&M contractor will be required to:

- (i) As far as possible use CCTV mechanism to detect the problems in pipelines and do not engage persons for this purpose
- (ii) As far as possible use mechanized cleaning of manholes and pipelines by using modern techniques and machines and do not engage persons for this purpose and engage persons only if mechanized cleaning is not possible in any way
- (iii) Ensure that employees and line management understand the risks through proper instruction, training and supervision.
- (iv) Use gas detector before entering any person inside manhole to detect any hazardous or inflammable gas present inside the manhole.
- (v) Provide suitable personal protective equipment that may include waterproof / abrasion-resistant gloves, footwear, eye and respiratory protection. Face visors are particularly effective against splashes. Equipment selection and a proper system for inspection and maintenance are important.
- (vi) Provide adequate welfare facilities, including clean water, soap, nail brushes, disposable paper towels, and where heavy contamination is foreseeable, showers.
- (vii) For remote locations portable welfare facilities should be provided.
- (viii) Areas for storage of clean and contaminated equipment should be segregated and separate from eating facilities.
- (ix) Provide adequate first-aid equipment, including clean water or sterile wipes for cleansing wounds, and a supply of sterile, waterproof, adhesive dressings.
- (x) Make effective arrangements for monitoring the health of staff.
- (xi) Keep emergency preparedness plan ready before start the work of sewage system cleaning

180. In the project, in a large portion of the project town areas, the septic tank system in individual households is replaced with direct connections to the new sewerage network. The impacts and mitigation measures from the existing septic tank that need to be closed should be identified in the Operation Phase.

G. Cumulative Impacts

181. Cumulative impacts are those that result from the successive, incremental, and/or combined effects of a project or activity when added to other existing, planned, and/or reasonably anticipated future ones. In Makrana Sewerage project only sewer works are proposed which include construction of STP, SPS, and sewer networks.

182. In Makrana, which is a small town congested with people, traffic and activities, there are sensitive places like hospitals, schools, and religious places. Works will be spread over least our areas of town, covering several roads and streets. Although no other notable public works are anticipated during the project implementation on public roads, there will be usual construction activities, such as building construction, as this is a developing town. Given dry and windy weather conditions, dust generation from cumulative construction activities may be significant,

and this may increase the particulate matter concentration in ambient air. Dust control measures suggested in the EMP aim to minimize the dust generation from the subproject construction activities. Suggested trenchless method, by avoiding excavation, will also help in reducing the overall dust generation from the subproject activities. If there are any road improvement works proposed to be implemented in Makrana, scheduling of works needs to be coordinated with the respective road agency (ULB or Public Works Department [PWD]) so that improved roads are not subjected for excavation. The increase in road traffic, disturbance to traffic, public safety and worker safety issues, damage to existing utilities, influx of outstation workers, etc., due to various simultaneous construction works will be notable. However, the measures suggested in the EMP will minimize these impacts greatly, and therefore effective implementation of EMP must be ensured. Thus, the net impacts are unlikely to be significant.

183. Project Benefits. The citizens of the Makrana will be the major beneficiaries of the improved sewerage system, as the human waste from the homes will be removed rapidly, which otherwise would flow in open drains. In addition to improved environmental conditions, the project will improve the over-all health condition of the town as diseases of poor sanitation will be reduced. This should improve the environment, should deliver major improvements in individual and community health and well-being. Diseases of poor sanitation, such as diarrhea and dysentery, should be reduced, so people should spend less on healthcare and lose fewer working days due to illness, so their economic status should also improve, as well as their overall health.

VI. PUBLIC CONSULTATION AND INFORMATION DISCLOSURE

A. Overview

184. The active participation of stakeholders including local community, NGOs/CBOs, and the media in all stages of project preparation and implementation is essential for successful implementation and as well as operation of the project. It will ensure that the subprojects are designed, constructed, and operated with utmost consideration to local needs, ensures community acceptance, and will bring maximum benefits to the people. Public consultation and information disclosure is a must as per the ADB policy.

185. A three tier consultation process has been adopted for RUIDP: focus group discussions, primary household sample surveys and a town-level public consultation workshop. Most of the main stakeholders have already been identified and consulted during preparation of detail project report and this IEE, and any others that are identified during project implementation will be brought into the process in the future. Primary stakeholders of the subproject are: residents, shopkeepers and businesspeople who live and work alongside the roads in which network improvements will be provided, and government and local agencies responsible for provision of services, Makrana Municipal Council, Public Health Engineering Department, and Rajasthan Pollution Control Board. Secondary stakeholder are: NGOs and CBOs working in the area, community representatives, beneficiary community in general, government agencies, the executing and implementing agencies (LSGD and RUIDP), Government of India and the ADB.

B. Public Consultation

186. The public consultation and disclosure program is a continuous process throughout the project implementation, including project planning, design and construction. Socio economic surveys were conducted in January, 2018. Informal consultations at sites were also conducted along with socio economic survey in Makrana, Additional consultation was conducted on

December 28, 2018 at certain locations where critical project components are located. The details of the consultations are provided in Appendix 20.

1. Consultation during Project Preparation

187. Institutional consultations were conducted with the Governmental Departments such as Local Self Government Department, Public Works Department, Pollution Control Board, Public Health Engineering Department, Makrana Municipal Council, etc. The project proposals are formulated in consultation with PHED and Makrana Municipal Council and the proposals are finalized after certification of Commissioner, Makrana Municipal Council that the proposals suit the requirements of the ULB. (refer Appendix 21).

188. Focus-group discussions with affected persons and other stakeholders were conducted to learn their views and concerns. City Level Committee (CLC) is formed for Makrana under chairmanship of District Collector, Nagaur and CLC meeting was done on 21 March 2018 in Nagaur to discuss the issues related to proposed project of sewerage in Makrana. A socio economic survey has been conducted in the town, covering sample households and vendors, to understand the basic characteristics of town, health status, and the infrastructure service levels, and also the demand for infrastructure services. General public and the vendors along the project activity areas were also consulted during visits to the project sites. (refer Appendix 20).

189. It was observed that people are willing to extend their cooperation as the proposed activities are proposed to enhance the infrastructure service levels and the living standard of the public. The public expressed their concern regarding the nuisance and disturbance (dust, road closure and traffic management activities) during the construction stage which can have impact on their day to day activities. Public demanded for advance notice before construction and proper warning signs along the construction area to avoid accidents and inconvenience. Public opined that an appropriate operation and maintenance system should be in place, especially for sewerage system, for its best functioning and to have the maximum health and aesthetic benefits. During consultations on 28 December 2018, the public agreed for location of the SPS near Jhalara Pond adjacent to an existing cremation ground.

2. Consultation during construction

190. Prior to start of construction, Municipal Council Makrana and PIU with the assistance of Consultant and CAPC will conduct information dissemination sessions at major intersections and solicit the help of the local community leaders/prominent citizens to encourage the participation of the people to discuss various environmental issues. At each ward/neighborhood level, focus group meetings will be conducted to discuss and plan construction work with local communities to reduce disturbance and other impacts, and provide a mechanism through which stakeholders can participate in project monitoring and evaluation.

191. A constant communication will be established with the affected communities to redress the environmental issues likely to surface during construction and operational phases and also regarding the grievance redress mechanism. Municipal Council Makrana /PIU with the help of Community Awareness and Participation Consultant (CAPC) will organize public meetings and will appraise the communities about the progress on the implementation of EMP. Meeting will also be organized at the potential hotspots/sensitive locations before and during the construction.

C. Information Disclosure

192. Executive summary of the IEE will be translated in the local language and made available at the offices of Municipal Council Makrana, RUIDP PMU and PIU. Copies of summary will be provided to participants of city level workshop to be organized in Makrana. Hard copies of the IEE will be accessible to citizens as a means to disclose the document and at the same time creating wider public awareness. Electronic version of the IEE in English and Executive Summary in Hindi will be placed in the official website of the Municipal Council Makrana/RUIDP after approval of the IEE by Government and ADB. Stakeholders will also be made aware of grievance register and redress mechanism.

193. Public information campaigns via newspaper/radio/TV, to explain the project details to a wider population will be conducted. Public disclosure meetings will be conducted at key project stages to inform the public about the progress and future plans. Prior to start of construction, the PIU will issue notification on the start date of implementation in local newspapers. A board showing the details of the project will be displayed at the construction site for the information of general public.

194. Local communities will be continuously consulted regarding location of construction camps, access and hauling routes and other likely disturbances during construction. The road closure together with the proposed detours will be communicated via public consultations, pamphlets, SMS, road signage, etc.

195. Project related information shall be disclosed through public consultation and making relevant documents available in public locations. PMU and PIUs shall provide relevant safeguards information in a timely manner, in an accessible place and in a form and languages understandable to affected person and other stakeholders. For illiterate people, other suitable communication methods will be used.

VII. GRIEVANCE REDRESS MECHANISM

A. Project Specific Grievance Redress Mechanism

196. A project-specific, three-tier grievance redress mechanism (GRM) covers both environment and social issues. The GRM will be established to receive, evaluate, and facilitate the resolution of affected persons' concerns, complaints, and grievances about the social and environmental performance at project level. The GRM will aim to provide a time-bound and transparent mechanism to voice and resolve social and environmental concerns related to the project. Assessment of the GRM designed and implemented for Rajasthan Urban Sector Development Program (RUSDP)²⁶ the system was effective in timely resolution of grievances in

²⁶ The procedures followed for grievance redress during implementation of RUSDP Phase III included the project GRM and the pilot GRM software application (Smart Check) in Pali, the Sampark portal of Government of Rajasthan, and the Chief Minister's helpline. Complaints received through various channels were mostly minor and pertained to damage to existing water supply pipelines and disruption of water supply during construction, delays in road restoration, and pending new connections. Complaints related to damage to private property (compound walls/steps, etc.) were less in number. The grievances were mostly possible to resolve in coordination with the contractors. Complaints received were immediately referred by the CAPC/PMDSC supervision staff to the PIU Nodal officer (safeguards) and concerned engineer at PIU, who advised them on further action. Follow up with the contractor on complaint resolution was undertaken by PIU Nodal officer CAPC and PMDSC and final feedback sought from complainant upon resolution. Complaints requiring inter-departmental coordination were referred to the

a transparent manner.²⁷ The multichannel, project-specific, three-tier GRM is functional at RUSDP, hence the design of GRM for RSTDSP takes into account the designed institutional structure for RSTDSP and the positive features and learnings from the previous GRM.²⁸

197. **Common GRM.** A common GRM will be in place for social, environmental, or any other grievances related to the project. Implementation of the resettlement plans/RIPPs/DDR/IEEs will follow the GRM described below. The GRM will provide an accessible and trusted platform for receiving and facilitating resolution of affected persons' grievances related to the project.

198. Public awareness campaigns within entire ULB/Municipal area will ensure that awareness on grievance redress procedures is generated. The nodal officer- social/environment at field level through community awareness and public participation consultant (CAPPC) will conduct ULB/Municipal area-based awareness campaigns to ensure that poor and vulnerable households are made aware of grievance redress procedures and entitlements. Contractors will provide pamphlets to communities prior to start of works and billboards during construction. The pamphlets and billboards will include relevant environmental and social safeguards, GRM information, and contact details of key personnel from PIU and contractors.

199. Affected persons will have the flexibility of conveying grievances/suggestions by dropping grievance redress/suggestion forms in complaint/suggestion boxes that will be installed by project PIUs or by e-mail, by post, or by writing in a complaints register in ULB offices/complaints register at contractor's work site²⁹ or by sending a WhatsApp message to the PIU³⁰ or by dialling the phone number of town level PIU/CAPPC or by dialling a toll-free number.³¹ Any aggrieved person can also avail the facilities of online grievance monitoring system 'Rajasthan Sampark' portal to register their grievances which is a parallel mechanism of grievance registration, in addition to the project GRM.³² Careful documentation of the name of the complainant, date of receipt of the complaint, address/contact details of the person, location of the problem area, and how the problem was resolved will be undertaken and feedback provided to the complainant on action/decision taken. The Safeguard and Safety Officer of town/city level PIU will have the overall responsibility for timely grievance redressal on environmental and social safeguards issues and for registration of grievances, related disclosure, with the assistance of project consultants. In case of grievances that are immediate

PMU for resolution, and feedback provided to complainant. The PMU kept regular track of grievances through Whatsapp and email alerts, ensuring registration and follow-up until resolution.

²⁷ Town-level grievance registration data indicates that a large number of grievances were registered, pointing to the effectiveness of the multi-channel GRM. No major grievance was received for RUSDP Phase III. The GRM helped smoothen the process of project implementation, hence the proposed architecture for the RSTDSP GRM remains similar, with some refinement, taking into account the changes in institutional setup proposed for project implementation.

²⁸ Continued logistics support at field level will be key to successful management of grievance redress under RSTDSP. The target date for establishment of the first level (PIU level) and second level (Zonal level) of GRM is before loan negotiation.

²⁹ RUSDP piloted an online application based live GRM counter for resolution of public grievances over and above the usual process of grievance registration and redressal. This app based GRM - "RUIDP Smart Check" is available at Google play store (free of cost) and is operational. The RUIDP Smart Check "app" was launched in Pali town in July 2017 and is proposed to be scaled up in RSTDSP project towns. For persons without access to the application, the traditional channels will continue to be available.

³⁰ It is suggested for each PIU to have a dedicated whatsapp group for registration of grievances and receipt of quick feedback, to be followed by more formal communication.

³¹ Project contractors in all project towns will have a toll-free number with specific working hours for registration of grievances related to RSTDSP.

³² <http://www.sampark.rajasthan.gov.in/RajSamWelcome.aspx>

and urgent in the perception of the complainant, the contractor, and officials of PIU with assistance from construction management and supervision consultants (CMSC) and CAPPC on-site will provide the most easily accessible or first level of contact for quick resolution of grievances. Contact numbers and names of the concerned PIU safeguard and safety officer, contractors, CAPPC and CMSC personal will be posted at all construction sites at visible locations.

- (i) **1st level grievance.** The contractors, PIU Executive Engineer (EE)/Assistant Engineer (AE) designated as safeguard and safety officer (social and environment), CMSC (safeguard staff) and CAPPC can immediately resolve issues on-site, in consultation with each other and will be required to do so within 7 days of receipt of a complaint/grievance. If required, city level monitoring committee (CLMC)³³ will be involved in resolution of grievances at the 1st level.
- (ii) **2nd level grievance.** All grievances that cannot be redressed within 7 days at field/PIU level will be brought to the notice of Zonal PIU headed by Additional Chief Engineer (ACE). The ACE at zonal PIU will resolve the grievance within 7 days of receipt of complaint/grievance in discussion with the ASO, field level PIU, CMSC, CAPPC and the contractor.
- (iii) **3rd level grievance.** All the grievances that are not addressed by Zonal PIU within 7 days of receipt will be brought to the notice of the PMU. Depending on the nature of grievance, the Project Officer (Social/Environment) at PMU will resolve the grievance within 15 days of receipt of grievance with necessary coordination of Zonal PIU and CMSC and guidance/instruction of Additional Project Director (APD-PMU).
- (iv) Grievances not redressed through this process within/at the project level within stipulated time period will be referred to the CLC/GRC, which has been set up.³⁴ In its role as a GRC, the CLC will meet whenever there is an urgent, pending grievance. Other grievances can be discussed during its regular meetings. Zonal PIU will inform the CLC regarding any grievances required to be resolved urgently. The GRC will resolve the grievance within 15 days of receiving the complaint. In case of any indigenous peoples impacts in subprojects, the CLC/GRC must have representation of the affected indigenous people community, the chief of the tribe or a member of the tribal council as traditional arbitrator (to ensure that traditional grievance redress systems are integrated) and an NGO working with indigenous people groups.
- (v) The multi-tier GRM for the project is outlined below (Figure 15), each tier having time-bound schedules and with responsible persons identified to address

³³ The CLMC has been formed at the town/city level for planning and monitoring of work, resolve issues related to departmental coordination etc. It is headed by Commissioner/Executive Officer ULB (Chairman) and city engineer of public health engineering department (PHED), public works department (PWD) and head of PIU acting as Member Secretary.

³⁴ City Level Committee (CLC)/grievance redress committees (GRCs) has been constituted for each town/city under the Chairmanship of District Collector to provide overall subproject guidance and "to sort out issues and remove hindrances, if any". CLC formed at city-level/district level with members composed of: District Collector as Chairperson, and following as members: ULB Commissioner/Mayor/Chairman; Deputy Mayor/Vice Chairman ULB; Chairman / Secretary Urban Improvement Trust (UIT); Head of Zonal/field level PIU as Member Secretary; one representative each from relevant government departments as appropriate (PWD/PHED/Town Planning Department etc.). All CLCs in their role as GRCs will have at least one-woman member/chairperson. In addition, for project-related grievances, representatives of affected persons, community-based organizations (CBOs), and eminent citizens will be invited as observers in GRC meetings. The concerned Member of Parliament (MP) and Member of Legislative Assembly are also part of the CLC.

grievances and seek appropriate persons' advice at each stage, as required. The GRC will continue to function throughout the project duration.

200. The project GRM notwithstanding, an aggrieved person shall have access to the country's legal system at any stage and accessing the country's legal system can run parallel to accessing the GRM and is not dependent on the negative outcome of the GRM. In case of grievance related to land acquisition, resettlement and rehabilitation, the affected persons will have to approach a legal body/court specially designed under the Right to Fair Compensation and Transparency in Land Acquisition, Rehabilitation and Resettlement Act (RFCTLARRA), 2013.³⁵

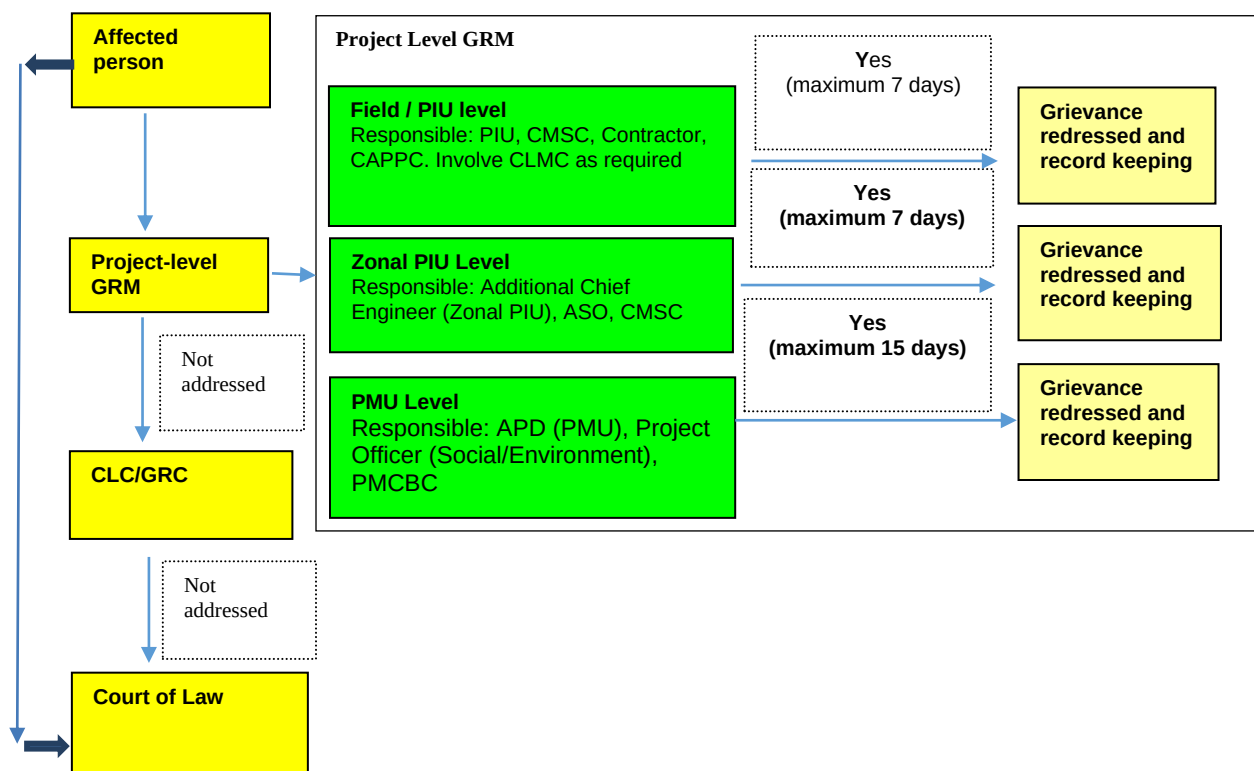
201. People who are, or may in the future be, adversely affected by the project may submit complaints to ADB's Accountability Mechanism. The Accountability Mechanism provides an independent forum and process whereby people adversely affected by ADB-assisted projects can voice, and seek a resolution of their problems, as well as report alleged violations of ADB's operational policies and procedures. Before submitting a complaint to the Accountability Mechanism, affected people should make an effort in good faith to solve their problems by working with the concerned ADB operations department. Only after doing that, and if they are still dissatisfied, should they approach the Accountability Mechanism.³⁶

202. **Record-keeping.** The PIU of each town/city will keep records of grievances received, including contact details of complainant, date the complaint was received, nature of grievance, agreed corrective actions and the date these were affected and final outcome. The number of grievances recorded and resolved, and the outcomes will be displayed/disclosed in the PMU office, PIU offices, and on the web, as well as reported in monitoring reports submitted to ADB on a semi-annual basis. The sample grievance registration format is attached as Appendix 22.

³⁵ The Authority admits grievance only with reference to the Land Acquisition and R&R issues under the RFCTLARRA, 2013.

³⁶ Accountability Mechanism. <http://www.adb.org/Accountability-Mechanism/default.asp>.

Figure 16: Grievance Redress Mechanism-RSTDSP



Note: APD = Additional Project Director, ASO = Assistant Safeguards Officer, CAPPC = community awareness and public participation consultant, CMSC = construction management and supervision consultants, CLC = city level committee, CLMC = city level monitoring committee, GRC = grievance redress committee, PIU = project implementation unit, PMU = program management unit, PMCBC = project management and capacity building consultant.

203. **Periodic review and documentation of lessons learned.** The PMU Project Officers (Social and Environment) will periodically review the functioning of the GRM in each town and record information on the effectiveness of the mechanism, especially on the project's ability to prevent and address grievances.

204. **Costs.** Contractors are required to allocated budget for pamphlets and billboards as part of the EMP. Costs involved in resolving the complaints (meetings, consultations, communication and reporting/information dissemination) will be borne by the concerned PIU at town level while costs related to escalated grievances will be met by the PMU. Cost estimates for grievance redress are included in resettlement cost estimates.

205. The PMU of RSTDSP has issued an Office Order dated 4 May 2018 establishing the GRM as described above (Appendix 23).

VIII. ENVIRONMENTAL MANAGEMENT PLAN

A. Environmental Management Plan

206. An Environmental Management Plan (EMP) has been developed to provide mitigation measures to reduce all negative impacts to acceptable level and monitoring the same. This is presented in the following tables, which show the potential environmental impacts, designed mitigation measures and responsible agencies for implementation and monitoring.

207. The purpose of the environmental management plan (EMP) is to ensure that the activities are undertaken in a responsible, non-detrimental manner with the objectives of: (i) providing a proactive, feasible, and practical working tool to enable the measurement and monitoring of environmental performance on-site; (ii) guiding and controlling the implementation of findings and recommendations of the environmental assessment conducted for the project; (iii) detailing specific actions deemed necessary to assist in mitigating the environmental impact of the project; and (iv) ensuring that safety recommendations are complied with.

208. A copy of the EMP must be kept at work sites at all times. This EMP will be included in the bid documents and will be further reviewed and updated during implementation. The EMP will be made binding on all contractors operating on the site and will be included in the contractual clauses. Non-compliance with, or any deviation from, the conditions set out in this document constitutes a failure in compliance.

209. For civil works, the contractor will be required to (i) establish an operational system for managing environmental impacts (ii) carry out all of the monitoring and mitigation measures set forth in the EMP; and (iii) implement any corrective or preventative actions set out in safeguards monitoring reports that the employer will prepare from time to time to monitor implementation of this IEE and EMP. The contractor shall allocate budget for compliance with these EMP measures, requirements and actions.

210. For civil works, the contractor will be required to (i) establish an operational system for managing environmental impacts (ii) carry out all of the monitoring and mitigation measures set forth in the EMP; and (iii) implement any corrective or preventative actions set out in safeguards monitoring reports that the employer will prepare from time to time to monitor implementation of this IEE and EMP. The contractor shall allocate budget for compliance with these EMP measures, requirements and actions.

211. The contractor will be required to submit to PIU, for review and approval, a site environmental plan (SEP) including (i) designed sites/locations for construction work camps, storage areas, hauling roads, lay down areas, disposal areas for solid and hazardous wastes; (ii) specific mitigation measures following the approved EMP; (iii) monitoring program as per SEP; and (iv) budget for SEP implementation. No works can commence prior to approval of SEP.

212. The following tables show the potential environmental impacts, designed mitigation measures and responsible agencies for implementation and monitoring.

Table 14: Design Stage Environmental Management Plan

Field	Anticipated Impact	Mitigation Measures	Responsible for Implementation/ Monitoring	Cost and Source of Funds
Sewage Treatment Plant (STP)	Odour nuisance and aesthetics	(i) Provide a green buffer zone of 10-20 m wide all around the STP with trees in multi-rows. This will act as a visual screen around the facility and will improve the aesthetic appearance. Treated wastewater shall be used for plantation. (ii) Develop layout plan of STP such that odour generating units (such as sludge / solids handling facilities) are located away from the surrounding area with future development potential.	DBO Contractor/ PIU	Project Costs
All work sites	Tree Cutting	(i) Minimize removal of trees by adopting to site condition and with appropriate layout design of STP and SPSs or any other site with trees (ii) Obtain prior permission for tree cutting at STP and SPS sites or at any other site that may require tree cutting finalized during detailed design. (iii) Plant and maintain 3 trees for each tree that is removed	DBO Contractor/ PIU	Project Costs
Design of Sewerage System	Non Compliance or non-adherence with the environmental considerations proposed in preliminary designs during detailed design:	Ensure compliance with the following during the detailed design: (i) Locating components and facilities appropriately by avoiding sensitive locations like forests and protected areas (environmentally, socially, and archeologically). (iv) Treatment and reuse of sludge from treatment process; providing a covered shed of adequate space to air dry the processed sludge for at least 15 days at STPs (v) Designing the entire system to maintain optimal flow and terminal pressure, and optimising the overall energy usage (vi) Avoiding usage of asbestos containing materials (viii) Reuse of treated wastewater from STP for non-potable uses thereby reducing the load in freshwater resources (ix) Adopting a combined approach of sewerage system and faecal sludge and septage management to cover 100% population of the town with safe collection, conveyance and treatment of sewage generated in the town (x) Provision of appropriate personal protection equipment to the workers and staff	DBO Contractor / PMU	Project costs
Seismic sensitivity	Damage to infrastructure and potential risks: project area in low	(i) Designs of project component structures shall comply with relevant codes of design such as Bureau of Indian Standard (BIS) specifications for earthquake resistant design (IS: 1893: Criteria for earthquake resistant design of structures).	DBO Contractor/PIU	Project costs

Field	Anticipated Impact	Mitigation Measures	Responsible for Implementation/ Monitoring	Cost and Source of Funds														
	earthquake risk zone (II)																	
STP	Hazardous/ harmful chemicals	(i) Reduce the use of chemicals in the treatment process to the extent possible (water treatment); provide non-chemical alternatives or easily recoverable and/or reusable chemicals or biocompatible alternatives. (ii) Establish proper handling / storage / application system according to the relevant standards, safety precautions and prevent accidental release / spill (iii) Provide leak/spill detection, collection / capture and safe disposal facilities such as chlorine absorption and neutralization facility (iv) Provide ventilation, lighting, entry and exit facilities; visible and audible alarm facilities to alert chemical/chlorine leak (v) Facility for isolation in the event of major leakages (vi) Eye wash and shower facility (vii) Personal protection and safety equipment for the operators (masks, oxygen cylinders, gloves, etc.) (viii) Provide training to the staff in safe handling and application of chemicals, material safety, and standard operating procedures and emergency responses (ix) Develop emergency response procedures	DBO Contractor/PIU	Project costs														
Sewage Treatment Plant (STP)	Inefficient sewage treatment, treated effluent characteristics not satisfying the CPCB/RSPCB standards	(i) Ensure that the selected process is appropriate for the town and meets discharge standards and facilitate reuse (ii) Treated effluent should meet the criteria set by RSPCB/CPCB or the following bid specified parameters, whichever are stringent: <table><tr><th>Paramater</th><th>Standards</th></tr><tr><td>BOD, mg/l</td><td>10</td></tr><tr><td>TSS, mg/l</td><td>20</td></tr><tr><td>COD, mg/l</td><td>50</td></tr><tr><td>Nitrogen-Total, mg/l</td><td>10</td></tr><tr><td>Phosphorus- Total, mg/l</td><td>1</td></tr><tr><td>Faecal Coliform (MPN/ 100 ml)</td><td>100 (Desirable) 230 (Permissible)</td></tr></table>	Paramater	Standards	BOD, mg/l	10	TSS, mg/l	20	COD, mg/l	50	Nitrogen-Total, mg/l	10	Phosphorus- Total, mg/l	1	Faecal Coliform (MPN/ 100 ml)	100 (Desirable) 230 (Permissible)	DBO Contractor / PIU	Project costs
Paramater	Standards																	
BOD, mg/l	10																	
TSS, mg/l	20																	
COD, mg/l	50																	
Nitrogen-Total, mg/l	10																	
Phosphorus- Total, mg/l	1																	
Faecal Coliform (MPN/ 100 ml)	100 (Desirable) 230 (Permissible)																	
Change in	Mixing of industrial	(i) No industrial wastewater shall be allowed to dispose into municipal	DBO Contractor and	Project														

Field	Anticipated Impact	Mitigation Measures	Responsible for Implementation/ Monitoring	Cost and Source of Funds
raw sewage quality	effluent with sewage	sewers (ii) As there is a risk of potential mixing of industrial waste, no domestic wastewater from industrial units shall be allowed into municipal sewers (iii) Ensure that there is no illegal discharge through manholes or inspection chambers (iv) Conduct public awareness programs; in coordination with RSPCB and CLC. (v) Conduct regular wastewater quality monitoring (at inlet and at outlet of STP) to ensure that the treated wastewater quality complies with the effluent standards	PIU / PMU	Costs
STP	Use of treated wastewater for reuse applications	Develop waste water reuse plan for Makrana town in consultation with CLC as per the Sewerage and Wastewater Policy, 2016. The Reuse Plan shall inter alia include the following: (i) Identify potential reuse application in Makrana and establish quality criteria for each of the use. (ii) For application that use treated wastewater wastewater directly (e.g., agriculture), the quality required for such application in safe manner considering health, environment and crop yield concerns shall be ensured; (iii) Prepare a reuse plan for agriculture, if that is the priority use or one of the applications as per the CLC in Makrana, clearly indicating the limits (geographical/crops/type of application/type of soils etc.); adopt international good practice suggested by agencies like World Health Organization (WHO), Food and Agricultural Organization (FAO) of the United Nations. (iv) Plan should include awareness and training provisions and responsibilities; these can be conducted by concerned department (e.g., Agricultural Department, District Collectorate) (v) Carryout regular / online monitoring of critical quality parameters of treated wastewater to ensure that they meet the preset standards established for reuse.	DBO Contractor / PIU	Project costs
STP	Treated effluent discharge into water channel/drains and associated impacts on river	(i) Obtain of consent of RSPCB for discharge of treated wastewater into drains (ii) Conduct a baseline water quality assessment of receiving water body (iii) Regularly monitor the treated wastewater quality at STP and ensure that it meets the discharge standards	DBO Contractor/PIU	Project Costs

Field	Anticipated Impact	Mitigation Measures	Responsible for Implementation/ Monitoring	Cost and Source of Funds
	water and downstream users	(iv) Monitor water quality periodically during operation phase as per the Environmental Monitoring Plan		
STP	Sludge management and reuse	(i) Prepare a sludge management plan (ii) Prepare a dried Sludge utilization plan for Makrana town within the help of Agriculture Department / CLC; plan should also include if any additional processing is required for sludge to use as soil conditioner (iii) Plan should clearly various potential uses and demand in Makrana and surroundings (iv) Establish usage limits, where required, (geographical / crops / type of application / type of soils etc.); adopt international good practice suggested by agencies like World Health Organization (WHO), Food and Agricultural Organization (FAO) of the United Nations. (v) Identify a landfill / suitable site for disposal of surplus dried sludge (vi) Monitor sludge quality during operation phase as per the Environmental Monitoring Plan, ensure that it meets the quality parameters established by FCO (vii) In case of sludge not meeting the quality parameters, it shall not be used as soil condition, and shall be disposed at appropriate disposal site (if it falls under hazardous category, it shall be disposed as per the Hazardous Waste Management Rules, 2016)	DBO Contractor/PIU	Project costs
Sewage pumping stations	Handling and disposal of accumulated waste at identified SPS sites	(i) Prepare a waste handling and management plan for the work, considering handling, disposal and occupational and public health safety (ii) Assess the working conditions, develop appropriate working method, and work shall be only conducted under continuous supervision of EHS supervisor (iii) Waste shall not be handled manually; use appropriate equipment (iv) All workers shall be provided with necessary personal protection equipment, including gloves, boots, face / gas masks and oxygen cylinders in handy for emergency use etc.; if gas emission is suspected at any point of time, workers shall use gas masks with oxygen cylinders (v) Inform surrounding public about the work (vi) Fire control and safety equipment shall be provided at the work site	DBO Contractor/PIU	Project costs

Field	Anticipated Impact	Mitigation Measures	Responsible for Implementation/ Monitoring	Cost and Source of Funds
		(vii) Waste shall be properly covered during transport (viii) (viii) Manage the solid waste as per the Solid Waste Management Rules, 2016		
Sewage pumping stations	Noise and odour generation from sewage pumping operations, and public and occupational safety	(i) Provide low noise, efficient pumping systems (ii) Provide dedicated power supply to SPS, if possible, otherwise DG set to be used during power failure, should be soundproof and having acoustic enclosures with low/permitted air emission standards (iii) Design SPS with appropriate retention time, so as not to retain the sewage in the sump for long time to avoid generation of odourous gases (iv) Firm barricades should be provided all round during construction of SPS; (v) Boundary wall of sufficient height should be provided during operation phase so that no children/residents can enter in the SPS premises (vi) Plantations should be provided if space available to reduce foul smell of sewer during operation (vii) No workers camps should be allowed during construction works at SPS site (viii) Entry should be restricted through provision of gate and guard during SPS operation. (ix) (ix) Highest Flood Level (HFL) should be used as a basis while deciding on the SPS dimensions. Also, all the prevention methods including buffer capacity secondary tank and alternative power arrangements should be implemented so that sewage does not either leak during power outages or percolate into ground and pollute water.	DBO Contractor/PIU	Project costs
Sewer network – collection and conveyance	Poor design leading to overflows, blockages, and creating nuisance, pollution	(i) Limit the sewer depth where possible (ii) Sewers shall be laid away from water supply lines and drains (at least 1 m, wherever possible); (iii) In all cases, the sewer line should be laid deeper than the water pipeline (the difference between top of the sewer and bottom of water pipeline should be at least 300 mm) (iv) In unavoidable, where sewers are to be laid close to storm water drains, appropriate pipe material shall be selected (stoneware pipes shall be avoided) (v) For shallower sewers and especially in narrow roads, use small	DBO Contractor/PIU	Project costs

Field	Anticipated Impact	Mitigation Measures	Responsible for Implementation/ Monitoring	Cost and Source of Funds
		inspection chambers in lieu of manholes; (vi) Design manhole covers to withstand anticipated loads and ensure that the covers can be readily replaced if broken to minimize silt/garbage entry (vii) Ensure sufficient hydraulic capacity to accommodate peak flows and adequate slope and gas vents in gravity mains to prevent buildup of solids and hydrogen sulfide generation (viii) Take necessary precautionary measures to protect sewer network, and to avoid disposal of solid wastes, debris, wastewater into newly laid sewers from the time it is constructed to the start of operation phase		
FSSM	Occupational health and safety issues, and impact on STP process	(i) Conduct detailed survey of the households to be covered with FSSM to design the system to suit the local conditions, such as type of septic tanks and their location in the houses (ii) Create awareness program on the FSSM from collection to treatment system that will be adopted (iii) Design the sewage treatment process duly considering mixing of septage (iv) Ensure that the FSSM system is completely mechanized no human touch, even accidentally, from collection at household to discharge into STP, and in periodic cleaning of tankers (v) Demarcate a proper area for cleaning of mobile tankers in STP premises, and ensure that the wastewater shall be discharged into STP (vi) Provide proper training to the workers, and staff in safe handling of FSSM tasks, provide all necessary personal protection equipment (vii) Ensure proper facilities for workers including showers, wash areas, toilets, drinking water, eating and resting places (viii) Conduct regular health checks (ix) Prepare Health and Safety Plan for FSSM	DBO Contractor/PIU	Project costs
Preparation of plans and protocols	Various impacts	(i) Preparation of waste handling and management plan for SPS sites (ii) Prepare traffic management plan (iii) Prepare occupational health and safety plan (iv) Prepare spoils management plan	DBO Contractor and PMCBC (for ACM plan)	Approval of plans by PIU

Table 15: Environmental Management Plan of Anticipated Impacts during Pre-Construction

Field	Anticipated Impact	Mitigation Measures	Responsible for Implementation	Monitoring of Mitigation	Cost and Source of Funds
Compliance with environmental subproject selection criteria	Environmental impacts due to subproject	Compliance with environmental subproject selection criteria	DBO Contractor, PIU and Makrana Municipal Council	PMU	No costs required
Environmental monitoring of baseline conditions of air, noise, water and soil	To establish base line environmental conditions	Environmental monitoring through NABL accredited laboratory	Construction contractor	Consultants/PIU	Contractor
Legal compliance	Environmental legal noncompliance may attract legal actions Failure to obtain necessary consents Permits, NOCs etc. can result to design revisions and /or stoppage of works	(i)Obtain all consents, clearances (CTE/CTO from RSPCB), permits NOCs etc. before start of construction works Ensure that all necessary approvals for construction to be obtained by contractor are in place before start of construction (ii)Following consents are required- Tree cutting-local authority Storage, handling and transport of hazardous materials- RSPCB Sand mining, quarries, borrow areas- Department of mines and Geology Traffic diversion/road cutting- local authority, traffic police (iii)Acknowledge in writing and provide report on compliance all obtained consents, permits, clearance, NOCs etc. (intake works) (iv)Include in detailed design drawings and documents all conditions and provisions; if necessary	PIU/Consultants in coordination of Municipal Council	PMU	Cost of obtaining all consents, permits, clearance, NOCs etc. prior to start of civil works responsibility of PIU.

Field	Anticipated Impact	Mitigation Measures	Responsible for Implementation	Monitoring of Mitigation	Cost and Source of Funds
Utilities	Telephone lines, electric poles and wires, water lines within proposed project area	(i) Identify and include locations and operators of these utilities in the detailed design documents to prevent unnecessary disruption of services during construction phase; and (ii) Require construction contractors to prepare a contingency plan to include actions to be taken in case of unintentional interruption of services. (iii) Require contractors to prepare spoils management plan (Appendix 9) and traffic management plan (Appendix 15)	DBO Contractor in collaboration with PIU and with approval of PMU	(i) List of affected utilities and operators; (ii) Bid document to include requirement for a contingency plan for service interruptions (example provision of water if disruption is more than 24 hours), spoil management plan (Appendix 14), and traffic management plan (Appendix 15)	No cost required. Mitigation measures are part of TOR of PMU, PIU and Consultant
Social and Cultural Resources	Ground disturbance can uncover and damage archaeological and historical remains	Develop a protocol for use by the construction contractors in conducting any excavation work, to ensure that any chance finds are recognized, and measures are taken to ensure they are protected and conserved.	DBO Contractor and PIU	Chance Finds Protocol	No cost required. Mitigation measures are part of TOR of PIU and Consultant
Construction work camps, hot mix plants, stockpile areas, storage areas, and disposal areas.	Disruption to traffic flow and sensitive receptors	(i) Prioritize areas within or nearest possible vacant space in the project location; (ii) If it is deemed necessary to locate elsewhere, consider sites that will not promote instability and result in destruction of property, vegetation, irrigation, and drinking water supply systems; (iii) Do not consider residential areas; (iv) Take extreme care in selecting sites to avoid	Contractor to finalize locations in consultation and approval of PIU	(i) List of selected sites for construction work camps, hot mix plants, stockpile areas, storage areas, and disposal	No cost required. Mitigation measures are part of TOR of PIU and Consultant and also part of contractual terms

Field	Anticipated Impact	Mitigation Measures	Responsible for Implementation	Monitoring of Mitigation	Cost and Source of Funds
		direct disposal to water body which will inconvenience the community. (v) For excess spoil disposal, ensure (a) site shall be selected preferably from barren, infertile lands. In case agricultural land needs to be selected, written consent from landowners (not lessees) will be obtained; (b) debris disposal site shall be at least 200 m away from surface water bodies; (c) no residential areas shall be located within 50 m downwind side of the site; and (d) site is minimum 250 m away from sensitive locations like settlements, ponds/lakes or other water bodies.		areas. (ii) Written consent of landowner/s (not lessee/s) for reuse of excess spoils to agricultural land	
Sources of Materials	Extraction of materials can disrupt natural land contours and vegetation resulting in accelerated erosion, disturbance in natural drainage patterns, ponding and water logging, and water pollution.	(i) Prioritize sites already permitted by the Department of Mines and Geology (ii) If other sites are necessary, inform construction contractor that it is their responsibility to verify the suitability of all material sources and to obtain the approval of PMU and (iii) If additional quarries will be required after construction is started, inform construction contractor to obtain a written approval from PIU.	DBO Contractor to prepare list of approved quarry sites and sources of materials with the approval of PIU	(i) List of approved quarry sites and sources of materials; (ii) Bid document to include requirement for verification of suitability of sources and permit for additional quarry sites if necessary.	No cost required. Mitigation measures are part of TOR of PIU and Consultant and also part of contractual terms
Consents, permits, clearances, NOCs, etc.	Failure to obtain necessary consents, permits, NOCs, etc. can result to design revisions and/or stoppage of works	(i) Obtain all necessary consents (including CTE for STP from RSPCB), permits, clearance, NOCs, etc. prior to award of civil works. Following consents are required- Tree cutting- local authority Storage, handling and transport of hazardous materials- RSPCB Sand mining, quarries, borrow areas- Department	DBO Contractor and PIU and Consultant	Incorporated in final design and communicated to contractors.	No cost required. Cost of obtaining all consents, permits, clearance, NOCs, etc. prior to start of civil works responsibility of PIU. Mitigation measures are part of TOR of PIU and

Field	Anticipated Impact	Mitigation Measures	Responsible for Implementation	Monitoring of Mitigation	Cost and Source of Funds
		of mines and Geology Traffic diversion/road cutting- local authority, traffic police (ii) Ensure that all necessary approvals for construction to be obtained by contractor are in place before start of construction (iii) Acknowledge in writing and provide report on compliance all obtained consents, permits, clearance, NOCs, etc. (iv) Include in detailed design drawings and documents all conditions and provisions if necessary			Consultant

Table 16: Environmental Management Plan of Anticipated Impacts during Construction

Field	Anticipated Impact	Mitigation Measures	Responsible for Mitigation	Monitoring of Mitigation	Cost and Source of Funds
EMP Implementation Training	Irreversible impact to the environment, workers, and community	(i) Contractor is required to depute a qualified EHS personnel in the start of the project to conduct training to all the personnel and effective monitoring of mitigation measures during construction (ii) Project manager and all key workers will be required to undergo EMP implementation including spoils management, Standard operating procedures (SOP) for construction works; occupational health and safety (OH&S), core labor laws, applicable environmental laws, etc.	Construction Contractor	(i)Certificate of Completion (Safeguards Compliance Orientation) (ii)Posting of Certification of Completion at worksites (iii) Posting of EMP at worksites	Cost of EMP Implementation Orientation Training to contractor is responsibility of PMU. Other costs responsibility of contractor.
Air Quality	Emissions from construction vehicles, equipment, and machinery	(i) Plan the work sites properly, and demarcate the sites for stockpiling of, soils, gravel, and other construction materials away from the traffic, vehicle, general worker movement to avoid disturbance of loose materials (ii) Damp down exposed soil and any stockpiled	Construction Contractor	(i) Location of stockpiles; (ii) Complaints from sensitive receptors; (iii) Heavy	Cost for implementation of mitigation measures responsibility of contractor.

Field	Anticipated Impact	Mitigation Measures	Responsible for Mitigation	Monitoring of Mitigation	Cost and Source of Funds
	used for installation of pipelines resulting to dusts and increase in concentration of vehicle-related pollutants such as carbon monoxide, sulfur oxides, particulate matter, nitrous oxides, and hydrocarbons.	material on site by water sprinkling; (iii) Use tarpaulins to cover sand and other loose material when transported by trucks; (iv) Clean wheels and undercarriage of haul trucks prior to leaving construction site (v) Don't allow access in the work area except workers to limit soil disturbance and prevent access by barricading and security personnel (vi) Fit all heavy equipment and machinery with air pollution control devices which are operating correctly contractor's vehicles and equipment should compulsorily have PUC and submit to PIU before deployment at site (vii) Obtain, CTE and CTO for batching plant, hot mix plant, crushers, DG set etc. if specifically established for this project. (viii) If contractor procures any material (such as ready mix concrete, asphalt/macadam, aggregates etc.,) from third party agencies, contractor shall ensure that such agencies have all necessary clearances / permissions as required under the law; these include CTE/CTO from RSPCB, environmental clearance, etc.,; contractor shall collect the copy of these certificates and submit to PIU; PIU will approve the source only after all the certificates are submitted (ix) Conduct air quality monitoring according to the Environmental Management Plan (EMP).		equipment and machinery with air pollution control devices; (iv) Certification that vehicles are compliant with Air Act (v) Reports of air quality monitoring	
Surface water quality	Works in rains/ Mobilization of settled silt materials, and chemical contamination from fuels and lubricants during installation of	(i) Prepare and implement a spoils management plan (ii) Avoid stockpiling of earth fill especially during the monsoon season unless covered by tarpaulins or plastic sheets; (iii) Prioritize re-use of excess spoils and materials in the construction works. If spoils will be disposed, consult with PIU on designated disposal areas; (iv) Inspect all the drainage at construction site/construction camp/labor camp etc. and clear all the	Construction Contractor	(i) Areas for stockpiles, storage of fuels and lubricants and waste materials; (ii) Number of silt traps installed along trenches leading to water bodies;	Cost for implementation of mitigation measures responsibility of contractor.

Field	Anticipated Impact	Mitigation Measures	Responsible for Mitigation	Monitoring of Mitigation	Cost and Source of Funds
	pipelines can contaminate nearby surface water quality.	drainage lines so that no water stagnation/flooding may occur during heavy rainfall (v) As for a possible avoid trench works and excavation works (pipe laying) during monsoon season to avoid any water logging and accident due to it (vi) If open trenches are not avoidable during monsoon, keep ready all the mitigations measures to avoid water logging such as dewatering pumps and sufficient pipes, traffic assistance, barricades etc. (vii) Inspect and verify all the emergency measures and emergency control system before start of monsoon, keep the emergency response committee on high alert during monsoon/heavy rain fall (ix) Install temporary silt traps or sedimentation basins along the drainage leading to the water bodies; (x) Place storage areas for fuels and lubricants away from any drainage leading to water bodies; (xi) Dispose any wastes generated by construction activities in designated sites; and (xii) Conduct surface quality inspection according to the Environmental Management Plan (EMP).		(iii) Records of surface water quality inspection; (iv) Effectiveness of water management measures; (v) No visible degradation to nearby drainages, nallahs or water bodies due to civil works	
Noise Levels	Increase in noise level due to earth-moving and excavation equipment, and the transportation of equipment, materials, and people	(i) Plan activities in consultation with PIU/Consultant so that activities with the greatest potential to generate noise are conducted during periods of the day which will result in least disturbance; (ii) Horns should not be used unless it is necessary to warn other road users or animals of the vehicle's approach; (iii) Minimize noise from construction equipment by using vehicle silencers, fitting jackhammers with noise-reducing mufflers, and portable street barriers the sound impact to surrounding sensitive receptor; and (iv) Maintain maximum sound levels not exceeding 80 decibels (dBA) when measured at a distance of 10 m or more from the vehicle/s. (v) Periodical monitoring of noise quality as per EMP	Construction Contractor	(i) Complaints from sensitive receptors; (ii) Use of silencers in noise-producing equipment and sound barriers; (iii) Equivalent day and night time noise levels (see Appendix 6 of this IEE)	Cost for implementation of mitigation measures responsibility of contractor.
Landscape and	Impacts due to	(i) Prepare and implement spoils management plan	Construction	(i) Complaints	Cost for

Field	Anticipated Impact	Mitigation Measures	Responsible for Mitigation	Monitoring of Mitigation	Cost and Source of Funds
aesthetics	excess excavated earth, excess construction materials, and solid waste such as removed concrete, wood, packaging materials, empty containers, spoils, oils, lubricants, and other similar items.	(Appendix 14); (ii) Avoid stockpiling of excess excavated soils; (iii) Coordinate with ULB/PIU for beneficial uses of excess excavated soils or immediately dispose to designated areas; (iv) Recover used oil and lubricants and reuse or remove from the sites; (v) Manage solid waste according to the following preference hierarchy: reuse, recycling and disposal to designated areas; (vi) Remove all wreckage, rubbish, or temporary structures which are no longer required; and (vii) Request PIU to report in writing that the necessary environmental restoration work has been adequately performed before acceptance of work.	Contractor	from sensitive receptors; (ii) Worksite clear of hazardous wastes such as oil/fuel (iii) Worksite clear of any excess excavated earth, excess construction materials, and solid waste such as removed concrete, wood, packaging materials, empty containers	implementation of mitigation measures responsibility of contractor.
Existing Infrastructure and Facilities	Disruption of service and damage to existing infrastructure at specified project location	(i) Obtain from PIU the list of affected utilities and operators if any; (ii) Prepare a contingency plan to include actions to be done in case of unintentional interruption of service	Construction Contractor	Existing Utilities Contingency Plan	Cost for implementation of mitigation measures responsibility of contractor.
Ecological Resources – Terrestrial	Loss of vegetation and tree cover	(i) Minimize removal of vegetation and disallow cutting of trees; (ii) If tree-removal will be required, obtain tree-cutting permit from the concerned department; and (iii) Plant three native trees for every one that is removed as per RUDSICO-EAP Circular.	Construction Contractor	PIU to report in writing the no of trees cut and planted.	Cost for implementation of mitigation measures responsibility of contractor.
Land use	Environmental Issues due to land use change	The impact due to change in land use will be negligible due to this project.	Not applicable	Not applicable	Not applicable
Accessibility	Traffic	i) Plan water and sewer line works to minimize	Construction	(i) Traffic route	Cost for

Field	Anticipated Impact	Mitigation Measures	Responsible for Mitigation	Monitoring of Mitigation	Cost and Source of Funds
	problems and conflicts near project locations and haul road	traffic disturbance / blockades; as the both water and sewer lines are to be laid in all the roads and streets in the town, work planning is crucial to minimize the inconvenience to public due to repeated excavations (ii) Prepare and implement a Traffic Management Plan (Appendix 15) (ii) Duly consider and select sections for trenchless method of pipe laying based on traffic conditions (iii) Plan transportation routes so that heavy vehicles do not use narrow local roads, except in the immediate vicinity of delivery sites; (iv) Schedule transport and hauling activities during non-peak hours; (v) Locate entry and exit points in areas where there is low potential for traffic congestion; (vi) Keep the site free from all unnecessary obstructions; (vii) Drive vehicles in a considerate manner; (viii) Coordinate with Traffic Police for temporary road diversions and with for provision of traffic aids if transportation activities cannot be avoided during peak hours; (ix) Notify affected sensitive receptors 1-week in advance by providing sign boards informing nature and duration of construction works and contact numbers for concerns/complaints. (x) Plan and execute the work in such a way that the period of disturbance/ loss of access is minimum. (xi) Provide pedestrian access in all the locations until normalcy is restored. Provide wooden/metal planks over the open trenches at each house to maintain the access.	Contractor	during construction works including number of permanent signage, barricades and flagmen on worksite; (ii) Complaints from sensitive receptors; (iii) Number of signage placed at project location.	implementation of mitigation measures responsibility of contractor.
Socio-Economic Income.	– Impede the access of residents and customers to nearby shops	(i) Prepare and implement spoils management plan (Appendix 14). Contractor to Implement RP and to follow mitigation measures prescribed (ii) Leave spaces for access between mounds of soil; (ii) Provide walkways and metal sheets where required	Construction Contractor	(i) Complaints from sensitive receptors; (ii) Spoils management plan	Cost for implementation of mitigation measures responsibility

Field	Anticipated Impact	Mitigation Measures	Responsible for Mitigation	Monitoring of Mitigation	Cost and Source of Funds
		for people; (iii) Increase workforce in front of critical areas such as institutions, place of worship, business establishment, hospitals, and schools; (iv) Consult businesses and institutions regarding operating hours and factoring this in work schedules; and (v) Provide sign boards for pedestrians to inform nature and duration of construction works and contact numbers for concerns/complaints. (vi) Notify community/ water users in advance about likely interruptions in water supply. (vii) Provide alternate sources of clean water until water supply is restored.		(iii) Number of walkways, signage, and metal sheets placed at project location.	of contractor.
Socio-Economic - Employment	Generation of temporary employment and increase in local revenue	(i) Employ local labour force, or to the maximum extent possible (ii) Comply with labor laws	Construction Contractor	(i) Employment records; (ii) Records of sources of materials (iii) Compliance to labor laws (see Appendix 8 of this IEE)	Cost for implementation of mitigation measures responsibility of contractor.
Occupational Health and Safety	Occupational hazards which can arise during work	(i) Comply with all national, state and local core labor laws (see Appendix 8 of this IEE); Following best practice health and safety guidelines: IFC's General EHS Guidelines ³⁷ and Sector Specific (Water and Sanitation) Guidelines; ³⁸ (ii) Develop and implement site-specific occupational health and safety (OH and S) Plan which will include measures such as: (a) excluding public from the site; (b) ensuring all workers are provided with and use	Construction Contractor	(i) Site-specific OH and S Plan; (ii) Equipped first-aid stations; (iii) Medical insurance coverage for workers; (iv) Number of	Cost for implementation of mitigation measures responsibility of contractor.

³⁷<https://www.ifc.org/wps/wcm/connect/554e8d80488658e4b76af76a6515bb18/Final%2B-%2BGeneral%2BEHS%2BGuidelines.pdf?MOD=AJPERES>

³⁸ <https://www.ifc.org/wps/wcm/connect/e22c050048855ae0875cd76a6515bb18/Final%2B-%2BWater%2Band%2BSanitation.pdf?MOD=AJPERES>

Field	Anticipated Impact	Mitigation Measures	Responsible for Mitigation	Monitoring of Mitigation	Cost and Source of Funds
		personal protective equipment like helmet, gumboot, safety belt, gloves, nose musk and ear plugs; (c) OHS Training for all site personnel; (d) documented procedures to be followed for all site activities; and (e) documentation of work-related accidents; (iii) Conduct work in confine spaces, trenches, and at height with suitable precautions and using standards and safe construction methods; do not adopt adhoc methods; all trenches deeper than 1.5 m shall be provided with safety shoring/braces; and avoid open cutting method for trenches deeper than 3.5 m by adopting trenchless technology (iv) Ensure that qualified first aid can be provided at all times. Equipped first-aid stations shall be easily accessible throughout the site; (v) Provide medical insurance coverage for workers; (vi) Secure all installations from unauthorized intrusion and accident risks; (vii) The project area experiences extreme temperature during summer months of April and May, which may affect the health of workers engaged in construction work. Contractor should take necessary measures during summers including the following: (a) work schedule should be adjusted to avoid peak temperature hours (12 – 3 PM); (b) provide appropriate shade near the workplace; allow periodic resting and provide adequate water, and (c) provide necessary medicine and facilities to take care of dehydration related health issues (viii) Provide supplies of potable drinking water; (vi) Provide clean eating areas where workers are not exposed to hazardous or noxious substances; (ix) Provide H and S orientation training to all new workers to ensure that they are apprised of the basic site rules of work at the site, personal protective protection, and preventing injuring to fellow workers; (x) Provide visitor orientation if visitors to the site can		accidents; (v) Supplies of potable drinking water; (vi) Clean eating areas where workers are not exposed to hazardous or noxious substances; (vii) record of H and S orientation trainings (viii) personal protective equipment; (ix) % of moving equipment outfitted with audible back-up alarms; (xi) permanent sign boards for hazardous areas such as energized electrical devices and lines, service rooms housing high voltage equipment, and areas for storage and disposal. (xii) Compliance to core labor laws	

Field	Anticipated Impact	Mitigation Measures	Responsible for Mitigation	Monitoring of Mitigation	Cost and Source of Funds
		gain access to areas where hazardous conditions or substances may be present. Ensure also that visitor/s do not enter hazard areas unescorted; (xi) Ensure the visibility of workers through their use of high visibility vests when working in or walking through heavy equipment operating areas; (xii) Ensure moving equipment is outfitted with audible back-up alarms; (xiii) Mark and provide sign boards for hazardous areas such as energized electrical devices and lines, service rooms housing high voltage equipment, and areas for storage and disposal. Signage shall be in accordance with international standards and be well known to, and easily understood by workers, visitors, and the general public as appropriate; (xiv) Disallow worker exposure to noise level greater than 85 dBA for a duration of more than 8 hours per day without hearing protection. The use of hearing protection shall be enforced actively. (xv) Conduct regular health check-ups for workers (xvi) Provide periodical awareness camps and special trainings for workers for health issues and risks in construction sites (xviii) Provide proper solid and liquid waste management system in workers' campsite, separate from spoils and debris disposal, as their presence can add to existing waste volume at the project sites.			
Community Health and Safety.	Traffic accidents and vehicle collision with pedestrians during material and waste transportation	(i) Trench excavation and pipeline works shall be conducted in a safe manner; if the allowing public movement along the work sites (pedestrians or vehicles as the case may be) is likely to cause safety risks, movement should be blocked temporarily and work shall be conducted; in such areas, conducting night work or working in small stretches to avoid blockage of traffic/movement no more than few hours in due consultation with the local community and ULB shall be planned	Construction Contractor	(i) Traffic Management Plan; (ii) Complaints from sensitive receptors	Cost for implementation of mitigation measures responsibility of contractor.

Field	Anticipated Impact	Mitigation Measures	Responsible for Mitigation	Monitoring of Mitigation	Cost and Source of Funds
		(ii) All trenches deeper than 1.5 m shall be provided with safety shoring/braces; and avoid open cutting method for trenches deeper than 3.5 m by adopting trenchless technology (iii) Survey the surrounding vulnerable buildings for likely issues in structural stability / differential settlement during the excavation works (iv) Provide prior information to the local people about the (v) Plan routes to avoid times of peak-pedestrian activities. (vi) Liaise with PIU/ULB in identifying high-risk areas on route cards/maps. (vii) Maintain regularly the vehicles and use of manufacturer-approved parts to minimize potentially serious accidents caused by equipment malfunction or premature failure. (viii) Provide road signs and flag persons to warn of on-going trenching activities.			
Safety of sensitive groups (children, elders etc.) and other pedestrians in narrow streets	Trench excavation in narrow streets will pose high risk to children and elders in the locality	(i) Provide prior information to the local people about the nature and duration of work (ii) Conduct awareness program on safety during the construction work (iii) Undertake the construction work stretch-wise; excavation, pipe laying and trench refilling should be completed on the same day (iv) Provide barricades, and deploy security personnel to ensure safe movement of people and also to prevent unnecessary entry and to avoid accidental fall into open trenches	Construction Contractor	Complaints from neighborhood and monitoring of accidents	Cost for implementation of mitigation measures responsibility of contractor.
Night Works	Public inconvenience due to traffic diversion, disturbance due to	Prepare a night work protocol and obtain prior approval from PIU, and strictly implement and report on implementation of protocol during the workers; Contractors should have handheld noise level meter for measurement of noise during night hours Contractors should have handheld lux meter for the	Contractor	Night work plan / protocol submitted by contractor and approved by PIU/Consultant	Contractor

Field	Anticipated Impact	Mitigation Measures	Responsible for Mitigation	Monitoring of Mitigation	Cost and Source of Funds
	excessive noise and access loss, occupational health and safety issues etc.	measurement of illumination during night hours Preferably electrical connection is available for running equipment otherwise soundproof/super silent Diesel Generator set should be available Sound level should not increase as prescribe by CPCB Illumination should be as prescribed in protocol As far as possible ready-mix concrete from batching plant to be used, otherwise the concrete should be prepared away from residential areas and brought to the site All the noisy activities like hammering, cutting, crushing, running of heavy equipment should be done in daytime and avoided in nighttime Workers engaged in night works should have adequate rest/sleep in daytime before start of night works Worker engaged for night works should have previous experience of night works and should be physically fit for such works including clear vision in night All the necessary provisions of traffic aids such as traffic signals, road signage, barricades, cautions boards, traffic diversion boards etc. should be available with fluorescent/retro-reflective arrangements Workers should be trained before start of night works about risks and hazards of night works and their mitigation measures and should be provided all the protective aids (PPEs) including fluorescent/retro-reflective vests Horns should not be permitted by equipment and vehicles Workers should not shout and create noise First aid and emergency vehicles should be available at site Emergency preparedness plan should be operative during night works Old persons and pregnant women and women having small kids should not work in night-time All the vehicles and equipment being used at night			

Field	Anticipated Impact	Mitigation Measures	Responsible for Mitigation	Monitoring of Mitigation	Cost and Source of Funds
		works should have adequate type of silencers/enclosures/mufflers to reduce noise All the vehicles should be checked for working head lamps, tail lamps, inner lights etc. before start of night works PIU/PMCBC site engineers and contractor's safety personnel should closely monitor the safety of works continuously and noise and illumination levels on hourly basis and maintain photographic and video graphic records as well as register the observations. Night works should be stopped early in the morning at least one hour before start of pedestrian/traffic movement After completion of night works all the site should be cleaned and maintained obstruction free for daytime movement of vehicles and pedestrians Drivers and workers should be alert and responsive during night works All the wages to workers working in night hours should be as per the applicable labour acts Avoid any nuisance which may create problems to nearby habitants and work peacefully during night hours Night works should not be conducted near hospitals and during peak seasons such as peak tourist season, students' exam times etc.			
Work in narrow streets	will pose high risk to children and elders in the locality	(i) Conduct awareness program on safety during the construction work (ii) Undertake the construction work stretch-wise; excavation, pipe laying and trench refilling should be completed on the same day (iii) Provide barricades, and deploy security personnel to ensure safe movement of people and also to prevent unnecessary entry and to avoid accidental fall into open trenches (iv) Trench excavation and pipeline works shall be conducted in a safe manner; if the allowing public movement along the work sites (pedestrians or vehicles			responsibility of contractor.

Field	Anticipated Impact	Mitigation Measures	Responsible for Mitigation	Monitoring of Mitigation	Cost and Source of Funds
		as the case may be) is likely to cause safety risks, movement should be blocked temporarily and work shall be conducted; in such areas, conducting night work or working in small stretches to avoid blockage of traffic/movement no more than few hours in due consultation with the local community and ULB shall be planned			
Construction camps and worker facilities	Temporary air and noise pollution from machine operation, water pollution from storage and use of fuels, oils, solvents, and lubricants Unsanitary and poor living conditions for workers	(i) Consult with PIU before locating project offices, sheds, and construction plants; (ii) Minimize removal of vegetation and disallow cutting of trees; (iii) Provide drinking water, water for other uses, and sanitation facilities for employees; (iv) Provided temporary rest and eating area at all work sites (v) Ensure conditions of livability at work camps are always maintained at the highest standards possible; living quarters and construction camps shall be provided with standard materials (as far as possible to use portable ready to fit-in reusable cabins with proper ventilation); thatched huts, and facilities constructed with materials like GI sheets, tarpaulins, etc., shall not be used as accommodation for workers; accommodation shall meet the IFC standards for workers accommodation which include: provision of safe housing, availability of electricity, plumbing, water and sanitation, adequate fire protection and dormitory/room facilities; accommodation shall be in the range from 10 to 12.5 cubic meters (volume) or 4 to 5.5 square meters (surface) per worker, a minimum ceiling height of 2.10 meters; a reasonable number of workers are allowed to share the same room – (standards range from 2 to 8 workers); workers with accompanying families shall be provided with a proper and safe accommodation (IFC benchmark standards for workers accommodation is provided in Appendix 16) (vi) Train employees in the storage and handling of	Construction Contractor	(i) Complaints from sensitive receptors; (ii) Drinking water and sanitation facilities for employees	Cost for implementation of mitigation measures responsibility of contractor.

Field	Anticipated Impact	Mitigation Measures	Responsible for Mitigation	Monitoring of Mitigation	Cost and Source of Funds
		materials which can potentially cause soil contamination; (vii) Recover used oil and lubricants and reuse or remove from the site; (viii) Manage solid waste according to the preference hierarchy: reuse, recycling and disposal to designated areas; (ix) Ensure unauthorized persons specially children are not allowed in any worksite at any given time.			
Social and Cultural Resources	Risk of archaeological chance finds	(i) Strictly follow the protocol for chance finds in any excavation work; (ii) Create awareness among the workers, supervisors and engineers about the chance finds during excavation work (iii) Stop work immediately to allow further investigation if any finds are suspected; (iv) Inform local Archeological Department / Museum office if a find is suspected and take any action, they require to ensure its removal or protection in situ	Construction Contractor	Records of chance finds	Cost for implementation of mitigation measures responsibility of contractor.
Monsoon preparedness	Disruption of utilities and water logging in trenches	(i) As for a possible avoid trench works and excavation works (pipe laying) during monsoon season to avoid any water logging and accident due to it (ii) if open trenches are not avoidable during monsoon, keep ready all the mitigations measures to avoid water logging such as dewatering pumps and sufficient pipes, traffic assistance, barricades etc. (iii) keep emergency response system ready before monsoon/heavy rain fall	Construction Contractor	Monsoon preparedness plan	Cost for implementation of mitigation measures responsibility of contractor.
Submission of EMP implementation report	Unsatisfactory compliance to EMP	(i) Appointment of supervisor to ensure EMP implementation (ii) Timely submission of monitoring reports including pictures	Construction contractor	Availability and competency of appointed supervisor Monthly report	Cost for implementation of mitigation measures responsibility of contractor.
Post-construction	Damage due to debris,	(i) Remove all spoils wreckage, rubbish, or temporary structures (such as buildings, shelters, and latrines)	Construction Contractor	PIU/Consultant report in writing	Cost for implementation

Field	Anticipated Impact	Mitigation Measures	Responsible for Mitigation	Monitoring of Mitigation	Cost and Source of Funds
clean-up	spoils, excess construction materials	which are no longer required; and (ii) All excavated roads shall be reinstated to original condition. (iii) All disrupted utilities restored (iv) All affected structures rehabilitated/compensated (v) The area that previously housed the construction camp is to be checked for spills of substances such as oil, paint, etc. and these shall be cleaned up. (vi) All hardened surfaces within the construction camp area shall be ripped, all imported materials removed, and the area shall be top soiled and re-grassed using the guidelines set out in the re-vegetation specification that forms part of this document. (vii) The contractor must arrange the cancellation of all temporary services. (viii) Request PIU to report in writing that worksites and camps have been vacated and restored to pre-project conditions before acceptance of work.		that (i) worksite is restored to original conditions; (ii) camp has been vacated and restored to pre-project conditions; (iii) all construction related structures not relevant to O and M are removed; and (iv) worksite clean-up is satisfactory.	of mitigation measures responsibility of contractor.

Table 17: Environmental Management Plan of Anticipated Impacts during Operation

Field	Anticipated Impact	Mitigation Measures	Responsible for Mitigation	Monitoring of Mitigation	Cost and Source of Funds
Sewerage system operation: treatment discharge of treated wastewater, sludge	Environmental and health issues due to operation	(i) Ensure that treated wastewater meets the established discharge standards all times; Conduct regular wastewater quality monitoring (at inlet and at outlet of STP) to ensure that the treated effluent quality complies with design standards; (ii) Conduct baseline water quality assessment of receiving water body prior to start of operation (iii) Ensure implementation of Reuse Plan, and ensure intended quality for each direct reuse (iv) Assess composition and	O & M contractor for 10 years and then Municipal Council	Municipal Council, Makrana	O&M cost of contractor

Field	Anticipated Impact	Mitigation Measures	Responsible for Mitigation	Monitoring of Mitigation	Cost and Source of Funds
		characteristics of sludge from the first batch operation at the initial phases, and confirm the handling, management and disposal/reuse actions suggested in the management plan (v) Conduct periodic testing of dried sludge/compost to check presence of heavy metals and confirming the concentrations to use as compost as specified in the Standards for Composting, Schedule II A, Solid Waste Management Rules, 2016, FCO = Fertilizer Control Order, 1985, amendments in 2009 and 2013. It shall not be used for food crops. (vi) Ensure valid consent to operate (CTO) from RSPCB for operation of STP (vii) Ensure that all conditions/standards prescribed by RSPCB are complied duly (viii) Ensure that chlorinator facility is operated only by trained staff and as per the standard operating procedures; in case of any accident and/or maintenance activity, ensure that the staff follows documented procedures only (ix) Implement Emergency Response System (ERS) for the chlorine leakage; Guidelines and Emergency plan for handling and storing chlorine is attached as Appendix 19 (x) Ensure proper knowledge transfer, hands-on training to municipal staff engaged in STP operation has been provided by contractor prior to handover of facility; (xi) Operate and maintain the facility following standard operating procedures of operational manual; (xii) Undertake preventive and periodic			

Field	Anticipated Impact	Mitigation Measures	Responsible for Mitigation	Monitoring of Mitigation	Cost and Source of Funds
		maintenance activities as required; (xiii) Conduct periodic training to workers; ensure that all safety apparatus at STP including personal protection equipment are in good condition all times; and are at easily accessible and identifiable place; periodically check the equipment, and conduct mock drills to deal with emergency situations; (xiv) No wastewater from industrial premises (including domestic wastewater) shall be allowed to dispose into municipal sewers; monitor regularly and ensure that there is no illegal discharge through manholes or inspection chambers; conduct public awareness programs; in coordination with RSPCB;			
Sewerage system operation: collection and conveyance	Environmental and health issues due to operation of sewer network	(i) Establish regular maintenance program, including: - Regular cleaning of grit chambers and sewer lines to remove grease, grit, and other debris that may lead to sewer backups. Cleaning should be conducted more frequently for problem areas. - Inspection of the condition of sanitary sewer structures and identifying areas that need repair or maintenance. Items to note may include cracked/deteriorating pipes; leaking joints or seals at manhole; frequent line blockages; lines that generally flow at or near capacity; and suspected infiltration or exfiltration; and - Monitoring of sewer flow to identify potential inflows and outflows - Conduct repairs on priority based on the nature and severity of the problem. Immediate clearing of blockage or repair is	O & M contractor for 10 years and then Municipal Council	Municipal Council, Makrana	O&M cost of contractor

Field	Anticipated Impact	Mitigation Measures	Responsible for Mitigation	Monitoring of Mitigation	Cost and Source of Funds
		warranted where an overflow is currently occurring or for urgent problems that may cause an imminent overflow (e.g. pump station failures, sewer line ruptures, or sewer line blockages); (ii) Review previous sewer maintenance records to help identify “hot spots” or areas with frequent maintenance problems and locations of potential system failure, and conduct preventative maintenance, rehabilitation, or replacement of lines as needed; (iii) When a spill, leak, and/or overflow occurs, keep sewage from entering the storm drain system by covering or blocking storm drain inlets or by containing and diverting the sewage away from open channels and other storm drain facilities (using sandbags, inflatable dams, etc.). Remove the sewage using vacuum equipment or use other measures to divert it back to the sanitary sewer system. (iv) Prohibit/prevent disposal of wastewater/effluent from industrial units in the sewers; ensure regular checking to ensure no illegal entry of industrial wastewater into sewers (v) Develop an Emergency Response System for the sewerage system leaks, burst and overflows, etc. (vi) Provide necessary health and safety training to the staff (vii) Provide all necessary personnel protection equipment (viii) During cleaning/clearing of manholes and sewer lines great precautions should be taken for the safety of workers			

Field	Anticipated Impact	Mitigation Measures	Responsible for Mitigation	Monitoring of Mitigation	Cost and Source of Funds
		conducting such works. • As far as possible use remote / CCTV mechanism to identify/detect the problems in sewers and do not engage persons for this purpose • As far as possible use mechanized cleaning of manholes and sewers by using modern techniques and machines and do not engage persons for this purpose • Ensure that maintenance staff and supervisors understand the risks; provide proper instructions, training and supervision. • Use gas detector to detect any hazardous or inflammable gas in confined areas like sewers /manholes prior to maintenance process • Provide suitable personal protective equipment that may include waterproof / abrasion-resistant gloves, footwear, eye and respiratory protection. Face visors are particularly effective against splashes. Equipment selection and a proper system for inspection and maintenance are important. • Provide adequate welfare facilities, including clean water, soap, nail brushes, disposable paper towels, and where heavy contamination is foreseeable, showers. • For remote locations portable welfare facilities should be provided. • Areas for storage of clean and contaminated equipment should be segregated and separate from eating facilities. • Provide adequate first-aid equipment, including clean water or sterile wipes for cleansing wounds, and a supply of			

Field	Anticipated Impact	Mitigation Measures	Responsible for Mitigation	Monitoring of Mitigation	Cost and Source of Funds
		sterile, waterproof, adhesive dressings. • Make effective arrangements for monitoring the health of staff. Keep emergency preparedness plan ready before starting the work of sewage system cleaning			
Repair and maintenance activities of water supply and sewerage Construction disturbances, nuisances, public and worker safety,	All work sites	Implementation of dust control, noise control, traffic management, and safety measures. Site inspection checklist to review implementation is appended at Appendix 24.	O & M contractor for 10 years and then Municipal Council	Municipal Council, Makrana	O&M cost of contractor
Asset management	Reduction in NRW Increased efficiency of the system	Preparation and implementation of O&M Manual	O & M contractor for 10 years and then Municipal Council	Municipal Council, Makrana	O&M cost of contractor

Table 18: Environmental Monitoring Plan of Anticipated Impacts during Construction

Monitoring field	Monitoring location	Monitoring parameters	Frequency	Responsibility	Cost & Source of Funds
Construction disturbances, nuisances, public & worker safety,	All work sites	Implementation of dust control, noise control, traffic management, & safety measures. Site inspection checklist to review implementation is appended at Appendix-24.	Weekly during construction	Supervising staff and EHS safeguards specialists	No costs required
Tree cutting and plantation	SPS, STP, Pipe laying etc.	Obtain permission from concerned authority for any tree cutting and plant trees in the ratio of 1:3 as per RUDSICO-EAP Circular	Weekly during construction	Supervising staff and safeguards specialist	Contractors cost
Noise and illumination levels on hourly basis and maintain photographic and videographic records as well as register the observations	All work sites	Noise and Illumination levels	Hourly Basis	Contractor	Cost for implementation of monitoring measures responsibility of contractor As per table 22 and Appendix-18.
Ambient air quality	4 locations (STP, SPS (2Nos.) and Pipe laying site and workers camp during construction)s	PM ₁₀ , PM _{2.5} , NO ₂ , SO ₂ , CO	Once before start of construction and quarterly (yearly 4-times) during construction except monsoon period	Contractor	Cost for implementation of monitoring measures responsibility of contractor (as per table 22 and Appendix-18)
Ambient noise	4 locations (STP, SPS (2 nos.) and Pipe laying site and workers camp during construction)	Day time and night time noise levels	Once before start of construction and quarterly (yearly 4-times)	Contractor	Cost for implementation of monitoring measures responsibility of contractor (as per table 22

Monitoring field	Monitoring location	Monitoring parameters	Frequency	Responsibility	Cost & Source of Funds
			during construction		and Appendix-16)
Ground Water Quality	3 locations(STP, SPS (2nos.) and construction	pH, TDS, Total Hardness, Zn, Chloride, Iron, Copper, DO, Manganese, Sulphate, Nitrate, Fluoride, Hg, Cadmium, Cr ⁺⁶ , Arsenic, Lead, Total Alkalinity, Phosphate, Phenolic compound	Once before start of construction and quarterly (yearly 4-times) during construction	Contractor	Cost for implementation of monitoring measures responsibility of contractor (as per table 22 and Appendix-18)
Surface Water quality	Jhalara Pond	pH, Turbidity, Total Hardness, DO, BOD, COD, Chloride, Hg, Iron, TDS, TSS, Calcium, Zn, Cr ⁺⁶ , Magnesium, Copper, Manganese, Sulphate, Cyanide, Nitrate, Sodium, Potassium, Fluoride, Cadmium, Arsenic, Lead, Boron, Selenium, Aluminium, Total residual Chlorine	Once before start of construction and quarterly (yearly 4-times) during construction	Contractor	Cost for implementation of monitoring measures responsibility of contractor (Ref. Table-22 and Appendix-18).
Soil quality	4 locations (STP, SPS (2 nos.), pipe laying site ,construction camps)	pH, Elect. Conductivity (at 25°C), Moisture (at 105°C), Texture (silt, clay, sand), Calcium (as CaO), Magnesium (as Mg), Permeability, Nitrogen (as N), Sodium (as Na), Phosphate (as PO ₄), Potassium (as K), Organic Matter, oil and grease	Once before start of construction and quarterly (yearly 4-times) during construction	Contractor	Cost for implementation of monitoring measures responsibility of contractor (as per Table 21 and Appendix-18)
Construction, Labour Camp,	Construction, Labour Camp, storage yard	As per EMP	Weekly	EHS officer, Environment	contractor

Monitoring field	Monitoring location	Monitoring parameters	Frequency	Responsibility	Cost & Source of Funds
storage yard Management	Management			Specialist of consultant	
Solid waste management	Construction, Labour Camp, storage yard Management	As per EMP	Weekly	EHS officer, Environment Specialist of consultant	contractor
Construction and demolition waste management	All construction site	As per EMP and applicable rules and regulations	Weekly	EHS officer, Environment Specialist of consultant	contractor
Consent to establish of STPs, batching plants, crusher, hot mix plant. DG sets etc.	STPs, batching plants, crusher, hot mix plants, DG sets etc	Consents are required as per table 4 & 5	Periodically	EHS officer, Environment Specialist of consultant	No cost required for monitoring cost for obtaining CTE/CTO from PMU and for others from Contractor

Table 19: Environmental Monitoring Plan of Anticipated Impacts during Operation

Monitoring field	Monitoring location	Monitoring parameters	Frequency	Responsibility	Cost & Source of Funds
Monitoring of raw wastewater quality	Inlet of the STP	Suspended solids, pH, Temperature Oil and grease, Total residual chlorine, Ammonical nitrogen (as N), BOD, COD, Nitrate Nitrogen The values should be within the limit specified by CPCB to discharge into municipal sewers (see Appendix 5)	As per O&M Plan	Municipal Council Makrana	O&M Contractor/ Municipal Council Makrana
Sludge quality (STP) and suitability as manure	Dried sludge	Analysis for concentration of heavy metals and confirm that value are within the following limits (all units are in mg/kg dry basis except pH) Arsenic - 10.00 Cadmium - 5.00 Chromium - 50.00 Copper- 300.00 Lead - 100.00 Mercury- 0.15 Nickel - 50.00 Zinc- 1000.00 PH - 5.5-8.5	Yearly twice	O&M contractor for 10 years and then Municipal Council	O&M Contractor/ Municipal Council

Monitoring field	Monitoring location	Monitoring parameters	Frequency	Responsibility	Cost & Source of Funds
Monitoring of treated effluent quality	Outlet of STP	pH, BOD, COD, TSS, NH ₄ -N, N-total, Fecal Coliform (as per Appendix-5)	As per O&M Plan	O&M Contractor/ Municipal Council	O&M Contractor/ Municipal Council
Monitoring of plantations	Plantations locations	Nos. of tree survived	monthly	O&M Contractor/Municipal Council	O&M Contractor/ Municipal Council
Sewer network to sustain operational efficiency and avoid clogging and early occurrence of leakages	Sewer network	to be included in the O&M plan prepared under the project	as per O&M plan	O&M Contractor/Municipal Council Makrana	O&M Contractor/ Municipal Council Makrana
Consent to operate (CTO) from RPCB	STP	CTO should be renewed before expired	5 yearly	Municipal Council Makrana	Municipal Council Makrana
Achieving targeted wastewater reuse and safe sludge disposal	STP	Volume of wastewater reuse	Monthly / Yearly	ULB	Municipal Council Makrana
	STP	Quantity of safe sludge disposal	Monthly / Yearly	ULB	Municipal Council Makrana

B. Institutional Requirements

213. Local Self Government Department (LSGD) of Government of Rajasthan will be the Executing Agency (EA) for the Rajasthan Secondary Towns Development Sector Project (RSTDSP). EA will be responsible for overall strategic guidance and for ensuring compliance with ADB's loan covenants. The existing RUDSICO-EAP (a unit of RUDSICO) will be the Implementing Agency (IA) responsible for technical supervision and project implementation.

214. The RUDSICO Board under the Chairmanship of the Minister for Urban Development, and members comprising of the Chief Secretary, Secretaries of LSGD, Finance, Planning, Public Works Department (PWD), PHED and the Project Director, RUDSICO-EAP as Member Secretary. It shall have full powers to decide on matters related to RSTDSP (RUDSICO-EAP Phase IV Project). The Board will take needful policy decisions, provide administrative and financial approvals, expedite clearances of project matters, ensure inter-departmental coordination and provide guidance to the PMU. As per GO dated 21 Feb 2018, all powers and responsibilities of earlier State Level Empowered Committee (SLEC, under RUDSICO-EAP Phase III) have now been transferred to RUDSICO Board.

215. The Town Level Committee (TLC) will be headed by the Chairperson of respective ULB and shall have Commissioner/Executive Officer of ULB, Local PHED and PWD Officers and officers of PIU of respective town/cluster as members. The AE of PIU (RUDSICO-EAP Officer) shall be Member-Secretary. The TLC shall meet at least once in two months to monitor the

project progress and sort out any local issues. The implementation arrangements shall further include a central PMU at Headquarter level and a number of PIUs at field level.

216. Project Management Unit. RUDSICO-EAP will establish a Jaipur based Central Project Management Unit (PMU) at headquarter level, headed by a dedicated Project Director.

217. Project Implementation Units (PIU). For the purpose of project implementation, two Zonal Project Implementation Units (Zonal PIUs), at Jaipur and Jodhpur, headed by Additional Chief Engineers (ACE) will be established. At field level, town-level PIUs will be established in each town, and cluster level PIUs for a cluster of towns. There will be a number of cluster level PIUs under each Zonal PIU. For ease of monitoring and management, RSTDSP towns have been grouped into 5 clusters for initial 14 towns based on geographical location, access for monitoring and total cost of proposed projects in these towns. Accordingly, typical clusters comprise of 2 to 4 towns. Cluster level PIUs will be headed by Superintending Engineer (SE) or Executive Engineer (EE) level officer, who shall work as employer representative and shall sign the contract documents, manage the contract and disburse payments as drawing and disbursing officer. PIU will report to respective cluster PIUs. PIUs will be staffed with necessary staff.

218. ULBs will be the final custodian and user of the created infrastructure and thus have major stakes in the project. Therefore, to involve and engage them in the implementation and day to day monitoring of the project, ULB staff will be part of the PIU. The PIU shall be responsible for the quality and quantity execution of all works under the project

219. The PMU will be supported by three institutional consultants under the supervision and control of PD, PMU. These consultants shall be:

- (i) Project Management and Capacity Building Consultants (PMCBC);
- (ii) Construction Management and Supervision Consultants (CMSC), 2 Nos. and
- (iii) Community Awareness and Participation Consultants (CAPC)

220. Project Management and Capacity Building Consultants (PMCBC) shall manage preparation/vetting design documents, tendering of contracts, implementation of resettlement, environmental management and gender action plans; setting and managing project performance monitoring systems, planning and managing implementation of training and capacity building as well as institutional strengthening activities besides preparing reports as per ADB requirements.

221. Construction Management and Supervision Consultants (CMSC) shall support Zonal PIUs and PIUs in day to day contract management, construction supervision including quality management of ongoing works etc. This shall include work measurement, quantities, verification of bills of contractors etc.

222. Community Awareness and Participation Consultants (CAPC) will closely work in field (with PIUs) to facilitate creation of project awareness and ensuring public participation for all project works at the community level. This shall mainly involve house connections for, sewerage and metering. Besides, they shall also undertake various IEC activities to promote and pursue health and hygiene amongst communities.

223. Safeguards Implementation Arrangements. At PMU, there will be two dedicated Project Officers (i) Project Officer (Environment) and (ii) Project Officer (Social), who will responsible for compliance with the environmental and social safeguards in program implementation. PO (Environment) will have overall responsibility in implementation of the RSTDSP program as per the Environmental Assessment and Review Framework (EARF) agreed between ADB and the government. At individual subproject level, PO will ensure that environmental assessment is conducted, and a project-specific is prepared and implemented, and the compliance, and corrective actions, if any are reported as required. PO (Environment) will be supported by Environmental Safeguards Specialist of PMCBC.

224. Each Zonal PIU will be staffed with two dedicated Safeguards Officers (Environmental Safeguards Officer, and Social Safeguards Officer) who will assist PMU Project Officer (Environment) in implementation of the environmental safeguards at the zonal PIU level. CMSC will assist Zonal, cluster and town-level PIUs and PMU in preparation, implementation and monitoring of environmental safeguards. There will be two sets of CMSCs each housed in a Zonal PIU (Jaipur and Jodhpur) and will assist the PIUs under respective Zonal PIUs. Each CMSC will be staffed with one Environmental Safeguard Specialist, and one Support Environmental Engineer in each PIU. Community Awareness and Public Participation Consultants (CAPC) will closely work in field (with PIUs) to facilitate creation of project awareness and ensuring public participation for all project works at the community level. This shall mainly involve house connections for water supply, sewerage and metering. Besides, they shall also undertake various IEC activities to promote and pursue health and hygiene amongst communities.

225. Contractor. Project being DBO contract, contractor will be required to review the IEE and provide information to consultant's ESS for update the IEE as per changed design and latest scope of works. The contractor shall appoint an Environment, Health and Safety (EHS) engineer who will be responsible on a day-to-day basis for (i) ensuring implementation of EMP, (ii) coordinating with the ACM and environment safeguards specialists (all levels PO, SO and ESS); (iii) community liaison,³⁹ consultations with interested/affected parties, and grievance redress ; and (iv) reporting. Requirement of EHS Supervisor will be included in the bid documents.

226. The following Table 20 summarizes the institutional responsibility of environmental safeguards at all stages of the project.

Table 20: Institutional Roles and Responsibilities

Responsible Agency	Responsibility		
	Pre-Construction Stage	Construction Stage	Post-Construction
Project Officer (Environment), PMU	(i) Review REA checklists and assign categorization based on ADB SPS 2009 (ii) Review and approve EIA/IEE (iii) Submit EIA/IEE to ADB for approval and disclosure in ADB website	(i) Over-all environmental safeguards compliance of the project; ensuring that construction work is started only after preparation and approval of SEMP (iii) Monitor and ensure compliance of EMPs as well	Compliance monitoring to review the environmental performance of project component, if required and as specified in EMP.

³⁹ Reasonable size social outreach team (SOT) to be appointed by contractor to facilitate community liaison, consultations and R and R implementation (including resolution of grievances). Requirement of SOT will be included in bid document.

Responsible Agency	Responsibility		
	Pre-Construction Stage	Construction Stage	Post-Construction
	(iv) Ensure approved IEEs are disclosed in RSTDSP/PMU websites and summary posted in public areas accessible and understandable by local people. (v) Ensure environmental management plans (EMPs) are included in the bid documents and contracts (vi) Organize an orientation workshop for PMU, PIU, ULB and all staff involved in the project implementation on (a) ADB SPS, (b) Government of India national, state, and local environmental laws and regulations, (c) core labor standards, (d) OH andS, (e) EMP implementation especially spoil management, working in congested areas, public relations and ongoing consultations, grievance redress, etc. (vii) Assist in addressing any grievances brought about through the Grievance Redress Mechanism in a timely manner as per the IEEs (viii) Organize an induction course for the training of contractors preparing them on EMP implementation, environmental monitoring requirements related to mitigation measures; and taking immediate actions to remedy unexpected adverse impacts or ineffective mitigation measures found during the course of implementation. (ix) Ensure compliance with all government rules and regulations regarding site and environmental clearances as well as any other environmental requirements (x) Approval of site environmental management	as any other environmental provisions and conditions. (i) Review and approve monthly and quarterly monitoring report (ii) Prepare and submit to ADB semi-annual monitoring reports (iv) If necessary, prepare Corrective Action Plan and ensure implementation of corrective actions to ensure no environmental impacts; (iii) Review and submit Corrective Action Plans to ADB (iv) Organize capacity building programs on environmental safeguards (iv) Coordinate with national and state level government agencies (vi) Assist in addressing any grievances brought about through the Grievance Redress Mechanism in a timely manner as per the IEEs (ix) Coordinate PIUs, consultants and contractors on mitigation measures involving the community and affected persons and ensure that environmental concerns and suggestions are incorporated and implemented	

Responsible Agency	Responsibility		
	Pre-Construction Stage	Construction Stage	Post-Construction
	plans (SEMPs) to ensure compliance with the IEE.		
PIU, Assistant Safeguard Officer,	(i) Ensure IEE is included in bid documents and contract agreements. Ensure cost of EMP implementation is provided. (iii) Disclose of approved EIAs/IEEs. (iii) Obtain all necessary clearances, permits, consents, NOCs, etc. Ensure compliance to the provisions and conditions. (iv) EMP implementation regarding sites for disposal of wastes, camps, storage areas, quarry sites, etc. (v) Organize an induction course for the training of contractors, preparing them on EMP implementation, environmental monitoring requirements related to mitigation measures, and on taking immediate action to remedy unexpected adverse impacts or ineffective mitigation measures found during the course of implementation. (vi) review of SEMP prepared by DBO contractor and submission to PMU	(i) oversee day-to-day implementation of EMPs by contractors, including compliance with all government rules and regulations; ensure that construction work is not started prior to preparation of SEMP by DBO contractor and approval by PMU (ii) take necessary action for obtaining rights of way; (iii) oversee implementation of SEMP/EMPs, including environmental monitoring by contractors; (iv) take corrective actions when necessary to ensure no environmental impacts; (v) submit monthly and quarterly environmental monitoring reports to PMU, (vi) conduct continuous public consultation and awareness; (vii) address any grievances brought about through the grievance redress mechanism in a timely manner as per the IEEs; and	(i) Conducting environmental monitoring, as specified in the EMP. (ii) Issuance of clearance for contractor's post-construction activities as specified in the EMP.
Consultant 1. PMCBC-Environmental Safeguard Specialist-1 Nos,	(i) Review IEE/EMP submitted by CMSC and revise report to submit to PMU (ii) Assist PMU and PIU in obtaining all necessary clearances, permits, consents, NOCs, etc. Ensure provisions and conditions are incorporated in the IEE and detailed design documents. (iii) Assist in ensuring IEE is included in bid documents and contract agreements. (iv) Assist in determining adequacy of cost for EMP implementation. (v) Assist in addressing any concern related to IEE and	(i) Monitor EMP implementation (ii) Assist in addressing any grievances brought about through the Grievance Redress Mechanism in a timely manner as per the IEEs	

Responsible Agency	Responsibility		
	Pre-Construction Stage	Construction Stage	Post-Construction
	EMP.		
Consultant 2. CMSC - 2 Nos. Environmental Safeguards professional	(i) Update initial environmental assessment for proposed project using REA checklists and submit to PIU/PMCBC (ii) Assist in summarizing IEE and translating to language understood by local people.	(i) Monitoring of Implementation of EMP at site by contractor (ii) Recommend corrective action measures for non-compliance by contractors (iii) Assist in the review of monitoring reports submitted by contractors (iv) Assist in the preparation of monthly monitoring reports conduct continuous public consultation and awareness;	(i) Assist in the inspection and verification of contractor's post-construction activities.
Contractors (EHS Engineer/ supervisor	(i) Review the IEE and provide information about changes needed as per revised design and scope of works to ESS of consultants for final revision of IEE (ii) Prepare EHS plan and take approval from PM Consultant/PIU and Ensure EMP implementation cost is included in the methodology. (iii) Undergo EMP implementation orientation by ESS of supervision consultant prior to start of works (iv) prepare site environmental management plan (SEMP) (iv) Provide EMP implementation orientation to all workers prior to deployment to worksites (v) Seek approval for camp sites and sources of materials. (vi) Ensure copy of IEE is available at worksites. Summary of IEE is translated to language understood by workers and posted at visible places at all times.	(i) Implement EMP / SEMP; ensure that works are not started without an approved SEMP (ii) Implement corrective actions if necessary. (iii) Prepare and submit monitoring reports including pictures to PIU (iv) Comply with all applicable legislation, is conversant with the requirements of the EMP; (v) Brief his staff, employees, and laborer about the requirements of the EMP and provide environmental awareness training to staff, employees, and laborers; (vi) Ensure any sub-contractors/ suppliers who are utilized within the context of the contract comply with all requirements of the EMP. The Contractor will be held responsible for non-compliance on their behalf; (vii) Bear the costs of any damages/compensation resulting from non-adherence to the EMP or written site instructions; (viii) Ensure that PIU and ACM/SO are timely informed of any foreseeable activities related to EMP implementation.	(i) Ensure EMP post-construction requirements are satisfactorily complied (ii) Request certification from PIU

C. Training Needs

227. The Implementing Agency, RUDSICO-EAP, has experienced project staff, who have knowledge and primary experience of ADB supported project implementation from earlier phases. It is hence understood that they have required familiarity with ADB environmental safeguard policies and its implementation. However, transfer of duties and candidates will require training of new staff and officers that will be involved in project preparation and implementation of this Project. The PMCBC ESS will be responsible for training PMU SPO and PIUs ESO and other staff on environmental aspects including consultation, specific recording, reporting, and disclosure requirements. The ESS will provide a training and capacity building program on Environmental management issues for the PMU and PIU staffs. Specific modules customized for the available skill set shall be devised after assessing the capabilities of the target participants and the requirements of the project.

228. The following Table 21 presents the outline of capacity building program to ensure EMP implementation. The estimated cost is Rs.275,000 (excluding trainings of contractors which will be part of EMP implementation cost during construction to be covered by the project's capacity building program. The detailed cost and specific modules will be customized for the available skill set after assessing the capabilities of the target participants and the requirements of the project by the ESS of PMCBC.

Table 21: Outline Capacity Building Program on EMP Implementation

Description	Target Participants and Venue	Estimate (INR)	Cost and Source of Funds
1. Introduction and Sensitization to Environmental Issues (1 day) - ADB Safeguards Policy Statement - Government of India and Rajasthan applicable safeguard laws, regulations and policies including but not limited to core labor standards, OHS, etc. - Incorporation of EMP into the project design and contracts - Monitoring, reporting and corrective action planning	All staff and consultants involved in the project at PMU, Jaipur	INR 100,000 (Lump sum)	PMU cost
2. EMP implementation (2 days) - Roles and responsibilities - OHS planning and implementation - Wastes management (water, hazardous, solid, excess construction materials, spoils, etc.) - Working in congested areas, - Public relations - Consultations	All staff and consultants involved in the Town subproject All contractors prior to award of contract At PIU, Makrana	INR 50,000 (Lump sum)	PMU cost

Description	Target Participants and Venue	Estimate (INR)	Cost and Source of Funds
- Grievance redress - Monitoring and corrective action planning - Reporting and disclosure - Post-construction planning			
3. Plans and Protocols (1 day) - Construction site standard operating procedures (SOP) - ACM Management Plan - Site-specific EMP - Traffic management plan - Spoils management plan - Waste management plan - Chance find protocol - O&M plans - Post-construction plan	All staff and consultants involved in the project All contractors prior to award of contract or during mobilization stage. At PIU Makrana	Lump sum INR 25,000 (Lump sum) Lump sum INR 25,000 (Lump sum)	PMU cost Contractors cost as compliance to contract provisions on EMP implementation (refer to EMP tables)
4. Experiences and best practices sharing - Experiences on EMP implementation - Issues and challenges - Best practices followed	All staff and consultants involved in the project All contractors All NGOs At PMU Jaipur	INR 100,000 (Lump sum)	PMU Cost
5. Contractors Orientation to Workers on EMP implementation (OH andS, core labor laws, spoils management, etc.)	All workers (including manual laborers) of the contractor prior to dispatch to worksite	Lump sum INR 25,000 (Lump sum)	Contractors cost as compliance to contract provisions on EMP implementation (refer to EMP tables)

Summary of Capacity Building cost for EMP Implementation

Contractor Cost - INR 50,000

PMU Cost - INR 275,000

Total - INR 325,000

D. Monitoring and Reporting

229. Prior to commencement of the work, the contractor will submit a compliance report to PIU ensuring that all identified pre-construction environmental impact mitigation measures as detailed in the EMP will be undertaken. PIU with the assistance of the ASO and ESS of Consultant will review the report and thereafter PMU will allow commencement of works.

230. During construction, results from internal monitoring by the contractor will be reflected in their monthly EMP implementation reports to the PIU and Assistant Construction Manager of Consultant. ASO and ACM will review and advise contractors for corrective actions if necessary. Monthly report summarizing compliance and corrective measures taken will be prepared by ASO with the assistance of ACM and submitted to PMU.

231. Quarterly report shall be prepared by CMSC and PIU and submitted to PMU for review and further actions.

232. Based on monthly reports, quarterly reports and measurements, PMU will draft, review, and submit to ADB, semi-annual environmental monitoring reports (Appendix-25). Once

concurrence from the ADB is received the report will be disclosed in the Project website. ADB's monitoring and supervision activities are carried out on an ongoing basis until a project completion report (PCR) is issued. Thus, semi-annual report, which may cover O&M of completed packages, will be submitted to ADB until PCR is issued.

233. ADB will review project performance against the RUIDP commitments as agreed in the legal documents. The extent of ADB's monitoring and supervision activities will be commensurate with the project's risks and impacts. Monitoring and supervising of social and environmental safeguards will be integrated into the project performance management system.

E. EMP Implementation Cost

234. Most of the mitigation measures require the contractors to adopt good site practice, which should be part of their normal procedures already, so there are unlikely to be major costs associated with compliance. Regardless of this, any costs of mitigation by the construction contractors or consultants are included in the budgets for the civil works and do not need to be estimated separately here. Mitigation that is the responsibility of PIU/ULB will be provided as part of their management of the project, so this also does not need to be duplicated here. Cost for the capacity building program is included as part of the project.

Table 22: Cost Estimates to Implement the EMP

	Particulars	Stages	Unit	Total Number#	Rate (INR)	Cost (INR)	Costs Covered By
A.	Monitoring Measures						
1	Ambient Air Quality-Monitoring	Pre-construction and Construction	Per sample	45	4920	221400	Civil works contract
2	Ambient Noise Quality-Monitoring	Pre-construction and Construction	Per sample	45	1980	89100	Civil works contract
3	Ground water quality	Pre-construction and Construction	Per sample	36	6720	241920	Civil works contract
4	Soil quality	Pre-construction and Construction	Per sample	44	5880	258720	Civil works contract
	Subtotal (A)					811140	
B.	Capacity Building						
1.	Introduction and sensitization to environment issues	Pre-construction	lump sum			100,000	PMU
2	EMP implementation	Construction	lump sum			50,000	PMU
3	Plans and	Construction	lump			25,000	PMU

	Particulars	Stages	Unit	Total Number#	Rate (INR)	Cost (INR)	Costs Covered By
	Protocols		sum				
4			lump sum			25,000	Civil works contract
5.	Experiences and best practices sharing Contractors Orientation to Workers on EMP implementation	Construction/P ost- Construction Prior to dispatch to worksite	lump sum lump sum			100,000 25,000	PMU Civil works contract
	Subtotal (B)					325000	
C	Civil Works						
1	Barricading with GI sheets	Construction	SQM	204773	101	20682073	Civil works contract
2	Barricading using 40mm dia M.S. pipe ("B" class) and fixing suitably two rows of 100mm wide PVC Tape	Construction	Mtr	125139	38.50	4817852	Civil works contract
3	Barricading using 40mm dia M.S. pipe ("B" class) and fixing suitably two rows of 40mm dia M.S. pipe ("B" class) with nut and bolts	Construction	Mtr	25040	50	1252000	Civil works contract
4	Plantations of trees***	Construction	Ha.	0.16	137200	21952	Civil works contract
5	RainWater Harvesting for STP	Construction	Nos.	1	LS	1000000	Civil works contract
	Sub Total (C)					27773877	
	Total (A+B+C)				INR	28910017	

* STP, SPS, Proposed Pipelines location, labor camp/construction camp/storage yard

** STP, SPS, Pipelines/working locations, Labour Camp, Construction Camps on quarterly basis

*** In preliminary design no trees are required to be cut, being DBO contract, contractor will be required to revise it. Compensatory plantation measures to be followed by contractor.

Computation of total number of samples for environmental monitoring as per Appendix 18.

Summary of EMP Cost incurred by Institution:

Contractor Cost - INR 28910017/-

PMU Cost - INR 275,000/-

Total - INR 29185017/-

(In Words: Two Crore Ninety One Lakhs Ten Thousand Seventeen Only)

IX. CONCLUSION AND RECOMMENDATION

235. The process described in this document has assessed the environmental impacts of all elements of the Makrana sewerage subproject. All potential impacts were identified in relation to pre-construction, construction, and operation phases. Planning principles and design considerations have been reviewed and incorporated into the site planning and design process wherever possible; thus, environmental impacts as being due to the project design or location were not significant. During the construction phase, impacts mainly arise from the construction dust and noise, the need to dispose of large quantities of waste soil and import a similar amount of construction material to support the sewer in the trenches; and from the disturbance of residents, businesses, traffic and important buildings by the construction work.

236. Subproject sites are located in Makrana urban area and surroundings. There are no environmentally or archeologically sensitive areas within or near Makrana Town.

237. One STPs of capacity 7.70 MLD are proposed based on SBR (sequential batch reactor) process, followed by disinfection. As the bid is DBO type, detailed design of the STP will be carried out by the contractor to the following specific discharge standards. Currently for STPs in India, the standards notified by Ministry of Environment, Forests and Climate Change (MOEFCC) in 2017 and NGT order 2019 as amended are applicable. However, under RSTDSP, PMU has decided to base the STP design on discharge standards for STPs suggested by CPCB in 2015 and order of NGT, 30th April, 2019, which are more stringent. The stringent standards also facilitate maximum utilization of treated wastewater for reuse in various purposes following the Sewerage and Wastewater Policy, 2016, of Rajasthan. The treated wastewater will be reused, and a reuse plan will be prepared during the detailed design. Various measures are suggested for safe reuse of wastewater and sludge.

238. Proposed STP sites are away from habitations and surrounded by agricultural and barren vacant lands, situated within campus of existing STP. Some trees are present at the proposed STP and SPS sites, which needs to be cut for construction of proposed facilities. During detail design all efforts should be done to reduce numbers of trees to be cut for construction works. Tree plantation will be carried out as per replacement ratio of 1:3. Treated wastewater will be mostly utilized in reuse purposes. STPs treated wastewater will be fully utilized for irrigation. For STP, reuse application will be as per the Reuse Plan to be prepared during detailed design phase. Excess treated wastewater, if any, will be discharged into government vacant / low lying lands near the STP. Given the desert region, there is no defined natural drainage system, nor there any streams / channels. Owing to large expanse of vacant lands, deep groundwater table, sandy soil and high temperature, etc., there are unlikely to be any issues due to discharge of treated wastewater on the land.

239. Except sewer works, all other construction activities will be confined to the selected sites, and the interference with the general public and community around is minimal. There will be temporary negative impacts, arising mainly from construction dust and noise, hauling of construction material, waste and equipment on local roads (traffic, dust, safety etc.), mining of construction material, occupation health and safety aspects. Sewer line works (sewers covering almost entire project area of Makrana town) will be conducted along public roads in an urban area congested with people, activities and traffic, subproject is likely to significant impacts during construction. Impacts mainly arise from the construction dust and noise; from the disturbance of residents, businesses, traffic by the construction work, safety risk to workers,

public and nearby buildings due to deep trench excavations, especially in narrow roads, dust, access impediment to houses and business, disposal of large quantities of construction waste, etc. These are all general impacts of construction in urban areas, and there are well developed methods of mitigation that are suggested in the EMP. Trenchless method will be adopted for sewers deeper than 3.5 m and also at main road and railway crossings.

240. Once the new system is operating, the facilities will operate with routine maintenance, which should not affect the environment. Improved system operation will comply with the operation and maintenance manual and standard operating procedures to be developed for all the activities.

241. Mitigation will be assured by a program of environmental monitoring conducted during construction and operation to ensure that all measures are implemented, and to determine whether the environment is protected as intended. This will include observations on- and off-site, document checks, and interviews with workers and beneficiaries, and any requirements for remedial action will be reported to the PMU. There will also be longer-term surveys to monitor, treatment efficiency of STP (raw and treated sewage quality), sludge at STPs. Mitigation and monitoring measures, along with the project agency responsible for such actions, form part of the Environmental Management Plan.

242. Certain new initiatives have been taken in the project viz., promoting wastewater reuse, sludge reuse and contractor to work on private properties to provide sewerage connections. Hence, appropriate guidelines for these measures should be provided for these new initiatives. These could include viz., Guidelines for the ULBs for promoting wastewater reuse; Guidelines for the ULBs for sludge reuse; and Guidelines for the Contractors to work within the private properties. In the project, in a large portion of the project town areas, the septic tank system in individual households is replaced with direct connections to the new sewerage network. The impacts and mitigation measures from the existing septic tank that need to be closed should be identified in the Operation Phase

243. Stakeholders were involved in developing the IEE through face-to-face discussions, on site meetings, and a city level consultation workshop, which was conducted for larger public participation in the project. Views expressed by the stakeholders were incorporated into the IEE and the planning and development of the project. The IEE will be made available at public locations and will be disclosed to a wider audience via the PMU and ADB websites. The consultation process will be continued during project implementation to ensure that stakeholders are engaged in the project and have the opportunity to participate in its development and implementation. The project's grievance redress mechanism will provide the citizens with a platform for redress their grievances, and describes the informal and formal channels, time frame, and mechanisms for resolving complaints about environmental performance.

244. The EMP will be included in the bid and contract documents to ensure compliance with the conditions set out in this document. The contractor will be required to submit to PIU, for review and approval, an updated EMP / site environmental management plan (SEMP) including (i) proposed sites/locations for construction work camps, storage areas, hauling roads, lay down areas, disposal areas for solid and hazardous wastes; (ii) specific mitigation measures following the approved EMP; and (iii) monitoring program as per EMP. The EMP shall be made binding on all contractors operating on the site and will be included in the contractual clauses. Non-compliance with, or any deviation from, the conditions set out in this document shall constitute a

failure in compliance. No works can commence prior to approval of SEMP. A copy of the EMP/approved SEMP will always be kept on site during the construction period .

245. The citizens of the Makrana will be the major beneficiaries of the sewerage systems. The subproject is primarily designed to improve environmental quality and living conditions of Makrana Town through provision of sewerage. The benefits arising from this subproject include: (i) better public health particularly reduction in waterborne and infectious diseases; (iv) reduced risk of groundwater contamination; (v) reduced risk of contamination of treated water supplies; and, (vi) improvement in quality of water quality due to avoidance of disposal of untreated effluent.

246. Therefore, as per ADB SPS, the project is classified as environmental category B and does not require further environmental impact assessment. However, to conform to government guidelines STPs requires consent to establishment (CTE) and consent to operate (CTO) from Rajasthan State Pollution Control Board. CTE will be obtained prior to construction, as the detailed designs will be undertaken by contractor.

247. **Recommendations.** The following are recommendations applicable to the subproject to ensure no significant impacts:

- Obtain all statutory clearances at the earliest time possible and ensure conditions/provisions are incorporated in the detailed design.
- Obtain CTO for existing STP as corrective action plan
- Include this IEE in bid and contract documents.
- Update and implement the asbestos management plan per site-specific conditions.
- Update and implement the recommendations from the biodiversity assessment report.
- Ensure that sludge management protocols are compliant with environmental regulations (Solid Waste Management Rules 2000 and its amendments) and solid waste disposal should have a designated site (dumping on vacant lot is not allowed);
- Conduct safeguards induction to the contractor upon award of contract;
- Strictly supervise EMP implementation.
- Ensure contractor appointed qualified EHS officers prior to start of works.
- Documentation and reporting on a regular basis as indicated in the IEE;
- Continuous consultations with stakeholders.
- Timely disclosure of information and establishment of grievance redressal mechanism (GRM);
- Involvement of contractors, including subcontractors, in first-level GRM;
- Commitment from PMU, PIUs, project consultants, and contractors to protect the environment and the people from any impact during project implementation.

248. This IEE shall be updated by PMU during the detailed design phase to reflect any changes, amendments and will be reviewed and approved by ADB.

Appendix 1: Rapid Environmental Assessment (REA) Checklist

Sewerage Treatment

Instructions:

The project team completes this checklist to support the environmental classification of a project. It is to be attached to the environmental categorization form and submitted to the Environment and Safeguards Division (RSES) for endorsement by the Director, RSES and for approval by the Chief Compliance Officer.

This checklist focuses on environmental issues and concerns. To ensure that social dimensions are adequately considered, refer also to ADB checklists and handbooks on (i) involuntary resettlement, (ii) indigenous peoples planning, (iii) poverty reduction, (iv) participation, and (v) gender and development.

Answer the questions assuming the “without mitigation” case. The purpose is to identify potential impacts. Use the “remarks” section to discuss any anticipated mitigation measures.

Country/Project Title: India/Rajasthan Secondary Towns Development Sector Project (RSTDSP)
Wastewater Project in Makrana town, Distt. Nagaur, Rajasthan

Sector Division: Urban Development

SCREENING QUESTIONS	Yes	No	REMARKS
A. Project Siting Is the project area...			
Densely populated?	√		Subproject activities extend to the entire town including the densely populated areas.
Heavy with development activities?	√		Makrana is a developing town with continuous urban expansion, there are no major industries and mostly business and service are the common occupations
Adjacent to or within any environmentally sensitive areas?		√	There are no environmental sensitive areas near the proposed sites.
Cultural heritage site		√	There are no cultural heritage site listed under state archeology department or ASI.
Protected Area		√	
Wetland		√	
Mangrove		√	
Estuarine		√	
Buffer zone of protected area		√	
Special area for protecting biodiversity		√	
Bay		√	
Potential Environmental Impacts Will the Project cause...			
Impairment of historical/cultural monuments/areas and loss/damage to these sites?		√	There are no cultural heritage sites of prominence. There are religious places of importance. However, the project will not interfere with these places
Interference with other utilities and blocking of access to buildings; nuisance to neighboring areas due to noise, smell, and influx of insects, rodents, etc.?	√		Construction work may interfere with the water supply, power and communication lines. Access to houses and business may be affected during pipe laying works.

SCREENING QUESTIONS	Yes	No	REMARKS
			Construction works may cause nuisance to public in form of traffic disturbance, utility disruption, increased noise and air. Proposed STP site is located away from inhabited areas. Adequate green buffer around the site will be provided to minimize the nuisance due to bad odour, if any.
dislocation or involuntary resettlement of people		√	Project does not involve land acquisition / involuntary resettlement /displacement. During the sewer construction, particularly in narrow streets and streets with commercial activities, there may be temporary disruption or relocation of hawkers and vendors. These are addressed through preparation of resettlement plan.
Disproportionate impacts on the poor, women and children, Indigenous Peoples or other vulnerable groups?		√	
Impairment of downstream water quality due to inadequate sewage treatment or release of untreated sewage?		√	There is proposal of reuse of treated effluent from STP and unused treated effluent shall be discharged into nearby drain/river, therefore treated effluent needs to meet prescribed standards set by the Central Pollution Control Board (CPCB).
Overflows and flooding of neighboring properties with raw sewage?		√	Swage from SPS shall be directly pumped to STP and raw sewage shall not cause any flooding and overflowing and will be ensured through regular operation and maintenance.
Environmental pollution due to inadequate sludge disposal or industrial waste discharges illegally disposed in sewers?	√		Inadequate sludge disposal may cause environmental pollution (soil and Water) This sewerage system will cater only domestic wastewater, no industrial wastewater discharge is allowed into the sewerage system. As a precaution, ULB should take responsibilities that wastewater from industrial units should not be allowed into sewers.
Noise and vibration due to blasting and other civil works?		√	Blasting for underground works is prohibited in RUIDP works
risks and vulnerabilities related to occupational health and safety due to physical, chemical, and biological hazards during project construction and operation?	√		Occupational health and safety risk are negligible due to chemical and biological hazards during construction in sewerage works, physical hazards may arise due to safety risks during construction works. During operation of sewerage system physical and biological hazards may cause health and safety risks to workers for which mitigation measures will be required
Discharge of hazardous materials into sewers, resulting in damage to sewer system and		√	This sewerage system will cater only domestic wastewater, no industrial

SCREENING QUESTIONS	Yes	No	REMARKS
danger to workers?			wastewater discharge is allowed into the sewerage system.
Inadequate buffer zone around pumping and treatment plants to alleviate noise and other possible nuisances, and protect facilities?		√	STP and Pumping station will be located in enclosed buildings with restricted entry. Pumps will be of low noise generating type and therefore there will be no nuisance. Proposed site for treatment plant is located away from habitation, with buffer and protection walls.
Road blocking and temporary flooding due to land excavation during the rainy season?	√		Road blocking/diversion will be done during pipe laying with prior permission from concerned authorities. Contractor has to prepare proper traffic management plan before excavation on roads. Underground construction works (sewer laying, foundations) will be carried out in non-monsoon period. In Makrana, rainfall is scanty and confined only to a limited period. No impacts envisaged
Noise and dust from construction activities?	√		Road cutting (cement and bituminous roads) for sewer laying works is likely to generate noise and dust. Scheduling of works appropriately and prior information to the affected people will minimize the impact. Dust generation will be controlled through water sprinkling, immediate transportation of excess soil, covered transport etc.
Traffic disturbances due to construction material transport and wastes?	√		Linear activities like sewer laying along the roads is likely to disrupt traffic. Vehicle movement for construction purpose will increase the traffic. Identification of alternate routes, allowing limited - at least one-way traffic, prior information about the works and alternative arrangements, providing information/sign boards etc will reduce the impact.
Temporary silt runoff due to construction?		√	Makrana is predominantly dry and rainfall is very limited
hazards to public health due to overflow flooding, and groundwater pollution due to failure of sewerage system?	√		Sewerage system will be designed with applicable standards. Adequate trained staff and necessary equipment will be in place for regular operation and maintenance of the system. Proposed treatment system will be efficient and appropriate repair and maintenance procedure will be developed. Sufficient funds for operation will be ensured. Backup power supply system is part of project.
deterioration of water quality due to inadequate sludge disposal or direct discharge of untreated sewage water?	√		Treated effluent and sludge, if not disposed adequately may cause water pollution. Adequate sludge treatment/drying process

SCREENING QUESTIONS	Yes	No	REMARKS
			is part of the STP construction. No untreated/ partially treated sewage will be disposed. STP designed to meet the peak demand. Regular monitoring of treated water will be conducted to check the treatment efficiency.
contamination of surface and ground waters due to sludge disposal on land?		√	Digested Sludge from reactors will be contamination free and will be collected, and stabilized/dried before disposal/reuse. This will process will ensure the dried sludge is harmless
Health and safety hazards to workers from toxic gases and hazardous materials which may be contained in sewage flow and exposure to pathogens in sewage and sludge?		√	It is unlikely that sewage contain hazardous substances. Necessary apparatus and personal protection equipment will be provided. Staff will be trained in safe handling of sewage and sludge, and in cleaning of sewers
large population increase during project construction and operation that causes increased burden on social infrastructure (such as sanitation system)?		√	Most of the unskilled workers will be hired locally, some of skilled workers will be brought from outside but numbers will not so large to have impacts on social infrastructure and services
Social conflicts between construction workers from other areas and community workers?		√	The contractor will be utilizing the local labour force as far as possible; in case if it is necessary, labour camps and facilities will be provided appropriately. No conflicts envisaged
risks to community health and safety due to the transport, storage, and use and/or disposal of materials such as explosives, fuel and other chemicals during construction and operation?		√	No explosives shall be used in project. Fuel and other chemicals will be used in very less quantities which will not have significant impact on community health and safety. Safe handling of fuels and chemicals will be ensured by contractor.
community safety risks due to both accidental and natural hazards, especially where the structural elements or components of the project are accessible to members of the affected community or where their failure could result in injury to the community throughout project construction, operation and decommissioning?	√		Community safety risk may be there during construction during excavation for pipe laying, equipment and vehicle operation, construction of STP and SPS etc. for which mitigation measures will be required by contractor

Checklist for Preliminary Climate Risk Screening

Country/Project Title: India/Rajasthan Secondary Towns Development Sector Project: (RSTDSP), Makrana Town Waste Water Project, Rajasthan.

Sector: Urban Development

Subsector: Waste Water

Division/Department: SARD/SAUW

Screening Questions		Score	Remarks ⁴⁰
Location and Design of project	Is siting and/or routing of the project (or its components) likely to be affected by climate conditions including extreme weather-related events such as floods, droughts, storms, landslides?	0	No such issue may affect the project
	Would the project design (e.g. the clearance for bridges) need to consider any hydro-meteorological parameters (e.g., sea-level, peak river flow, reliable water level, peak wind speed etc.)?	0	No such issue may affect the project
Materials and Maintenance	Would weather, current and likely future climate conditions (e.g. prevailing humidity level, temperature contrast between hot summer days and cold winter days, exposure to wind and humidity hydro-meteorological parameters likely affect the selection of project inputs over the life of project outputs (e.g. construction material)?	0	No such issues may affect the project
	Would weather, current and likely future climate conditions, and related extreme events likely affect the maintenance (scheduling and cost) of project output(s)?	0	No such issue may affect the project
Performance of project outputs	Would weather/climate conditions and related extreme events likely affect the performance (e.g. annual power production) of project output(s) (e.g. hydro-power generation facilities) throughout their design lifetime?	0	No problem will be envisaged in future which likely affect the performance of project output

Options for answers and corresponding score are provided below:

Response	Score
Not Likely	0
Likely	1
Very Likely	2

Responses when added that provide a score of 0 will be considered low risk project. If adding all responses will result to a score of 1-4 and that no score of 2 was given to any single response, the project will be assigned a medium risk category. A total score of 5 or more (which include providing a score of 1 in all responses) or a 2 in any single response will be categorized as high risk project.

Result of Initial Screening (Low, Medium, High): Low

⁴⁰ If possible, provide details on the sensitivity of project components to climate conditions, such as how climate parameters are considered in design standards for infrastructure components, how changes in key climate parameters and sea level might affect the siting/routing of project, the selection of construction material and/or scheduling, performances and/or the maintenance cost/scheduling of project outputs.

Other Comments: The proposed subproject activity involves construction of one new STP and the anticipated environmental impacts are very marginal and the construction activity does not impose any threat to the existing climatic conditions.

Appendix 2: Compliance with Environmental Criteria for Subproject Selection

Applicability	Environmental Selection Criteria	Compliance
All Subprojects	i. Comply with all requirements of relevant national and state laws.	Being complied
	ii. Avoid significant environmental impacts.	Being complied
	iii. Avoid and/or minimize involuntary resettlement by prioritizing rehabilitation over new construction, using vacant government land where possible, and taking all possible measures in design and selection of site or alignment to avoid resettlement impacts	Complied
	iv. Avoid locating subprojects in forest areas	Complied
	v. If there are underground asbestos cement (AC) pipes in the existing systems, the project design should include that the AC pipes are left undisturbed in the ground vi. Prior to site clearance & trench exaction for pipes/sewers, exact location of underground AC pipes should be ascertain with the Public Health Engineering Department (PHED)	Being complied
	vii. Avoid where possible, and minimize to extent feasible, facilities in locations with social conflicts.	Complied
	viii. Avoid where possible locations that will result in destruction/disturbance to historical and cultural places/values.	Being complied
	ix. Avoid tree-cutting where possible. Retain mature roadside trees which are important/valuable or historically significant. If any trees have to be removed, plant two new trees for every one that is lost.	Being complied
	x. Ensure all planning and design interventions and decisions are made in consultation with local communities and include women. Reflect inputs from public consultation and disclosure for site selection.	Being complied
Sewerage	i. Comply with all requirements of relevant national and local laws, rules, and guidelines.	Being complied
	ii. Ensure no immediate downstream drinking water intakes at treated wastewater disposal point.	Being complied
	iii. As far as possible, new Sewage Treatment Plants (STP) should be preferably 100m away from any inhabited areas, in locations where no urban expansion is expected in the next 20 years, thus establishing a buffer to reduce effects of odor, visual appearance or other nuisance of the site (this may be reviewed depending on the technology adopted for the treatment of effluent).	Being complied
	iv. As far as possible Sewage Pumping Stations (SPS) and wet wells should be located preferably 50m from any inhabited areas and from sites such as hospitals, schools, temples, etc. to minimize nuisance impacts from odor, rodents, etc.	In case of non-availability of suitable sites due to land and technical design constraints in already developed areas, where 50 m buffer is not available, following procedures shall be adopted and documented in order to

Applicability	Environmental Selection Criteria	Compliance
		finalize sites for implementation of project: (i) conduct alternate site analysis, justify the selected site; (ii) develop odor mitigation measures to prevent and control odor/air emissions – design measures, and operational practices that are feasible and practical in local conditions and include in IEE; (iii) develop layout plan with maximum buffer to nearby houses; (iv) provide a peripheral green buffer (at least three rows of trees within the pumping station compound); and (v) public information – consult local community, inform about the need, process adopted to select sites, its suitability, and measures adopted for odor prevention and control
	v. Locate facilities where there is a suitable means of disposal for the treated wastewater effluent and bio-solids.	Being complied
	vi. Locate facilities where there is no risk of flooding or other hazards that might impair operations and present a risk of damage to the facilities or its environs.	Being complied
Treated water	vii. Ensure that no wastewater is discharged into a water course in which it could be a hazard to downstream users (e.g. a waterway that is used as a source of water for domestic or municipal supply)	Being Complied
Sludge	viii. Include measures to ensure the safe disposal of sewage sludge and if possible, to promote its safe and beneficial use as an agricultural fertilizer	Being Complied
	ix. Ensure appropriate training will be provided to ULB staffs on the operations and maintenance of the facilities.	Will be complied
Right-of-way for sewer network	x. Locate sewage pipelines within the right of way (ROW) of other linear structures (e.g. roads) wherever feasible, to reduce new land acquisition.	Complied
	xi. Ensure that routes of sewage mains do not require land acquisition from individual farmers that is a significant proportion of their total land holding (10%)	

Appendix-3: Subproject Sites Photographs

	
Existing STP at Ward no. 1	Existing pond at STP campus to collect the treated effluent of STP
	
Plantations on vacant land of existing STP campus	Vacant land near Jhalara pond for proposed SPS
	
Cremation ground (shamshan) near Jhalara Pond	Jhalara Pond near proposed SPS site



Vacant govt. land proposed for SPS near Sheetla Mata Temple



Sheetla Mata Temple near proposed SPS site



Wide city roads in Makrana city



Main city road in Makrana



Narrow city road in Makrana



Marble mining activities

Appendix 4: Drinking Water Standards, Ambient Air Quality, Vehicle, Diesel Generator Emissions Standards

Group	National Standards for Drinking Water ^a			WHO Guidelines for Drinking-Water Quality, 4 th Edition, 2011 ^b	Applicable Per ADB SPS ^{c, d}
	Parameter	Unit	Max. Concentration Limits ^d		
Physical	Turbidity	NTU	1 (5)	-	1 (5)
	pH		6.5 – 8.5	none	6.5 – 8.5
	Color	Hazen units	5 (15)	none	5 (15)
	Taste and Odor		Agreeable	-	Agreeable
	TDS	mg/l	500 (2,000)	-	500 (2,000)
	Iron	mg/l	0.3	-	0.3
	Manganese	mg/l	0.1 (0.3)	-	0.1 (0.3)
	Arsenic	mg/l	0.01 (0.05)	0.01	0.01
	Cadmium	mg/l	0.003	0.003	0.003
	Chromium	mg/l	0.05	0.05	0.05
	Cyanide	mg/l	0.05	none	0.05
	Fluoride	mg/l	1 (1.5)	1.5	1 (1.5)
	Lead	mg/l	0.01	0.01	0.01
	Ammonia	mg/l	0.5	none established	0.5
Chemical	Chloride	mg/l	250 (1,000)	none established	250 (1,000)
	Sulphate	mg/l	200 (400)	none	200 (400)
	Nitrate	mg/l	45	50	45
	Copper	mg/l	0.05 (1.5)	2	0.05 (1.5)
	Total Hardness	mg/l	200 (600)	-	200 (600)
	Calcium	mg/l	75 (200)	-	75 (200)
	Zinc	mg/l	5 (15)	none established	5 (15)
	Mercury	mg/l	0.001	0.006	0.001
	Aluminum	mg/l	0.1 (0.3)	none established	0.1 (0.3)
	Residual Chlorine	mg/l	0.2	5	0.2
Micro Germs	E-coli	MPN/100ml	Must not be detectable in any 100 ml sample	Must not be detectable in any 100 ml sample	Must not be detectable in any 100 ml sample
	Total Coliform	MPN/100ml			
Physical	Turbidity	NTU	1 (5)	-	1 (5)
	pH		6.5 – 8.5	none	6.5 – 8.5
	Color	Hazen units	5 (15)	none	5 (15)
	Taste and Odor		Agreeable	-	Agreeable
	TDS	mg/l	500 (2,000)	-	500 (2,000)
	Iron	mg/l	0.3	-	0.3
	Manganese	mg/l	0.1 (0.3)	-	0.1 (0.3)
	Arsenic	mg/l	0.01 (0.05)	0.01	0.01
	Cadmium	mg/l	0.003	0.003	0.003
	Chromium	mg/l	0.05	0.05	0.05
	Cyanide	mg/l	0.05	none	0.05
	Fluoride	mg/l	1 (1.5)	1.5	1 (1.5)
	Lead	mg/l	0.01	0.01	0.01
	Ammonia	mg/l	0.5	none established	0.5
Chemical	Chloride	mg/l	250 (1,000)	none established	250 (1,000)
	Sulphate	mg/l	200 (400)	none	200 (400)

Group	National Standards for Drinking Water ^a			WHO Guidelines for Drinking-Water Quality, 4 th Edition, 2011 ^b	Applicable Per ADB SPS ^{c, d}
	Parameter	Unit	Max. Concentration Limits ^d		
	Nitrate	mg/l	45	50	45
	Copper	mg/l	0.05 (1.5)	2	0.05 (1.5)
	Total Hardness	mg/l	200 (600)	-	200 (600)
	Calcium	mg/l	75 (200)	-	75 (200)
	Zinc	mg/l	5 (15)	none established	5 (15)
	Mercury	mg/l	0.001	0.006	0.001
	Aluminum	mg/l	0.1 (0.3)	none established	0.1 (0.3)
	Residual Chlorine	mg/l	0.2	5	0.2
	E-coli	MPN/100ml	Must not be detectable in any 100 ml sample	Must not be detectable in any 100 ml sample	Must not be detectable in any 100 ml sample
Micro Germs	Total Coliform	MPN/100ml			

^a Bureau of India Standard 10500: 2012.

^b Health-based guideline values.

^c Per ADB SPS, the government shall achieve whichever of the standards is more stringent. If less stringent levels or measures are appropriate in view of specific project circumstances, the executing agency of the government will provide full and detailed justification for any proposed alternatives that are consistent with the requirements presented in ADB SPS.

^d Figures in parenthesis are maximum limits allowed in the absence of alternate source. IS10500:2012 indicates these values in parenthesis may still be tolerated only if there are no other sources that could meet the base acceptable limit.

Ambient Air Quality Standards

Parameter	Location ^a	India Ambient Air Quality Standard ($\mu\text{g}/\text{m}^3$) ^b	WHO Air Quality Guidelines ($\mu\text{g}/\text{m}^3$)		Applicable Per ADB SPS ^e ($\mu\text{g}/\text{m}^3$)
			Global Update ^c 2005	Second Edition 2000	
PM ₁₀	Industrial Residential, Rural and Other Areas	60 (Annual) 100 (24-hr)	20 (Annual) 50 (24-hr)	-	20 (Annual) 50 (24-hr)
	Sensitive Area	60 (Annual) 100 (24-hr)	20 (Annual) 50 (24-hr)	-	20 (Annual) 50 (24-hr)
PM ₂₅	Industrial Residential, Rural and Other Areas	40 (Annual) 60 (24-hr)	10 (Annual) 25 (24-hr)	-	10 (Annual) 25 (24-hr)
	Sensitive Area	40 (Annual) 60 (24-hr)	10 (Annual) 25 (24-hr)	-	10 (Annual) 25 (24-hr)
SO ₂	Industrial Residential, Rural and Other Areas	50 (Annual) 80 (24-hr)	20 (24-hr) 500 (10-min)	-	50 (Annual) 20 (24-hr) 500 (10-min)
	Sensitive Area	20 (Annual) 80 (24-hr)	20 (24-hr) 500 (10-min)	-	20 (Annual) 20 (24-hr) 500 (10-min)
NO ₂	Industrial Residential, Rural and Other	40 (Annual) 80 (24-hr)	40 (Annual) 200 (1-hr)	-	40 (Annual) 80 (24-hr) 200 (1-hr)

Parameter	Location ^a	India Ambient Air Quality Standard	WHO Air Quality Guidelines ($\mu\text{g}/\text{m}^3$)		Applicable Per ADB SPS ^e
	Areas				
	Sensitive Area	30 (Annual) 80 (24-hr)	40 (Annual) 200 (1-hr)	-	30 (Annual) 80 (24-hr) 200 (1-hr)
CO	Industrial Residential, Rural and Other Areas	2,000 (8-hr) 4,000 (1-hr)	-	10,000 (8-hr) 100,000 (15-min)	2,000 (8-hr) 4,000 (1-hr) 100,000 (15-min)
	Sensitive Area	2,000 (8-hr) 4,000 (1-hr)	-	10,000 (8-hr) 100,000 (15-min)	2,000 (8-hr) 4,000 (1-hr) 100,000 (15-min)
Ozone (O ₃)	Industrial Residential, Rural and Other Areas	100 (8-hr) 180 (1-hr)	100 (8-hr)		100 (8-hr) 180 (1-hr)
	Sensitive Area	100 (8-hr) 180 (1-hr)	100 (8-hr)		100 (8-hr) 180 (1-hr)
Lead (Pb)	Industrial, Residential, Rural and Other Areas	0.5 (Annual) 1.0 (24-hr)		0.5 (Annual)	0.5 (Annual) 1.0 (24-hr)
	Sensitive Area	0.5 (Annual) 1.0 (24-hr)		0.5 (Annual)	0.5 (Annual) 1.0 (24-hr)
Ammonia (NH ₃)	Industrial Residential, Rural and Other Areas	100 (Annual) 400 (24-hr)			100 (Annual) 400 (24-hr)
	Sensitive Area	100 (Annual) 400 (24-hr)			100 (Annual) 400 (24-hr)
Benzene (C ₆ H ₆)	Industrial Residential, Rural and Other Areas	5 (Annual)			5 (Annual)
	Sensitive Area	5 (Annual)			5 (Annual)
Benzo(o)pyrene (BaP) particulate phase only	Industrial Residential, Rural and Other Areas	0.001 (Annual)			0.001 (Annual)
	Sensitive Area	0.001 (Annual)			0.001 (Annual)
Arsenic (As)	Industrial Residential, Rural and Other Areas	0.006 (Annual)			0.006 (Annual)
	Sensitive Area	0.006 (Annual)			0.006 (Annual)
Nickel (Ni)	Industrial Residential, Rural and Other Areas	0.02 (Annual)			0.02 (Annual)
	Sensitive Area	0.02 (Annual)			0.02 (Annual)

^a Sensitive area refers to such areas notified by the India Central Government.

^b Notification by Ministry of Environment and Forests, Government of India Environment (Protection) Seventh Amendment Rules, 2009.

- ^c WHO Air quality guidelines for particulate matter, ozone, nitrogen dioxide and sulfur dioxide. *Global update 2005*. WHO. 2006.
- ^d Air Quality Guidelines for Europe Second Edition. WHO 2000.
- ^e Per ADB SPS, the government shall achieve whichever of the ambient air quality standards is more stringent. If less stringent levels or measures are appropriate in view of specific project circumstances, the executing agency of the government will provide full and detailed justification for any proposed alternatives that are consistent with the requirements presented in ADB SPS.

Vehicle Exhaust Emission Norms

1. Passenger Cars

Norms	CO (g/km)	HC+ NOx (g/km)
1991 Norms	14.3-27.1	2.0(Only HC)
1996 Norms	8.68-12.40	3.00-4.36
1998 Norms	4.34-6.20	1.50-2.18
India stage 2000 norms	2.72	0.97
Bharat stage-II	2.2	0.5
Bharat Stage-III	2.3	0.35(combined)
Bharat Stage-IV	1.0	0.18(combined)
Bharat Stage-VI (Petrol)	1.0	0.16 (Combined)

2. Heavy Diesel Vehicles

Norms	CO (g/kmhr)	HC (g/kmhr)	NOx (g/kmhr)	PM (g/kmhr)
1991 Norms	14	3.5	18	-
1996 Norms	11.2	2.4	14.4	-
India stage 2000 norms	4.5	1.1	8.0	0.36
Bharat stage-II	4.0	1.1	7.0	0.15
Bharat Stage-III	2.1	1.6	5.0	0.10
Bharat Stage-IV	1.5	0.96	3.5	0.02
Bharat Stage-VI (Diesel)	0.5	0.17 (HC+NOx)		0.0045

Source: Central Pollution Control Board

CO = Carbon Monoxide; g/kmhr = grams per kilometer-hour; HC = Hydrocarbons; NOx = oxides of nitrogen; PM = Particulates Matter

**Emission limits for New DG sets up to 800 KW
(As per Environment (Protection) (Third Amendment) Rules, 2013)**

TABLE

Power Category	Emission Limits (g/kW-hr)			Smoke Limit (light absorption coefficient, m ⁻¹)
	NO _x +HC	CO	PM	
Upto 19 KW	≤ 7.5	≤ 3.5	≤ 0.3	≤ 0.7
More than 19 KW upto 75 KW	≤ 4.7	≤ 3.5	≤ 0.3	≤ 0.7
More than 75 KW upto 800 KW	≤ 4.0	≤ 3.5	≤ 0.2	≤ 0.7

Note:

1. The abbreviations used in the Table shall mean as under: NO_x – Oxides of Nitrogen; HC – Hydrocarbon; CO – Carbon Monoxide; and PM – Particulate Matter.
2. Smoke shall not exceed above value throughout the operating load points of the test cycle.
3. The testing shall be done as per D2 – 5 mode cycle of ISO: 8178- Part 4.
4. The above mentioned emission limits shall be applicable for Type Approval and Conformity of Production (COP) carried out by authorised agencies.
5. Every manufacturer, importer or, assembler (hereinafter referred to as manufacturer) of the diesel engine (hereinafter referred to as 'engine') for genset application manufactured or imported into India or, diesel genset (hereinafter referred to as 'product'), assembled or imported into India shall obtain Type Approval and comply with COP of their product(s) for the emission limits which shall be valid for the next COP year or, the date of implementation of the revised norms specified above, whichever earlier.
Explanation. - The term 'COP year' means the period from 1st April to 31st March.
6. Stack height (in metres), for genset shall be governed as per Central Pollution Control Board (CPCB) guidelines.

DIESEL GENERATOR SETS : STACK HEIGHT

The minimum height of stack to be provided with each generator set can be worked out using the following formula :

$$H = h + 0.2 \times \sqrt{\text{KVA}}$$

H = Total height of stack in metre

h = Height of the building in metres where the generator set is installed

KVA = Total generator capacity of the set in KVA

Based on the above formula the minimum stack height to be provided with different range of generator sets may be categorised as follows:

For Generator Sets	Total Height of stack in metre
50 KVA	Ht. of the building + 1.5 metre
50-100 KVA	Ht. of the building + 2.0 metre
100-150 KVA	Ht. of the building + 2.5 metre
150-200 KVA	Ht. of the building + 3.0 metre
200-250 KVA	Ht. of the building + 3.5 metre
250-300 KVA	Ht. of the building + 3.5 metre

Similarly for higher KVA ratings a stack height can be worked out using the above formula.

Source : Evolved By CPCB
[Emission Regulations Part IV:COINDS/26/1986-87]

Appendix 5: Effluent Discharge Standards for STPs by NGT order, 30.04.2019

Sl. No.	Parameters	Parameters Limit
1	pH	5.5-9.0
2	BOD (mg/l)	Not more than 10 mg/l
3	COD (mg/l)	Not more than 50 mg/l
4	TSS (mg/l)	Not more than 20 mg/l
5	P-Total (mg/l)- for discharge into ponds/lakes	Not more than 1.0 mg/l
6	N-Total (mg/l)	Not more than 10 mg/l
7	Fecal Coliform (MPN/100ml)	Desirable- Less than 100 MPN/100ml Permissible- <230 MPN/100ml

Appendix 6: Ambient Air Quality Standards in Respect of Noise

Receptor/ Source	India National Noise Level Standards ^a (dBA)		WHO Guidelines Value For Noise Levels Measured Out of Doors ^b (One Hour LA _{eq} in dBA)		Applicable Per ADB SPS ^c (dBA)	
	Day	Night	07:00 – 22:00	22:00 – 07:00	Day time	Night time
Industrial area	75	70	70	70	70	70
Commercial area	65	55	70	70	65	55
Residential Area	55	45	55	45	55	45
Silent Zone	50	40	55	45	50	40

^a Noise Pollution (Regulation and Control) Rules, 2002 as amended up to 2010.

^b Guidelines for Community Noise. WHO. 1999.

^c Per ADB SPS, the government shall achieve whichever of the ambient air quality standards is more stringent. If less stringent levels or measures are appropriate in view of specific project circumstances, the executing agency of the government will provide full and detailed justification for any proposed alternatives that are consistent with the requirements presented in ADB SPS.

Noise Limits for Diesel Generator Sets

Noise Limit for Generator Sets run with Diesel

1. Noise limit for diesel generator sets (upto 1000 KVA) manufactured on or after the 1st January, 2005

The maximum permissible sound pressure level for new diesel generator (DG) sets with rated capacity upto 1000 KVA, manufactured on or after the 1st January, 2005 shall be 75 dB(A) at 1 metre from the enclosure surface.

The diesel generator sets should be provided with integral acoustic enclosure at the manufacturing stage itself.

The implementation of noise limit for these diesel generator sets shall be regulated as given in paragraph 3 below.

2. Noise limit for DG sets not covered by paragraph 1.

Noise limits for diesel generator sets not covered by paragraph 1, shall be as follows:-

2.1 Noise from DG set shall be controlled by providing an acoustic enclosure or by treating the room acoustically, at the users end.

2.2 The acoustic enclosure or acoustic treatment of the room shall be designed for minimum 25 dB (A) insertion loss or for meeting the ambient noise standards, whichever is on the higher side (if the actual ambient noise is on the higher side, it may not be possible to check the performance of the acoustic enclosure/acoustic treatment. Under such circumstances the performance may be checked for noise reduction upto actual ambient noise level, preferably, in the night time). The measurement for Insertion Loss may be done at different points at 0.5 m from the acoustic enclosure/ room, then averaged.

2.3 The DG set shall be provided with proper exhaust muffler with insertion loss of minimum 25 dB (A).

2.4 These limits shall be regulated by the State Pollution Control Boards and the State Pollution Control Committees.

2.5 Guidelines for the manufacturers/ users of Diesel Generator sets shall be as under:-

01. The manufacturer shall offer to the user a standard acoustic enclosure of 25 dB (A) insertion loss and also a suitable exhaust muffler with insertion loss of 25 dB(A).
02. The user shall make efforts to bring down the noise levels due to the DG set, outside his premises, within the ambient noise requirements by proper citing and control measures.
03. Installation of DG set must be strictly in compliance with the recommendations of the DG set manufacturer.
04. A proper routine and preventive maintenance procedure for the DG set should be set and followed in consultation with the DG set manufacturer which would help prevent noise levels of the DG set from deteriorating with use.

3.0 Limits of Noise for DG Sets (upto 1000 KVA) Manufactured on or after the 1st January, 2005

3.1 Applicability

01. These rules apply to DG sets upto 1000 KVA rated output, manufactured or imported in India, on or after 1st January, 2005.
02. These rules shall not apply to –
 - a) DG sets manufactured or imported for the purpose of exports outside India; and
 - b) DG sets intended for the purpose of sample and not for sale in India.

3.2 Requirement of Certification

Every manufacturer or assembler or importer (hereinafter referred to as the "manufacturer") of DG set (hereinafter referred to as "product") to which these regulations apply must have valid certificates of Type Approval and also valid certificates of Conformity of Production for each year, for all the product models being manufactured or assembled or imported from 1st January, 2005 with the noise limit specified in paragraph 1.

3.3 Sale, import or use of DG sets not complying with the rules prohibited

No person shall sell, import or use of a product model, which is not having a valid Type Approval Certificate and Conformity of Production certificate.

Appendix 7: Extract from Construction and Demolition Management Rules, 2016

[Published In the Gazette of India, Part-II, Section-3, Sub-section (ii)]
Ministry of Environment, Forest and Climate Change

NOTIFICATION

New Delhi, the 29th March, 2016

G.S.R. 317(E).—Whereas the Municipal Solid Wastes (Management and Handling) Rules, 2000 published vide notification number S.O. 908(E), dated the 25th September, 2000 by the Government of India in the erstwhile Ministry of Environment and Forests, provided a regulatory frame work for management of Municipal Solid Waste generated in the urban area of the country;

And whereas, to make these rules more effective and to improve the collection, segregation, recycling, treatment and disposal of solid waste in an environmentally sound manner, the Central Government reviewed the existing rules and it was considered necessary to revise the existing rules with a emphasis on the roles and accountability of waste generators and various stakeholders, give thrust to segregation, recovery, reuse, recycle at source, address in detail the management of construction and demolition waste.

And whereas, the draft rules, namely, the Solid Waste Management Rules, 2015 with a separate chapter on construction and demolition waste were published by the Central Government in the Ministry of Environment, Forest and Climate Change vide G.S.R. 451 (E), dated the 3rd June, 2015 inviting objections or suggestions from the public within sixty days from the date of publication of the said notification;

And Whereas, the objections or suggestions received within the stipulated period were duly considered by the Central Government;

Now, therefore, in exercise of the powers conferred by sections 6, 25 of the Environment (Protection) Act, 1986 (29 of 1986), and in supersession of the Municipal Solid Wastes (Management and Handling) Rules, 2000, except as respect things done or omitted to be done before such supersession, the Central Government hereby notifies the following rules for Management of Construction and Demolition Waste –

1. Short title and commencement.—(1) These rules shall be called the Construction and Demolition Waste Management Rules, 2016.

(2) They shall come into force on the date of their publication in the Official Gazette.

2. Application.—The rules shall apply to every waste resulting from construction, re-modeling, repair and demolition of any civil structure of individual or organisation or authority who generates construction and demolition waste such as building materials, debris, rubble.

3. Definitions —(1) In these rules, unless the context otherwise requires,–

(a) “ACT” means the Environment (Protection) Act, 1986 (29 of 1986);

(b) “**construction**” means the process of erecting of building or built facility or other structure, or

building of infrastructure including alteration in these entities,;

- (c) **"construction and demolition waste"** means the waste comprising of building materials, debris and rubble resulting from construction, re-modeling, repair and demolition of any civil structure;
- (d) **"de-construction"** means a planned selective demolition in which salvage, re-use and recycling of the demolished structure is maximized;
- (e) **"demolition"** means breaking down or tearing down buildings and other structures either manually or using mechanical force (by various equipment) or by implosion using explosives.
- (f) **"form"** means a **Form annexed to these rules**;
- (g) **"local authority"** means an urban local authority with different nomenclature such as municipal corporation, municipality, nagarpalika, nagarnigam, nagarpanchayat, municipal council including notified area committee and not limited to or any other local authority constituted under the relevant statutes such as gram panchayat, where the management of construction and demolition waste is entrusted to such agency;
- (h) **" schedule"** means a schedule annexed to these rules;
- (i) **"service provider"** means authorities who provide services like water, sewerage, electricity, telephone, roads, drainage etc. often generate construction and demolition waste during their activities, which includes excavation, demolition and civil work;
- (j) **"waste generator"** means **any person or association of persons** or institution, residential and commercial establishments including Indian Railways, Airport, Port and Harbour and Defence establishments who undertakes construction of or demolition of any civil structure which generate construction and demolition waste.

(2) Words and expressions used but not defined herein shall have the same meaning defined in the ACT.

(4) Duties of the waste generator -

- (1) Every waste generator shall prima-facie be responsible for 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.
- (2) The generator shall ensure that other waste (such as solid waste) does not get mixed with this waste and is stored and disposed separately.
- (3) Waste generators who generate more than 20 tons or more in one day or 300 tons per project in a month shall segregate the waste into four streams such as concrete, soil, steel, wood and plastics, bricks and mortar and shall submit waste management plan and get appropriate approvals from the local authority before starting construction or demolition or remodeling work and keep the concerned

authorities informed regarding the relevant activities from the planning stage to the implementation stage and this should be on project to project basis.

(4) Every waste generator shall keep the construction and demolition waste within the premise or get the waste deposited at collection centre so made by the local body or handover it to the authorised processing facilities of construction and demolition waste; and ensure that there is no littering or deposition of construction and demolition waste so as to prevent obstruction to the traffic or the public or drains.

(5) Every waste generator shall pay relevant charges for collection, transportation, processing and disposal as notified by the concerned authorities; Waste generators who generate more than 20 tons or more in one day or 300 tons per project in a month shall have to pay for the processing and disposal of construction and demolition waste generated by them, apart from the payment for storage, collection and transportation. The rate shall be fixed by the concerned local authority or any other authority designated by the State Government.

(5) Duties of service provider and their contractors -

(1) The service providers shall prepare within six months from the date of notification of these rules, a comprehensive waste management plan covering segregation, storage, collection, reuse, recycling, transportation and disposal of construction and demolition waste generated within their jurisdiction.

(2) The service providers shall remove all construction and demolition waste and clean the area every day, if possible, or depending upon the duration of the work, the quantity and type of waste generated, appropriate storage and collection, a reasonable timeframe shall be worked out in consultation with the concerned local authority.

(3) In case of the service providers have no logistics support to carry out the work specified in sub-rules (1) and (2) , they shall tie up with the authorised agencies for removal of construction and demolition waste and pay the relevant charges as notified by the local authority.

(6) Duties of local authority-The local authority shall,-

(1) issue detailed directions with regard to proper management of construction and demolition waste within its jurisdiction in accordance with the provisions of these rules and the local authority shall seek detailed plan or undertaking as applicable, from generator of construction and demolition waste;

(2) chalk out stages, methodology and equipment, material involved in the overall activity and final clean up after completion of the construction and demolition ;

(3c) seek assistance from concerned authorities for safe disposal of construction and demolition waste contaminated with industrial hazardous or toxic material or nuclear waste if any;

(4) shall make arrangements and place appropriate containers for collection of waste and shall remove at regular intervals or when they are filled, either through own resources or by appointing private operators;

(5) shall get the collected waste transported to appropriate sites for processing and disposal either through own resources or by appointing private operators;

(6) shall give appropriate incentives to generator for salvaging, processing and or recycling preferably in-situ;

(7) shall examine and sanction the waste management plan of the generators within a period of one month or from the date of approval of building plan, whichever is earlier from the date of its submission;

(8) shall keep track of the generation of construction and demolition waste within its jurisdiction and establish a data base and update once in a year;

(9) shall device appropriate measures in consultation with expert institutions for management of construction and demolition waste generated including processing facility and for using the recycled products in the best possible manner;

(10) shall create a sustained system of information, education and communication for construction and demolition waste through collaboration with expert institutions and civil societies and also disseminate through their own website;

(11) shall make provision for giving incentives for use of material made out of construction and demolition waste in the construction activity including in non-structural concrete, paving blocks, lower layers of road pavements, colony and rural roads.

(7) Criteria for storage, processing or recycling facilities for construction and demolition waste and application of construction and demolition waste and its products-

(1) The site for storage and processing or recycling facilities for construction and demolition waste shall be selected as per the criteria given in **Schedule I**;

(2) The operator of the facility as specified in sub- rules (1) shall apply in **Form I** for authorization from State Pollution Control Board or Pollution Control Committee.

(3) The operator of the facility shall submit the annual report to the State Pollution Control Board in **Form II**.

(3) Application of materials made from construction and demolition waste in operation of sanitary landfill shall be as per the criteria given in **Schedule II**.

(8) Duties of State Pollution Control Board or Pollution Control Committee-

(1) State Pollution Control Board or Pollution Control Committee shall monitor the implementation of these rules by the concerned local bodies and the competent authorities and the annual report shall be sent to the Central Pollution Control Board and the State Government or Union Territory or any other State level nodal agency identified by the State Government or Union Territory administration for generating State level comprehensive data. Such reports shall also contain the comments and suggestions of the State Pollution Control Board or Pollution Control Committee with respect to any comments or changes required;

(2) State Pollution Control Board or Pollution Control Committee shall grant authorization to construction and demolition waste processing facility in **Form-III** as specified under these rules after examining the application received in **Form I**;

(3) State Pollution Control Board or Pollution Control Committee shall prepare annual report in **Form IV** with special emphasis on the implementation status of compliance of these rules and forward report to Central Pollution Control Board before the 31st July for each financial year.

(9) Duties of State Government or Union Territory Administration-

(1) The Secretary in-charge of development in the State Government or Union territory administration shall prepare their policy document with respect to management of construction and demolition of waste in accordance with the provisions of these rules within one year from date of final notification of these rules.

(2) The concerned department in the State Government dealing with land shall be responsible for providing suitable sites for setting up of the storage, processing and recycling facilities for construction and demolition waste.

(3) The Town and Country planning Department shall incorporate the site in the approved land use plan so that there is no disturbance to the processing facility on a long term basis.

(4) Procurement of materials made from construction and demolition waste shall be made mandatory to a certain percentage (say 10-20%) in municipal and Government contracts subject to strict quality control.

(10) Duties of the Central Pollution Control Board - (1) The Central Pollution Control Board shall,-

(a) prepare operational guidelines related to environmental management of construction and demolition waste management;

(b) analyze and collate the data received from the State Pollution Control Boards or Pollution Control Committee to review these rules from time to time;

(c) coordinate with all the State Pollution Control Board and Pollution Control Committees for any matter related to development of environmental standards;

(d) forward annual compliance report to Central Government before the 30th August for each financial year based on reports given by State Pollution Control Boards or Pollution Control Committees.

(11) Duties of Bureau of Indian Standards and Indian Roads Congress -The Bureau of Indian Standards and Indian Roads Congress shall be responsible for preparation of code of practices and standards for use of recycled materials and products of construction and demolition waste in respect of construction activities and the role of Indian Road Congress shall be specific to the standards and practices pertaining to construction of roads.

Schedule III
Timeframe for Planning and Implementation
[See Rule 13]

Sl. No.	Compliance Criteria	Cities with population of 01 million and above	Cities with population of 0.5-01 million	Cities with population of less than 0.5 million
1	Formulation of policy by State Government	12 months	12 months	12 months
2	Identification of sites for collection and processing facility	18 months	18 months	18 months
3	Commissioning and implementation of the facility	18 months	24 months	36 months
4	Monitoring by SPCBs	3 times a year – once in 4 months	2 times a year – once in 6 months	2 times a year – once in 6 months

**The time Schedule is effective from the date of notification of these rules.*

FORM – I

See [Rule 7 (2)]

Application for obtaining authorisation

To,
The Member Secretary

_____ Name of the local authority or Name of the agency :
appointed by the municipal authority

Correspondence address Telephone No. Fax No.	
Nodal Officer and designation (Officer authorized by the competent authority or agency responsible for operation of processing or recycling or disposal facility)	
Authorisation applied for (Please tick mark)	Setting up of processing or recycling facility of construction and demolition waste
Detailed proposal of construction and demolition waste processing or recycling facility to include the following Location of site approved and allotted by the Competent Authority. Average quantity (in tons per day) and composition of construction and demolition waste to be handled	

Appendix 8: Salient Features of Major Labour Laws Applicable to Establishments Engaged in Construction of Civil Works

1. Workmen Compensation Act, 1923 - The Act provides for compensation in case of injury by accident arising out of and during the course of employment.
2. Payment of Gratuity Act, 1972 - Gratuity is payable to an employee under the Act on satisfaction of certain conditions on separation if an employee has completed 5 years' service or more or on death at the rate of 15 days wages for every completed year of service. The Act is applicable to all establishments employing 10 or more employees.
3. Employees' PF and Miscellaneous Provisions Act, 1952 - The Act provides for monthly contributions by the employer plus workers @10 % or 8.33 %. The benefits payable under the Act are: (a) Pension or family pension on retirement or death as the case may be; (b) deposit linked insurance on the death in harness of the worker; (c) payment of PF accumulation on retirement/death etc.
4. Maternity Benefit Act, 1951 - The Act provides for leave and some other benefits to women employees in case of confinement or miscarriage etc.
5. Contract Labour (Regulation and Abolition) Act, 1970 - The Act provides for certain welfare measures to be provided by the Contractor to contract labor and in case the Contractor fails to provide, the same are required to be provided by the Principal Employer by Law. The principal employer is required to take Certificate of Registration and the Contractor is required to take a License from the designated Officer. The Act is applicable to the establishments or Contractor of principal employer if they employ 20 or more contract labor.
6. 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 and Runways are scheduled employment.
7. Payment of Wages Act, 1936 - It lays down as to by what date the wages are to be paid, when it will be paid and what deductions can be made from the wages of the workers.
8. Equal Remuneration Act, 1979 - The Act provides for payment of equal wages for work of equal nature to Male and Female workers and not for making discrimination against Female employees in the matters of transfers, training and promotions etc.
9. Payment of Bonus Act, 1965 - The Act is applicable to all establishments employing 20 or more workmen. The Act provides for payments of annual bonus subject to a minimum of 8.33 % of wages and maximum of 20 % of wages to employees drawing Rs. 3,500/- per month or less. The bonus to be paid to employees getting Rs. 2,500/- per month or above up to Rs.3,500/- per month shall be worked out by taking wages as Rs.2,500/- per month only. The Act does not apply to certain establishments. The newly set up establishments are exempted for five years in certain circumstances. Some of the State Governments have reduced the employment size from 20 to 10 for the purpose of applicability of the Act.
10. Industrial Disputes Act, 1947 - The Act lays down the machinery and procedure for resolution of industrial disputes, in what situations a strike or lock-out becomes illegal and what

are the requirements for laying off or retrenching the employees or closing down the establishment.

11. Industrial Employment (Standing Orders) Act, 1946-It is applicable to all establishments employing 100 or more workmen (employment size reduced by some of the States and Central Government to 50). The Act provides for laying down rules governing the conditions of employment by the employer on matters provided in the Act and get the same certified by the designated Authority.

12. Trade Unions Act, 1926 - The Act lays down the procedure for registration of trade unions of workmen and employees. The trade unions registered under the Act have been given certain immunities from civil and criminal liabilities.

13. Child Labor (Prohibition and Regulation) Act, 1986 - The Act prohibits employment of children below 14 years of age in certain occupations and processes and provides for regulation of employment of children in all other occupations and processes. Employment of child labor is prohibited in Building and Construction Industry.

14. Inter-State Migrant Workmen's (Regulation of Employment and Conditions of Service) 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.

15. Construction and Demolition Waste Management Rules 2016- This Rule stipulate that-

- (i) Every waste generator shall segregate construction and demolition waste and deposit at collection center or handover it to the authorized processing facilities
- (ii) Shall ensure that there is no littering or deposition so as to prevent obstruction to the traffic or the public or drains.
- (iii) Large generators (who generate more than 20 tons or more in one day or 300 tons per project in a month) shall submit waste management plan and get appropriate approvals from the local authority before starting construction or demolition or remodeling work,
- (iv) Large generators shall have environment management plan to address the likely environmental issues from construction, demolition, storage, transportation process and disposal / reuse of C & D Waste.
- (v) Large generators shall segregate the waste into four streams such as concrete, soil, steel, wood and plastics, bricks and mortar,
- (vi) Large generators shall pay relevant charges for collection, transportation, processing and disposal as notified by the concerned authorities;

16. Solid Waste Management Rules 2016- As per this Rule responsibility of Solid Waste Generator is as below.

- (i) segregate and store the waste generated in three separate streams namely bio-degradable, non-biodegradable and domestic hazardous wastes in suitable bins and handover segregated wastes to authorized waste pickers or waste collectors as per the direction or notification by the local authorities from time to time;

- (ii) store separately construction and demolition waste, as and when generated, in his own premises and shall dispose off as per the Construction and Demolition Waste Management Rules, 2016; and
- (iii) No waste generator shall throw, burn or bury the solid waste generated by him, on streets, open public spaces outside his premises or in the drain or water bodies.

17. The Building and Other Construction Workers (Regulation of Employment and Conditions of Service) Act, 1996 and the Cess Act of 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. 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. The employer to whom the Act applies has to obtain a registration certificate from the Registering Officer appointed by the Government. Salient features of this Act are given below.

Employer shall-

- Provide and maintain, at suitable point, sufficient quantity of wholesome drinking water, such point shall be at least 6 meters away from any washing areas, urinals or toilets
- Provide sufficient urinals and latrines at convenient place, easily accessible by workers
- Provide free of charge, temporary living accommodations near to work sites with separate cooking place, bathing and lavatory facilities and restore the site as pre conditions after completing the construction works
- Provide crèche with proper accommodation, ventilation, lighting, cleanliness and sanitation if more than fifty female workers are engaged
- Provide first aid facilities in all construction sites

For safety of workers employer shall provide-

- Safe access to site and workplace
- Safety in demolition works
- Safety in use of explosives
- Safety in operation of transporting equipments and appoint competent person to drive or operate such vehicles and equipments
- Safety in lifting appliance, hoist and lifting gears
- Adequate and suitable lighting to every workplace and approach
- Prevention of inhalation of dust, smoke, fumes, gases during construction works and provide adequate ventilation in workplace and confined space
- Safety in material handling and stacking/unstacking
- Safeguarding the machinery with fly-wheel of moving parts
- Safe handling and use of plants operated by compressed air
- Fire safety
- Limit of weight to be lifted by workers individually
- Safety in electric wires, apparatus, tools and equipments
- Provide safety net, safety sheet, safety belts while working at height (more than 1.6mtrs as per OSHA)
- Providing scaffolding, ladders and stairs, lifting appliances, chains and accessories where required
- Safety in pile works, concrete works, hot asphalt, tar, insulation, demolition works,

- excavation, underground construction and handling materials
- Provide and maintain medical facilities for workers
- Any other matters for the safety and health of workers

Appendix 9: Biodiversity Assessment Report -Makrana

Biodiversity Assessment – Makrana Town Sewerage Subproject

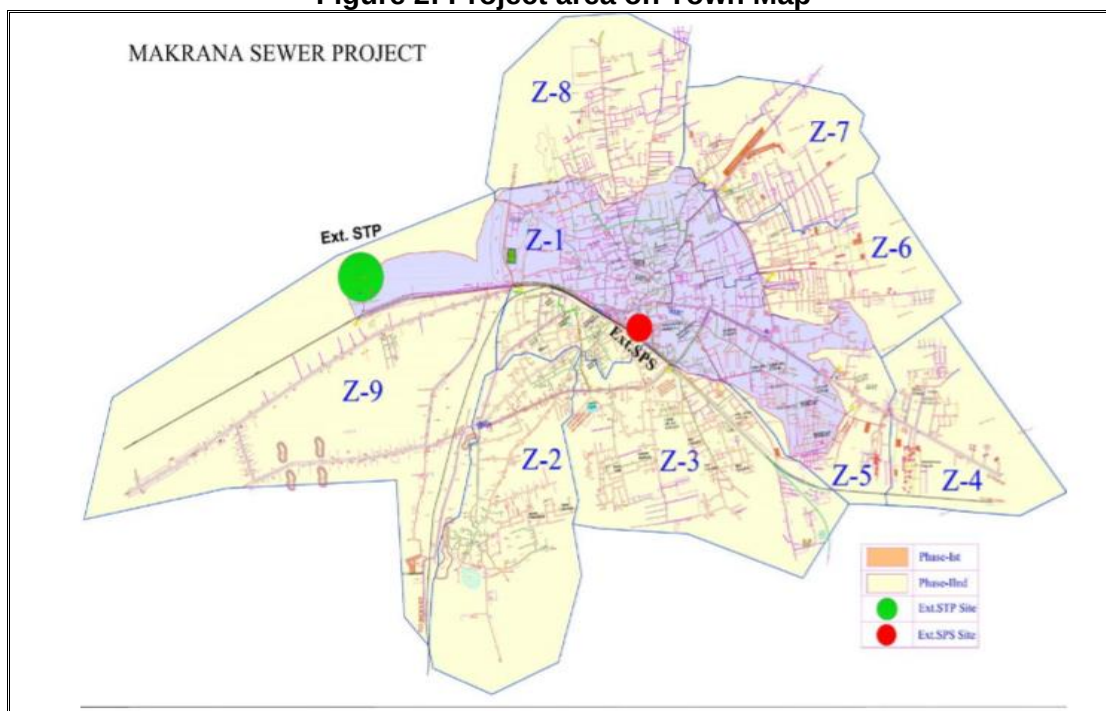
A. Introduction

This detailed biodiversity assessment is carried out for the proposed Makrana Sewerage Subproject located in Makrana Town, Nagaur district of Rajasthan State in India. This subproject is included in the Rajasthan Secondary Towns Development Sector Project (RSTDSP) to be financed by ADB. The assessment has been carried out to identify critical habitats and anticipated impacts from the subproject implementation. The assessment is based on the desk review and analysis of the secondary information collected through various sources and supported by the results of the proximity report generated by the Integrated Biodiversity Assessment Tool (IBAT). The findings and assessment will be further strengthened following detailed field assessments and consultations with key stakeholders involving forest and wildlife officials from the state before project implementation.

B. Project Description

The project is located in Makrana Town of Nagaur District of Rajasthan State. Most of the project components are planned and will be located inside the municipality limits on land owned by the local government. There is one number of STP based on SBR technology of 7.70 MLD capacity proposed on vacant land of Municipal Council, Makrana in the campus of existing STP on Borawar Road near Railway line. The sewage collation network will be constructed by laying approx. 95 km length of different diameter pipelines along the road in the town area. The sewerage network also include construction of two Sewage Pump Station of 2.30MLD and 2.10 MLD at Jhalra Pond and Near Sheetla Mata Seva Samiti; respectively on land in possession of municipal Council. The location of project component on town map is given in Figure-1.

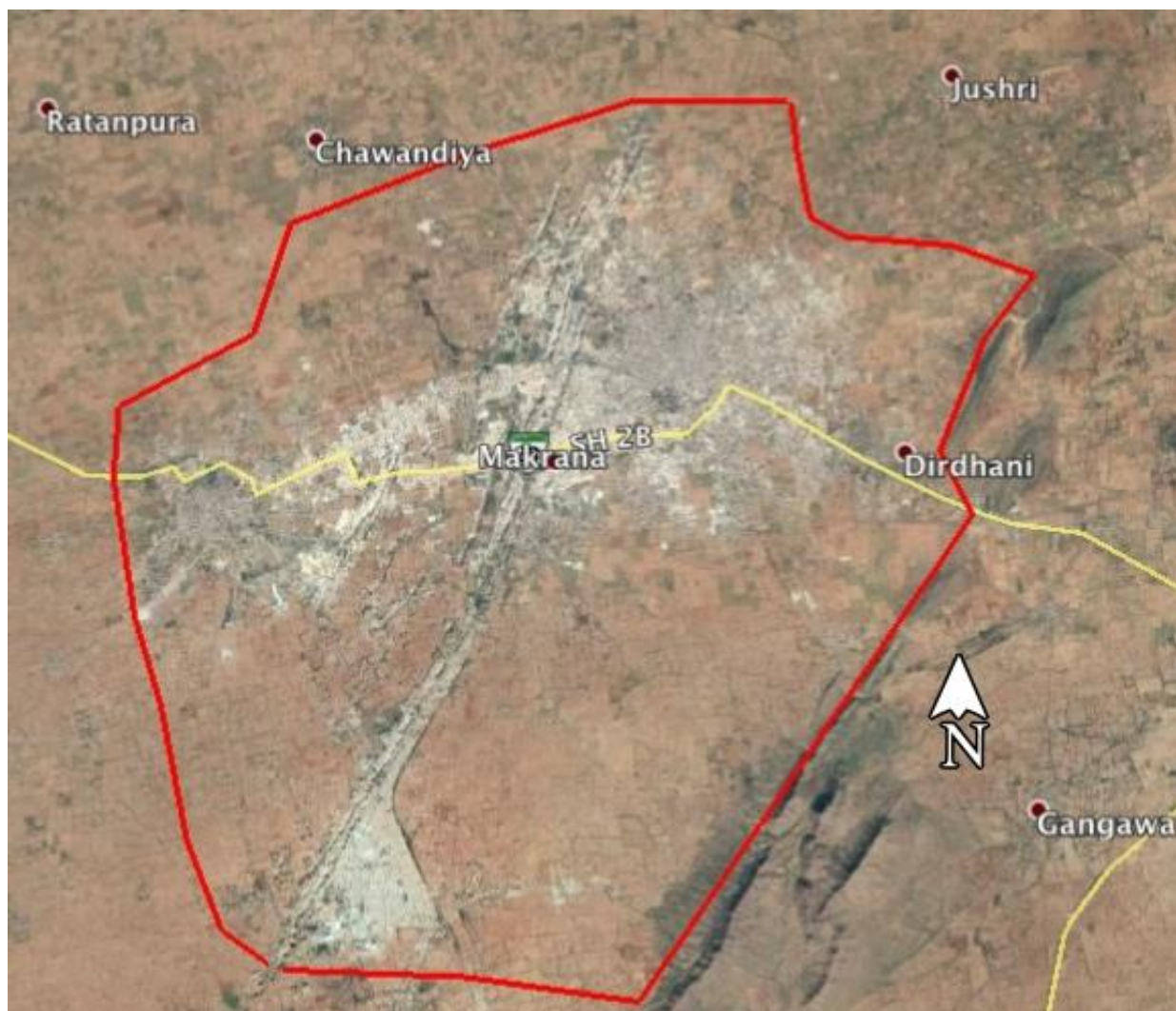
Figure 2: Project area on Town Map



C. Establishing project area of influence (PAI)

The project area of influence (PAI) for study is established on basis of locations on project components of proposed project. The scope of work covering all components and associated facilities under the project in Makrana Town are considered as a project area of influence (PAI). The critical habitat assessment has been conducted within the boundaries of PAI which has been established using ecological units and/or physical features within the landscape such as roads, railway line, hills or seasonal streams. The established PAI for sewerage treatment system in Makrana Town is given in Figure -2.

Figure 3: Map showing boundary of PAI Makrana subproject



The boundaries of PAI for subproject has been established on the basis of physical/topographical features surrounding the Town area. There is hillock surrounding the town from east to south direction considered as boundary for establishing study area. On the south of town area along the Parbatsar-Bidiyad road marble market is marked as area of town limits for study of impacts due to project activities. In west side of the town unpaved road surrounding the habitation area of Borawar is followed for boundary of PAI. While on east direction the settlement limits between Markrana Town and Chawandiya is followed for

considering boundary of study area.

D. Biodiversity Assessment

Biodiversity assessment in the project influence area has been conducted as per the International Finance Corporation's (IFC) Performance Standard No 6 of 2012, within updated version in June 2019 on the Guidance Note for the Performance Standard. The process of biodiversity assessment based on presence of protected or designated areas and the potential presence of Critical Habitat in the study area. The Critical Habitat assessment is based on presence of Threatened species (Critically Endangered (CR), Endangered (EN) species, and to a lesser extent Vulnerable (VU) species as defined by the IUCN.

D.1 Key Biodiversity Area

The project areas have been screened to determine presence of Key Biodiversity Areas (KBAs) using the Integrated Biodiversity Assessment Tool (IBAT).⁴¹ As per the Proximity report generated by IBAT,, there are neither protected area nor any key biodiversity areas within the buffer of 10km radius of the subproject components. The nearest internationally designated area is Sambhar Lake; a Ramsar Site which is approx. 15 km away (nearest aerial distance) from the town area. However, there are 32 International Union for the Conservation of Nature (IUCN) Red List threatened species, one key biodiversity area reported within the 50km radius of the subproject components. The key findings of the IBAT report are presented in the subsequent sections.

D.2 Ramsar Site (Sambhar Lake)

There is no nationally notified protected area in the vicinity of project area, one internationally designated area Sambhar Lake (main lake reservoir) under Ramsar Site is located on South east direction of the city at an approx.15 km aerial distance. Figure-3 shows Sambhar Lake and subproject are.

India is a signatory to Ramsar Convention and Sambhar Lake has been declared as Ramsar Site on 23 March 1990. The designated site has a total area of 240 sq.km. of a large saline lake fed by four streams set in a shallow wetland and the water level fluctuates seasonally. The lake is surrounded by sand flats and dry thorn scrub and fed by seasonal rivers and streams. The site is important for a variety of wintering water birds, including large numbers of flamingos.

Sambhar Lake is also an Important Bird Area, identified under IBA programme of Birdlife International. Sambhar Lake as an IBA site quality two criteria (A1 & A4i, A4iii) out of total four criterion set for IBA site The IBAs serve as conservation areas for protection of birds at the global, regional or sub-regional level. There are four criterion set out to qualify for IBA sites based on threshold of species, the criteria are:

⁴¹ IBAT is a multi-institutional programme of work involving Bird Life International, Conservation International, IUCN and UNEP-WCMC. IBAT provides a basic risk screening on biodiversity. It draws together information on globally recognized biodiversity information drawn from a number of IUCN's Knowledge Products: IUCN Red List of Threatened Species, Key Biodiversity Areas (priority sites for conservation) and Protected Planet/The World Database on Protected Areas (covering nationally and internationally recognized sites, including IUCN management categories I–VI, Ramsar Wetlands of International Importance and World Heritage sites).

A1) Globally threatened species: The site qualifies if it is known, estimated or thought to hold a population of a species categorized by the IUCN Red List as Critically Endangered, Endangered or Vulnerable

A2) Restricted-range species: The site forms one of a set selected to ensure that all restricted-range species of an Endemic Bird Area (EBA) or a Secondary Area (SA) are present in significant numbers in at least one site and preferably more.

A3) Biome-restricted species: The site forms one of a set selected to ensure adequate representation of all species restricted to a given biome, both across the biome as a whole and for all of its species in each range state.

A4) Congregations

- i) This applies to 'waterbird' species as defined by Delaney and Scott⁴² and is modelled on criterion 6 of the Ramsar Convention for identifying wetlands of international importance. Depending upon how species are distributed, the 1% thresholds for the biogeographic populations may be taken directly from Delaney & Scott, they may be generated by combining flyway populations within a biogeographic region or, for those for which no quantitative thresholds are given, they are determined regionally or inter-regionally, as appropriate, using the best available information.
- li) This includes those seabird species not covered by Delaney and Scott (2002). Quantitative data are taken from a variety of published and unpublished sources.
- lii) This is modelled on criterion 5 of the Ramsar Convention for identifying wetlands of international importance. The use of this criterion is discouraged where quantitative data are good enough to permit the application of A4i and A4ii.
- Iv) The site is known or thought to exceed thresholds set for migratory species at bottleneck sites.

⁴² Delaney and Scott (2002) Waterbird Population Estimates Third Edition, Wetlands International, Wageningen, The Netherlands.

Figure 4: Map showing Subproject location and Sambhar Lake



D.3 Critically Endangered / Endangered Species

A total of 32 IUCN red list (CR, EN & VU) species reported within 50km radius. Out of these 32 IUCN red list species, 12 species are classified as Critically Endangered (CR) and Endangered (EN). Birds are common species which includes 23 species (CR-5, EN-7 & VU-11), 5 mammals (EN-1, VU-4), 1 reptiles (VU-1), 1 Fish (VU-1) and 2 plants (VU-2). Table-1 lists the species designated by the International Union for the Conservation of Nature (IUCN) as Critically Endangered (CR), Endangered (EN) and Vulnerable (VU) having recorded ranges that include the study area.

Table 2: List of species designated by IUCN threatened species as CR, EN & VU

S.No.	Scientific Name	Common Name	IUCN Red List category
	Birds		
1	<i>Ardeotis nigriceps</i>	Great Indian Bustard	CR
2	<i>Vanellus gregarius</i>	Sociable Lapwing	CR
3	<i>Gyps bengalensis</i>	White-rumped Vulture	CR
4	<i>Sarcogyps calvus</i>	Red-headed Vulture	CR
5	<i>Gyps indicus</i>	Indian Vulture	CR
6	<i>Oxyura leucocephala</i>	White-headed Duck	EN
7	<i>Sypheotides indicus</i>	Lesser Florican	EN
8	<i>Haliaeetus leucoryphus</i>	Pallas's Fish-eagle	EN
9	<i>Neophron percnopterus</i>	Egyptian Vulture	EN
10	<i>Aquila nipalensis</i>	Steppe Eagle	EN
11	<i>Falco cherrug</i>	Saker Falcon	EN
12	<i>Leptoptilos dubius</i>	Greater Adjutant	EN
13	<i>Antigone antigone</i>	Sarus crane	VU

14	<i>Aquila heliaca</i>	Eastern imperial eagle	VU
15	<i>Aquila rapax</i>	Tawny eagle	VU
16	<i>Aythya ferina</i>	Common pochard	VU
17	<i>Chlamydotis macqueenii</i>	Asian houbara	VU
18	<i>Ciconia episcopus</i>	Asian woollyneck	VU
19	<i>Clanga clanga</i>	Greater spotted eagle	VU
20	<i>Columba eversmanni</i>	Yellow-eyed pigeon	VU
21	<i>Machlolophus nuchalis</i>	White-naped tit	VU
22	<i>Rynchops albicollis</i>	Indian skimmer	VU
23	<i>Saxicola macrorhynchus</i>	White-browed bushchat	VU
	Mammals		
24	<i>Manis crassicaudata</i>	Indian Pangolin	EN
25	<i>Lutrogale perspicillata</i>	Smooth-coated otter	VU
26	<i>Panthera pardus</i>	Leopard	VU
27	<i>Tetracerus quadricornis</i>	Four-horned antelope	VU
28	<i>Rusa unicolor</i>	Sambar	VU
	Reptile		
29	<i>Crocodylus palustris</i>	Mugger	VU
	Fish		
30	<i>Wallago attu</i>	Catfish	VU
	Plant		
31	<i>Anacyclus pyrethrum</i>	Atlas daisy	VU
32	<i>Oryza malampuzhaensis</i>	Asian Rice	VU

E. Critical Habitat Assessment Process

Habitats that are critical to the survival of International Union for the Conservation of Nature (IUCN) designated Critically Endangered or Endangered species, migratory species, congregatory species and endemic or restricted range species are classified as critical habitats.

The screening of Critical Habitat in the area has been conducted based on species which enlisted in redlist of IUCN. The presence of habitat of these species in the area will designate Critical Habitat. There are five criterion set out in updated Performance Standard No 6 Guidance note (IFC 2019) to consider the area as Critical Habitat. The five criterion for Critical Habitat determination is:

Criterion 1: Critically Endangered and Endangered Species

Criterion 2: Endemic and Restricted range Species

Criterion 3: Migratory and Congregatory Species

Criterion 4: Highly Threatened or Unique Ecosystems

Criterion 5: Key Evolutionary Processes

Out of these five criteria, first three criteria are related to species and threshold of species enlisted in the IUCN Redlist representing the risk of extinction of species at global level. While the criterion 4 & 5 are related to ecosystems and evolutionary processes. The brief description of criteria is mentioned in below sections.

E.1 Criterion 1: Critically Endangered and Endangered Species

Species threatened with global extinction and listed as CR and EN on the IUCN Red List of Threatened Species shall be considered as part of Criterion 1. Critically Endangered species

face an extremely high risk of extinction in the wild. Endangered species face a very high risk of extinction in the wild.

As described in footnote 11 of Performance Standard 6, the inclusion in Criterion 1 of species that are listed nationally/regionally as CR or EN in countries that adhere to IUCN guidance shall be determined on a project-by-project basis in consultation with competent professionals.

Thresholds for Criterion 1 are the following:

- a) Areas that support globally important concentrations of an IUCN Red-listed EN or CR species ($\geq 0.5\%$ of the global population AND ≥ 5 reproductive units of a CR or EN species).
- b) Areas that support globally important concentrations of an IUCN Red-listed Vulnerable (VU) species, the loss of which would result in the change of the IUCN Red List status to EN or CR and meet the thresholds.
- c) As appropriate, areas containing important concentrations of a nationally or regionally listed EN or CR species.

E.2 Criterion 2: Endemic and Restricted range Species

For purposes of this Guidance Note, the term endemic is defined as restricted range. Restricted range refers to a limited extent of occurrence (EOO).

- For terrestrial vertebrates and plants, restricted range species are defined as those species that have an EOO less than 50,000 km².
- For marine systems, restricted range species are provisionally being considered those with an EOO of less than 100,000 km².
- For coastal, riverine, and other aquatic species in habitats that do not exceed 200 km width at any point (for example, rivers), restricted range is defined as having a global range of less than or equal to 500 km linear geographic span (i.e., the distance between occupied locations furthest apart).

The threshold for Criterion 2 is the following:

- a) Areas that regularly hold $\geq 10\%$ of the global population size and ≥ 10 reproductive units of a species.

E.3 Criterion 3: Migratory and Congregatory Species

Migratory species are defined as any species of which a significant proportion of its members cyclically and predictably move from one geographical area to another (including within the same ecosystem).

Congregatory species are defined as species whose individuals gather in large groups on a cyclical or otherwise regular and/or predictable basis. Examples include the following:

- Species that form colonies.
- Species that form colonies for breeding purposes and/or where large numbers of individuals of a species gather at the same time for non-breeding purposes (for example, foraging and roosting).
- Species that utilise a bottleneck site where significant numbers of individuals of a species occur in a concentrated period of time (for example, for migration).

- Species with large but clumped distributions where a large number of individuals may be concentrated in a single or a few sites while the rest of the species is largely dispersed (for example, wildebeest distributions).
- Source populations where certain sites hold populations of species that make an inordinate contribution to recruitment of the species elsewhere (especially important for marine species).

Thresholds for Criterion 3 are the following:

- a) Areas known to sustain, on a cyclical or otherwise regular basis, ≥ 1 percent of the global population of a migratory or congregatory species at any point of the species' lifecycle.
- b) Areas that predictably support ≥ 10 percent of the global population of a species during periods of environmental stress.

E.4 Criterion 4: Highly Threatened or Unique Ecosystems

The IUCN is developing a Red List of Ecosystems, following an approach similar to the Red List for Threatened Species. The client should use the Red List of Ecosystems where formal IUCN assessments have been performed. Where formal IUCN assessments have not been performed, the client may use assessments using systematic methods at the national/regional level, carried out by governmental bodies, recognized academic institutions and/or other relevant qualified organizations (including internationally recognized Non-Government Organizations (NGOs)).

The thresholds for Criterion 4 are the following:

- a) Areas representing $\geq 5\%$ of the global extent of an ecosystem type meeting the criteria for IUCN status of CR or EN.
- b) Other areas not yet assessed by IUCN but determined to be of high priority for conservation by regional or national systematic conservation planning.

E.5 Criterion 5: Key Evolutionary Processes

The structural attributes of a region, such as its topography, geology, soil, temperature, and vegetation, and combinations of these variables, can influence the evolutionary processes that give rise to regional configurations of species and ecological properties. In some cases, spatial features that are unique or idiosyncratic of the landscape have been associated with genetically unique populations or subpopulations of plant and animal species. Physical or spatial features have been described as surrogates or spatial catalysts for evolutionary and ecological processes, and such features are often associated with species diversification. Maintaining these key evolutionary processes inherent in a landscape as well as the resulting species (or subpopulations of species) has become a major focus of biodiversity conservation in recent decades, particularly the conservation of genetic diversity. By conserving species diversity within a landscape, the processes that drive speciation, as well as the genetic diversity within species, ensures the evolutionary flexibility in a system, which is especially important in a rapidly changing climate.

For illustrative purposes, some potential examples of spatial features associated with evolutionary processes are as follows:

- Landscapes with high spatial heterogeneity are a driving force in speciation, as species are naturally selected based on their ability to adapt and diversify.
- Environmental gradients, also known as ecotones, produce transitional habitat, which has been associated with the process of speciation and high species and genetic diversity.
- Edaphic interfaces are specific juxtapositions of soil types (for example, serpentine outcrops, limestone, and gypsum deposits), which have led to the formation of unique plant communities characterized by both rarity and endemism.
- Connectivity between habitats (for example, biological corridors) ensures species migration and gene flow, which is especially important in fragmented habitats and for the conservation of metapopulations. This also includes biological corridors across altitudinal and climatic gradients and from “crest to coast.”
- Sites of demonstrated importance to climate change adaptation for either species or ecosystems are also included within this criterion.

F. Critical Habitat Assessment in PAI

A critical habitat assessment has been carried out using the above mentioned five criterion of Performance Standard No 6 Guidance note (IFC 2019).

F.1 IBAT study output for habitat analysis (Criteria 1-3)

A habitat analysis carried out for the Critically Endangered (CR) and Endangered species reported in the project area of influence (50km) shows that it is likely that the 33 species identified in IBAT are mostly located inside the ecological areas and not within the project area of influence (PAI). Details of the habitat analysis in the PAI is presented in Table-2.

Table 3: Habitat Analysis in PAI – Makrana Subproject

S. No.	Common Name (<i>Species Name</i>)	IUCN Category	Habitat Preferences	Likelihood of Occurrence in PAI
Birds				
1	Great Indian Bustard (<i>Ardeotis nigriceps</i>)	CR	Grassland - Subtropical/Tropical Dry	None: Possible range extend in State of Rajasthan. The species occurs in the Indian Subcontinent, with strongholds in the Thar desert in the north-west and the Deccan tableland of the Peninsula. Mainly found in Western Rajasthan with small population in in Gujarat, Maharashtra, Andhra Pradesh and Karnataka. https://www.iucnredlist.org/species/22691932/134188105#geographic-range
2	Sociable Lapwing (<i>Vanellus gregarious</i>)	CR	Desert, Wetlands (inland), Grassland, Artificial/Terrestrial	None; The species occurs in the north-west part of India, as non-breeding habitat, mainly in Great Rann of Kutch. https://www.iucnredlist.org/species/22694053/130586388#habitat-ecology
3	White-rumped vulture (<i>Gyps bengalensis</i>)	CR	Forest, Grassland, Shrubland, Savanna, Artificial/Terrestrial	Yes, the species habitat in South Asia and South-east Asia. Habitat is widely spread and reported in North India including Rajasthan state as reported by Prakash et al. during 2003 and 2007. https://www.iucnredlist.org/species/22695194/118307773
4	Red-headed Vulture (<i>Sarcogyps calvus</i>)	CR	Forest, Grassland, Shrubland, Savanna, Artificial/Terrestrial	Yes; distributed in parts of Rajasthan State, habitat extend mainly in North India as studied between 2006 and 2010 by Ramesh et al. 2011. https://www.iucnredlist.org/species/22695254/118371885
5	Indian Vulture (<i>Gyps indicus</i>)	CR	Forest, Grassland, Shrubland, Savanna, Artificial/Terrestrial	Yes; possibility of habitat in Rajasthan, species breeds in south-east Pakistan and peninsular India south of the Gangetic plain, north to Delhi, east through Madhya Pradesh, south to the Nilgiris, and occasionally further south. https://www.iucnredlist.org/species/22729731/117875047
6	White-headed Duck (<i>Oxyura leucocephala</i>)	EN	Wetlands (inland), Artificial/Aquatic & Marine, Marine Coastal/Supratidal	None: Habitat range in South Asia is limited to Pakistan and rarely reported in India. https://www.iucnredlist.org/species/22679814/119403602
7	Lesser Florican (<i>Sypheotides</i>)	EN	Grassland, Artificial/Terrestrial	Yes; possibility of habitat in Rajasthan state as species breeds in Gujarat, Rajasthan, Maharashtra, Madhya Pradesh & Andhra Pradesh.

S. No.	Common Name (Species Name)	IUCN Category	Habitat Preferences	Likelihood of Occurrence in PAI
	<i>indicus</i>)			As latest study reported by P. Patil in litt. 2012. https://www.iucnredlist.org/species/22692024/110438391
8	Pallas's Fish-eagle (<i>Haliaeetus leucoryphus</i>)	EN	Wetlands (inland)	None: species breed only in northern India with strongholds in Assam and Uttarakhand only. https://www.iucnredlist.org/species/22695130/131934599
9	Egyptian Vulture (<i>Neophron percnopterus</i>)	EN	Rocky areas (eg. inland cliffs, mountain peaks), Wetlands (inland), Grassland, Shrubland, Savanna, Artificial/Terrestrial	Yes; extend of migratory bird species breeding habitat during winter in India including Rajasthan state. https://www.iucnredlist.org/species/22695180/154895845
10	Steppe Eagle (<i>Aquila nipalensis</i>)	EN	Rocky areas (eg. inland cliffs, mountain peaks), Grassland, Savanna	Yes; extend of migratory bird species non-breeding habitat during winter in India including Rajasthan state. https://www.iucnredlist.org/species/22696038/155419092
11	Saker Falcon (<i>Falco cherrug</i>)	EN	Marine Intertidal, Wetlands (inland), Grassland, Shrubland, Artificial/Terrestrial	Yes; extend of migratory bird species non-breeding habitat during winter in India including Rajasthan state. https://www.iucnredlist.org/species/22696495/110525916
12	Greater Adjutant (<i>Leptoptilos dubius</i>)	EN	Forest, Wetlands (inland), Artificial/Terrestrial, Grassland	None; in India species breeding habitat extend is limited in Assam and Bihar state only. https://www.iucnredlist.org/species/22697721/93633471
13	Sarus crane (<i>Antigone antigone</i>)	VU	Grassland, Artificial/Terrestrial, Wetlands (inland), Artificial/Aquatic & Marine	Yes; habitat extend of the bird species resident is mainly in Uttar Pradesh State and nearby areas of surrounding states, breeding habitat during winter extended in adjoining areas of Rajasthan state. https://www.iucnredlist.org/species/22692064/93335364
14	Eastern imperial eagle (<i>Aquila heliaca</i>)	VU	Forest, Wetlands (inland), Grassland, Shrubland, Artificial/Terrestrial	None; in India species non-breeding habitat extend is limited in Northern parts only. https://www.iucnredlist.org/species/22696048/155464885

S. No.	Common Name (Species Name)	IUCN Category	Habitat Preferences	Likelihood of Occurrence in PAI
15	Tawny eagle (<i>Aquila rapax</i>)	VU	Forest, Grassland, Shrubland, Savanna, Artificial/Terrestrial	Yes; habitat extend of the bird species resident is mainly in central India including Rajasthan state https://www.iucnredlist.org/species/22696033/131671001
16	Common pochard (<i>Aythya ferina</i>)	VU	Marine Neritic, Wetlands (inland), Marine Coastal/Supratidal, Artificial/Aquatic & Marine	None; the migratory bird specie's non-breeding habitat extend during winter season is limited in eastern and northern parts of India https://www.iucnredlist.org/species/22680358/155473754
17	Asian houbara (<i>Chlamydotis macqueenii</i>)	VU	Desert, Grassland, Artificial/Terrestrial	None; in India species non-breeding habitat extend is limited in western parts of Punjab and Rajasthan State. https://www.iucnredlist.org/species/22733562/155425140
18	Asian woollyneck (<i>Ciconia episcopus</i>)	VU	Marine Intertidal, Forest, Artificial/Terrestrial, Artificial/Aquatic & Marine, Grassland, Wetlands (inland), Marine Neritic	None; the species is found patchily across South Asia and South East Asia, range extends throughout India https://www.iucnredlist.org/species/22727255/110064997
19	Greater spotted eagle (<i>Clanga clanga</i>)	VU	Forest, Wetlands (inland), Shrubland, Artificial/Aquatic & Marine, Grassland	Yes; the species non-breeding habitat is found across South Asia and South East Asia, range extends throughout northeast and Northern India https://www.iucnredlist.org/species/22696027/110443604
20	Yellow-eyed pigeon (<i>Columba eversmanni</i>)	VU	Desert, Caves and Subterranean Habitats (non-aquatic), Wetlands (inland), Shrubland, Artificial/Terrestrial	None; in India species non-breeding habitat extend is limited in north-west parts including parts of Rajasthan State. https://www.iucnredlist.org/species/22690097/110099638
21	White-naped tit (<i>Machlolophus nuchalis</i>)	VU	Forest, Shrubland, Artificial/Terrestrial	None; species is endemic to India it occurs in isolated patches in central and southern Rajasthan state https://www.iucnredlist.org/species/22711924/110264998
22	Indian skimmer (<i>Rynchops albicollis</i>)	VU	Wetlands (inland)	None; the species is found patchily across India; range extends throughout Rajasthan State. https://www.iucnredlist.org/species/22694268/110600990

S. No.	Common Name (Species Name)	IUCN Category	Habitat Preferences	Likelihood of Occurrence in PAI
23	White-browed bushchat (<i>Saxicola macrorhynchus</i>)	VU	Desert, Grassland, Shrubland	None; The species is endemic to the north-west Indian subcontinent, distribution recorded in Punjab, Haryana, Uttar Pradesh, Rajasthan and Gujarat. The recent regular records of this species from Churu district of Rajasthan State. https://www.iucnredlist.org/species/22710160/110578039
Mammals				
24	Indian Pangolin (<i>Manis crassicaudata</i>)	CR	Forest, Savanna, Shrubland, Artificial/Terrestrial, Grassland	Yes; species is distributed in South Asia through much of India including Rajasthan https://www.iucnredlist.org/species/12761/123583998
25	Smooth-coated otter (<i>Lutrogale perspicillata</i>)	VU	Artificial/Aquatic & Marine, Wetlands (inland), Forest, Grassland, Marine Coastal/Supratidal, Marine Neritic, Marine Intertidal, Shrubland	Yes; species is distributed in South Asia through much of India including Rajasthan https://www.iucnredlist.org/species/12427/21934884
26	Leopard (<i>Panthera pardus</i>)	VU	Forest, Desert, Rocky areas (eg. inland cliffs, mountain peaks), Grassland, Savanna, Shrubland	None; Leopard range widespread in inside and outside Protected Areas of India. https://www.iucnredlist.org/species/15954/160698029
27	Four-horned antelope (<i>Tetracerus quadricornis</i>)	VU	Forest, Shrubland	None; species habitat is extended most parts of India including Rajasthan https://www.iucnredlist.org/species/21661/50195368
28	Sambar (<i>Rusa unicolor</i>)	VU	Forest, Artificial/Terrestrial, Savanna, Shrubland, Grassland, Wetlands (inland)	None; the habitat extend is throughout India except North India and western parts of Rajasthan and Gujarat state. https://www.iucnredlist.org/species/41790/85628124
Reptile				
29	Mugger (<i>Crocodylus</i>)	VU	Wetlands (inland), Marine Neritic, Artificial/Aquatic &	None; the species habitat extends in India to waterbodies including rivers, in Rajasthan State mainly in River Chambal.

S. No.	Common Name (Species Name)	IUCN Category	Habitat Preferences	Likelihood of Occurrence in PAI
	<i>palustris</i>)		Marine	https://www.iucnredlist.org/species/5667/3046723
Fish				
30	Catfish (<i>Wallago attu</i>)	VU	Wetlands (inland), Artificial/Aquatic & Marine	None; this freshwater fish species is widespread all across India, including fresh water bodies in Rajasthan State. https://www.iucnredlist.org/species/166468/60586371
Plant				
31	Atlas daisy (<i>Anacyclus pyrethrum</i>)	VU	Rocky areas (eg. inland cliffs, mountain peaks), Forest, Grassland, Shrubland	Yes; the plant species is native to India and extend of occurrence in Rajasthan State. https://www.iucnredlist.org/species/202924/121743450
32	Asian Rice (<i>Oryza malampuzhaensis</i>)	VU	Particularly found in forest reserves either in marshy fields or along the margins of streams or rivulets in the forest interiors	None; the species is endemic to the Kerala region in India. https://www.iucnredlist.org/species/112680709/113899465

F.2 Assessment output based on Criteria 4&5

The ecosystem within the project area of influence has not been assessed to date under IUCN assessment for the extinction threat to species. The ecosystem within the PAI is not considered to be highly threatened, as main land use is of residential & commercial in urban or agricultural in the surrounding locality. Further, there is no key evolutionary processes⁴³ within the PAI, as key indicator for evolutionary process areas is presence of a high number of endemic or range restricted species. Therefore, the project area of influence does not meet the thresholds set out in Criterion 4 & 5.

F.3 Protected Areas

As per ADB's SPS 2009; the designated⁴⁴ or proposed protected areas at national and international level should be considered as Critical Habitat. In the PAI for subproject in Makrana Town there is no national protected area and no international designated site or proposed and notified protected area. The nearest Internationally designated Ramsar Site is Sambhar Lake, which is approx. 15 km away from the PAI boundary established for critical habitat assessment study.

G. Impacts & Mitigation Measures

The project components are proposed to be implemented within the developed areas of Makrana Town and on land under municipal limits. The project area is approx. 15 away from the boundary of Ramsar site of Sambhar Lake. The Ramsar Site of Sambhar Lake has also been established an IBA site due to migratory birds visits the area during winter season. There is Aravalli Hill range in between Sambhar Lake and Makrana town. The project area has few small water bodies created due to stone mining around town; which rarely attract migratory birds due to low water level during winter season.

The species of vulture and eagle reported in the project area of influence or passing by may visit the project area due extend range of habitat or in search of food during migration period. The availability of these species in the PAI need to be confirm with local community and district forest and wildlife department.

Implementation of subproject for sewage treatment plant and collection network for the town will result in reduce in waste water in reservoir. It is generally known that birds generally migrate in winter season. The treated water from proposed sewerage treatment plant will be used for irrigation purposes in agriculture fields and horticulture plantation in area. This will increase in food sources and with horticulture plantation will be improve settler and nesting ground for birds.

Construction workers may hunt, birds or carry out other activities that will negatively impact wildlife. No construction or labour camps, batching plants, and quarrying activities will be allowed within or near the wetland area. The contractor will clearly brief the construction workers on strict forestry rules on illegal harvesting of forest products and poaching of wildlife.

⁴³ The evolutionary processes often occur in an isolated habitat and ecosystem due to physical or biological barriers, for example habitat on islands or valley.

⁴⁴ As per ADB's SPS the sites which are of international designation, such as Ramsar and UNESCO sites should be considered as Critical Habitat.

Contractor will ensure supply of all necessary food items; cooking fuel and proper housing is provided to prevent illegal hunting and tree felling.

The operation of various construction equipment is likely to generate significant noise. Noise disturbance may cause migration of the birds to other areas which may increase the probability of habitat loss. Setting of construction camp near forests or protected area may generally disturb surrounding fauna.

The such impacts on avifauna can be mitigated by following measures:

- Project improvement proposals are restricted to available land with minimal tree cutting.
- Adequate measure is included in the design for development of green belt development and horticulture plantation scheme at proposed STP area.
- Noise generating equipment like DG set, compressors will have acoustic enclosures. Noise generating activities should not be permitted during night.
- Workers should be warned about wild life protected areas and possible movement.
- project staff and work crews should not be allowed to have fire-arms and animal traps etc.;
- construction facilities such as workers camp, construction camp, batching plant should be located at least 1 km away from any the forest stretches.
- employment agreements should specify heavy penalties for illegal hunting, trapping and wildlife trading – all other ancillary works should also agree not to participate in such activities.
- Strict anti-poaching surveillance measures need to be implemented, especially during project construction phase.

The anticipated impacts on ecological system due to project and proposed mitigation measures for EMP are provided in Table -3.

Table 4: Impact-mitigation measures for EMP

Field	Anticipated Impact	Mitigation Measure	Responsible for Implementation	Monitoring of Mitigation	Cost and Source of Funds
Design					
Site selection for project component implementation	Disruption of biodiversity & damage to habitat due to project infrastructure at specified location	(i) Avoid or no land acquisition in forest area or in notified wildlife area	PIU/PMU	PMU	No cost required Mitigation measures are part of project design
Water in wastewater drain and tree cutting	Sources of food and water for birds in the area	(i) Green belt and landscaping development plan at location of proposed STP	PIU/PMU	PMU	No cost required mitigation measures are part of project design
Permission	Failure to obtain necessary permits for tree cutting can result to design revisions and/or stoppage of works	(i) Ensure all permission before start of construction in place (ii) Removal of trees after verification and approval from concerned agency (iii) Plantation of three trees against every single tree removed	PIU/PMU	PMU	No cost required mitigation measures are part of project design
Construction					
Construction camp location	Impacts on forest resources for establishing construction camp and plants.	(i) Prior approvals for establishing construction facilities from PMU with submission of location details (ii) Construction facilities such as workers camp, construction camp, batching plant should be	Construction Contractor	PMU	Cost for implementation of mitigation measures responsibility of contractor

Field	Anticipated Impact	Mitigation Measure	Responsible for Implementation	Monitoring of Mitigation	Cost Source and of Funds
		located at least 1 km away from the forest stretches			
Construction work camps, hot mix plants, stockpile areas, storage areas, and disposal areas.	(i) Impact due to noise generated from project activities (ii) Contamination of water and soil due to construction waste disposal in forest area	(i) Minimize noise from construction equipment by using vehicle silencers, fitting jackhammers with noise-reducing mufflers to reduce impact to surrounding sensitive receptor; and (ii) Prepare and implement construction waste management plan (iii) Disposal of waste at designated sites and approval from local authorities (iv) Conduct surface quality monitoring according to the EMP.	Construction Contractor	PMU	Cost for implementation of mitigation measures responsibility of contractor
Construction Workers	Involvement in illegal hunting, trapping and wildlife trading	(i) Awareness training to workers on wildlife presence in the project area and protection of wildlife. (ii) Reporting to PMU on slighting of wild animals in the project	Construction Contractor	PMU	Cost for implementation of mitigation measures responsibility of contractor

Field	Anticipated Impact	Mitigation Measure	Responsible for Implementation	Monitoring of Mitigation	Cost Source and of Funds
		area. (iii) Employment agreements should specify heavy penalties for illegal hunting, trapping and wildlife trading – all other ancillary works should also agree not to participate in such activities. (iv) Strict anti-poaching surveillance measures need to be implemented, especially during project construction phase			
Operational Stage					
Project area development	Failure of STP for wastewater treatment, plantation of non-fruit bearing trees, contamination of water source or agriculture fields due to inadequately treated wastewater	(i) Regular monitoring of treated effluent quality before discharge or reuse for plantation and irrigation purposes (ii) Tree plantation and landscaping in the project area as per approved plan with preference to local species	O&M Contractor	Makrana Nagar Parishad	Contractor's O&M cost

H. Conclusion

ADB SPS's requires that project will not be developed in critical habitat area or will not adversely affect the identified critical habitat. The below mentioned criteria should be considered for assessment of impacts on biodiversity, if project development in an identified critical habitat:

- There should be no measurable adverse impacts, or likelihood of such impacts on the critical habitat which could deteriorate its high biodiversity value or the ability to function of ecology of the area.
- The project is not anticipated to lead to a reduction in the population of any recognized endangered or critically endangered species or a loss in area of the habitat concerned such that the persistence of a viable and representative of host ecosystem be compromised.
- Any lesser impacts are mitigated.

This assessment study for Critical Habitat indicates that within the PAI there are no known species which would qualify the area as Critical Habitat for Criterion 1 - 3. Further, within the PAI there are chances that migratory bird (falcon, sarus, vultures and eagle) species may be visiting the wetland which is next to town area. The presence of birds in the wetland need to be confirm by PIU by field visit and consultation with local community and divisional forest & wildlife department. The PAI does not qualify as Critical Habitat under Criteria 4 and 5.

The implementation of project component is not anticipated to trigger in a population reduction of any recognized endangered or critically endangered species or a loss in area of the habitat for wildlife. The construction activities of the project may lead to some impacts on biodiversity and ecosystem in the area, these impacts can be mitigated with application of measures in design and construction phase.

I. Recommendation

Following are the recommendations to support and reconfirm the identified potential adverse impacts and suggested mitigation measures for biodiversity due to project implementation:

- i. PIU should conduct consultation before start of work with local community in subproject area and district forest and wildlife department to confirm the presence of migratory birds in Wetland around the town area created due to stone mining under subproject as mentioned in Table -2, this assessment report.
- ii. Contract a local biodiversity expert to further verify the presence of IUCN red list species in the subproject area,
- iii. On confirmation of enlisted species in the subproject area, same will be reported to PIU and do not start of works on site until clearance from PIU
- iv. Update Environmental management plan based on findings/verification of IUCN species in the subproject area, and

The finding/presence of IUCN red list species in the subproject area are confirmed in course of construction work, PIU shall stop the work and coordinate with forest department for the translocation of species.

Appendix 10: Geographical position coordinates of all project sites

Components	Latitude	Longitude
SPS-1 (2.30 MLD) near Jhalra Pond	27° 1'48.63"N	74°43'24.47"E
Proposed 7.70MLDSTP Location	27° 2'21.80"N	74°42'9.88"E
SPS-2 (2.10MLD) Near Sheetla Mata SevaSamiti	27° 3'21.73"N	74°43'23.65"E
Discharge Location of Treated Effluent from STP	27° 2'25.43"N	74°42'9.85"E

STP: Sewage Treatment Plant; SPS: Sewage Pumping Station

Appendix 11: Sample chance find protocol

Introduction

Project town being a heritage town, there are possibility of any chance finds (artefacts) recovery during excavations. Contractors working at heritage towns must take additional care not to destroy or damage historic features during excavations. There may be many buried historic features in heritage towns such as – idols, toys, wells, ancient drains, remains of buildings, other walls, grain pits, etc. Every care must be made not to destroy these during excavations.

Excavator drivers need to be instructed to be aware of hitting buried features and that they must be investigated before continuing work. When features are encountered during mechanical excavation, work should stop and the PIU/Consultants engineers must be informed immediately so that they can be inspected at the first opportunity.

When historic features such as walls, brick constructions and other features are encountered during excavation the excavation must be stopped immediately and the PIU/Consultants must be informed immediately.

- 1.1 **Contractors' instruction:** As soon as contractor recovers any chance find during any excavation works for pipe laying, they should immediately inform PIU/Consultant present in town about the chance find recovery. Immediately stop the excavation activity near point of recovery. After PIU/consultants engineers come at site, contractor should follow cleaning and photography in supervision of PIU/Consultant engineers.
- 1.2 **Cleaning** - When a feature/chance find is discovered it must be defined by careful cleaning. Roots must be removed and dirt must be carefully cleaned away. The section or trench base should also be cleaned back for a little distance around the feature.
- 1.3 **Record photography** – When the feature is clean good photography should be taken – vertical and face-on shots and a few general shots of the feature, also showing its position in relation to surrounding features, buildings, etc. The photographed should be catalogued (date, location, direction of shot)
- 1.4 **Drawn record** -When features/chance finds are revealed a drawn record should also be made.
 - a. General location record – measuring its position and orientation within the protected site / in relation to surrounding structures
 - b. Record drawings – detail drawings made in plan and section/profile. The extent (edges) of the feature should be drawn and the level of the existing ground surface and the top and base of the feature should be recorded. These levels should be marked on the drawings. The drawings should include detail of the construction of the feature. Perspective sketches could also be made if necessary. Explanatory notes can also be put on the drawings.
- 1.5 **Reporting finds** - When finds are made these should be reported to PIU/Consultants. Photographs and record drawings should be sent.
- 1.6 **Discovery of historic objects** - When clearance and excavation takes place artifacts and historic objects are sometimes found. These should be recovered and kept in a safe place. The place of discovery should be recorded and each find given a number and tag tied to the find with the same number on it. A list of the finds should be kept (with the find

No. And place of discovery and date of discovery recorded).

- 1.7 ***PIU/Consultants responsibility-*** PIU/Consultants should inform in written to the State Archaeological Department at the earliest with photographs and request to Archaeology Department to visit the site and hand over the chance finds to them.

Appendix 12: Excerpts on reuse from Rajasthan state Sewerage and Wastewater Policy

STATE SEWERAGE AND WASTE WATER POLICY- 2016

- viii. Design and performance specifications of wastewater treatment plants shall be as per guidelines given in the manual on sewerage treatment systems published by CPHEEO. Sufficient room in tendering for the construction of new plants shall be provided for competition to take place in both technologies and costs.

5.4. On Reuse of Treated Effluent and Sludge

1. Treated wastewater effluent is considered a water resource and is added to the water stock for reuse.
2. Priority shall be given to agricultural reuse of treated effluent for unrestricted irrigation. Blending of treated wastewater with fresh water shall be made to improve quality where possible. Crops to be irrigated by the treated effluent or blend thereof with freshwater resources shall be selected to suit the irrigation water, soil type and chemistry, and the economics of the reuse operations.
3. Crop nutrient requirements shall be determined taking into consideration the prevailing effluent quality. Overuse of nutrients shall be avoided.
4. Accumulation of heavy metals and salinity shall be monitored, managed and mitigated. Leaching of soils shall be advocated by the irrigation authorities.
5. Farmers shall be encouraged to determine the rate of water application needed for different crops, taking into consideration the value of nutrients in the treated water and other parameters.
6. Farmers shall be encouraged to use modern and efficient irrigation technologies. Protection of on-farm workers and of crops against pollution with wastewater shall be ensured.
7. Treated effluent quality should be monitored and users alerted to any emergency causing deterioration of the quality so that they will not use such water unless corrective measures are taken.
8. Studies should be conducted and projects designed and implemented to store the excess treated wastewater in surface reservoirs but artificial recharge is not permitted . Due attention shall be given to the quality of treated and groundwater and the characteristics of the strata.
9. Plans and studies for power generation from sludge, if proven technically, economically and financially feasible, shall be made with due attention to environment impacts.
10. Sludge produced from the treatment process would be processed so it may be used as fertilizer and soil conditioner. Care shall be taken to conform to the regulations of public health and environment protection norms.

11. **Industry:** Industrial reuse of reclaimed wastewater represents major reuse next only to irrigation in both developed and developing countries. Reclaimed wastewater is ideal for many industrial purposes,. Where effluent is to be used in the industrial processes, it should be the responsibility of the industry to treat it to the quality standards required. Pilot scale feasibility studies carried out in Australia have concluded that it is possible to economically treat the domestic wastewater to achieve adequate quality for reuse as cooling water. Based on the conclusions of the feasibility study, a full-scale treatment plant employing cross-flow membrane microfiltration system may be installed. The membrane filtration system can remove all suspended solids, fecal coliforms, and giardia cysts. It could also significantly reduce human enteric viruses such as *reovirus* and *enterovirus*. The water reclamation plant at Eraring Power Station demonstrates the potential for reuse of wastewater in power generation and other industrial manufacturing facilities.

Industrial uses for reclaimed water include:

- (i) Evaporative cooling water:-
 - (a) Once-through cooling system.
 - (b) Re-circulating cooling system.
 - (c) Cooling water quality requirements.
- (ii) Boiler –Feed water- The use of reclaimed water differs little from use of conventional public supplies for boiler-feed water, as both require extensive additional treatment quality requirement for boiler feed make up water are dependent upon pressure at which boiler is operated.
- (iii) Industrial process water-

Suitability of reclaimed water for use in industrial process depends upon particular use like-

- (a) Pulp and paper.
 - (b) Chemical industry.
 - (c) Textile industry.
 - (d) Petroleum and coal.
12. Whenever possible, other end uses of treated effluents; such as recycling, cooling, power generation, etc. shall be considered.
13. **Re-use Options:** The following options for re-use of effluent have been identified: In general, public health concern is the major issue in any type of reuse of wastewater, be it for irrigation or non-irrigation utilization, especially long term impact of reuse practices. It is difficult to delineate acceptable health risks and is a matter that is still hotly debated. Potential reuse of wastewater depends on the hydraulic and biochemical characteristics of wastewater, which determine the methods and degree of treatment required. While agricultural irrigation reuses, in general, require lower quality levels of treatment, domestic reuse options (direct or indirect potable and non-potable) reuses need the highest treatment level. Level of treatment for other

reuse options lie between these two extremes. The reuse options may be (artificial recharge of aquifers is not permitted):

- i. Irrigation
 - (a) Agriculture and forestry
 - (b) Landscaping
- ii. Fish – farming
- iii. Industry
- iv. Non-potable Domestic Reuse.

The detailed project report should clearly define the best reuse option particular to town and strategy to obtain it. Action plan with clarity should be the part of Detailed Project Report (DPR), while preparing sewerage projects. Before deciding the reuse of treated waste water, authorities must full fill the water quality norms and its legal implications.

14. Governing local body can sell the treated waste water and digested sludge to generate the revenue.

5.5. On Pricing, Financing and Investment

1. In view of increasing marginal cost of wastewater collection and treatment, wastewater charges, connection fees, sewerage taxes and treatment fees shall be set to cover at least the operation and maintenance costs. It is also highly desirable that part of the capital cost of the services shall be recovered. The ultimate aim is for a full cost recovery.
2. Appropriate criteria in order to apply the "polluter pays" principle shall be established.
3. Different charges for different areas may be applied. This shall be assessed for each geographical area as a function of end users and effluent quality and will be subject to economic and social considerations.
4. Because of the limited financial resources available to Government of Rajasthan, setting investment priorities in wastewater will be compatible with government investment plans.
5. Criteria for prioritizing investments in the wastewater sector shall take into account the current and future needs of the state, needs to expand wastewater systems in urban areas and to provide wastewater systems to smaller towns and villages.
6. Priorities of wastewater projects shall not be disconnected from water supply projects and urbanization in general. Decisions will be made concerning them to attain optimum solutions to the need for services, availability of finance and availability of trained manpower.

Appendix 13: Guidelines for Sewerage System Operations, Reuse of Treated Effluent and Sludge from STP for Beneficial Purposes

(Source: Manual on Sewerage and Sewage Treatment Systems, CPHEEO, Ministry of Urban Development, Govt. of India)

Health Hazards during Sewage Operations

Labourers working on the sewage treatment and operations may suffer from a number of ailments directly attributed to handling of sewage. In view of this it is desirable to disinfect sewage and where feasible mechanize sewage operations.

The staff of sewage operations must be well educated in the sanitary rules on the utilization of sewage for irrigation as well as with personal hygiene. All persons working in sewage farms must undergo preventive vaccination against enteric infections and annual medical examination for helminthiasis and be provided treatment if necessary.

Sewage treatment plants should be provided with adequate space for canteens with proper sanitation, wash-stands and lockers for irrigation implements and protective clothing. Safe drinking water must be provided for the workers and for population residing within the effective range of the sewage treatment plants.

All workers should be provided with gum boots and rubber gloves, which must compulsorily be worn while at work. They should be forced to observe personal hygiene such as washing after work as well as washing before taking food. The use of antiseptics in the water used for washing should be emphasized. The farm worker should be examined medically at regular intervals and necessary curative measures enforced.

Mitigation measures to avoid Health Hazards

Personal Hygiene against Pathogen

The worker should take precautions because a large number of coliform groups, various kinds of micro-organisms, and egg parasites exist in sewage. The workers should strive to maintain good health by taking care of the following points:

- Wear clean uniform, work boots, etc.
- After work and before having a meal, always wash hands and disinfect them.
- After work, take a shower if possible.
- Do not enter the offices and lounges wearing dirty clothes.
- If necessary, take vaccinations against tetanus, leptospirosis fever and so on

Maintaining Cleanliness. The worker should maintain each facility in a clean and neat condition.

- The floors of workrooms, stairs and corridors should be cleaned at the appropriate frequency to maintain them in a clean condition
- Disinfection of relevant locations is to be carried out periodically.

Health Check Workers should receive health check once a year to maintain their health, and prevent illnesses or detect them at an early stage. The results of the health check should be maintained as records. Recommended items to be inspected during the health check are as given below.

- Examine medical history.

- Examine subjective symptoms and other objective symptoms.
- Check height, weight, vision and hearing ability.
- Chest X-ray examination.
- Blood pressure measurement.
- Check for anaemia.
- Check for liver functions.
- Check for lipids in blood.
- Check blood sugar level
- Urine analysis.
- Electrocardiogram analysis

Welfare Measures. The Sanitation Workers (Regulation of Employment and Conditions of Service) Act 2012 proposes constitution of a Sanitation Workers State Welfare Board to exercise powers conferred on it and to perform welfare functions such as the following for sanitation workers:

- Provide immediate assistance to a beneficiary in case of an accident
- Sanction of loan and advances
- Medical expenses for treatment of major ailments
- Financial assistance for education of children
- Payment of maternity benefits
- Make provision and improvement of welfare measures and facilities as may be prescribed

Corrective Measures When a worker has symptoms of an illness listed above, the plant engineer should ensure that the worker is checked-up by a specialist doctor and receives proper treatment and care and should take the following actions considering the content of work done by the worker:

- Change the workplace if necessary
- Change the content of the work
- Shorten the working hours
- Perform relevant measurements of the working environment
- Maintain the facility or equipment

Risks in use of treated effluent and sludge in agriculture practices

Cultivation of crops that are eaten raw should be banned. Cultivation of paddy in bunded fields is likely to give rise to sanitation problems and hence is undesirable. Growing of non-edible commercial crops like cotton, jute, fodder, milling varieties of sugarcane and tobacco would be suitable. Cultivation of grasses and fodder legumes, medicinal and essential oil yielding plants like menthol and citronella may be allowed. Cultivation of cereals, pulses, potatoes and other crops that are cooked before consumption may be permitted, if sewage is treated and care is taken in handling the harvests to ensure that they are not contaminated. Cultivation of crop exclusively under seed multiplication programs would be advantageous as these are not consumed. As an additional safeguard, sewage irrigation should be discontinued at least two months in advance of harvesting of fruits and berries, one month for all kinds of vegetables and a fortnight for all other crops. Direct grazing on sewage irrigated farms should be prohibited.

Risks of Nutrient Loading in Agriculture

Crops receiving excessive dosage of nitrogen show superfluous vegetative growth and decrease in grain or fruit yield. The phosphate deficit of sewage, therefore, should be made good by supplementing with phosphate fertilizers, the extent of phosphate fortification depending upon

the nature of crop and its phosphate requirements. As the availability of phosphate is low in the irrigation water it would be desirable to apply the required quantity of phosphatic fertilizer at the time or even (about a fortnight) before the sowing or planting of the crop. Even when sewage nutrients are balanced by fortification, irrigation with such sewage may supply excessive amount of nutrients resulting in waste or unbalanced growth of plants with adverse effects on yields. It may therefore be necessary to dilute the sewage. Dilution also helps in reducing the concentration of dissolved salts and decomposable organic matter in the sewage thus, decreasing hazards to the fertility of the soil. It is desirable to limit the BOD and total suspended solids of sewage to be disposed on land for irrigation, as per relevant standards. There is a need to take caution on describing nutrient supply capacity of sewage particularly in the case of availability of phosphorus because there is a possible conversion of available phosphorus in unavailable mode in the presence of heavy metals present in the sewerage. This happens commonly in high as well as low pH soils.

Alternative Arrangement during Non-irrigating Periods

During rainy and non-irrigating seasons, agricultural practices may not need any water for irrigation. Even during irrigating season, the water requirement fluctuates significantly. Hence, satisfactory alternative arrangements have to be made for the disposal of sewage on such occasions either by storing the excess sewage or discharging it elsewhere without creating environmental hazards. The following alternatives are generally considered: a) Provision of holding lagoons for off-season storage. They enable irrigation of a fixed area of land to varying rates of crop demand. They may also serve as treatment units such as aerated or stabilization lagoons, provided the minimum volume required for treatment is provided beyond the flow-balancing requirement. b) Provision of additional land where treated sewage is not required on the main plot of land c) Discharge of surplus treated sewage to river or into sea with or without additional treatment. Combining surface discharge facilities with irrigation system is quite common and often quite compatible. d) Resorting to artificial recharge in combination with an irrigation system where feasible.

Treated Sewage into Perennial Rivers

When sewage is treated and discharged into perennial flowing rivers and the blended river water is drawn downstream of the point of such blending as raw water for treatment in public water supply schemes. This is indirect potable use after blending. This is historical and ongoing all around. However, of late, the organic load due to the discharged treated, partially treated and non-point sewage becomes in excess of the self-purifying capacity of the river. Thus, the river water is not actually fresh water. The water quality of Yamuna river for Agra water supply scheme requires to be first treated in MBBR to purify the river water to a level as raw water for the downstream WTP. When it passes through flowing surface water it has the potential disadvantages of contamination by human and animal activities adding organic matter and waterborne pathogens unless the river stretch is protected from such activities. The guiding principle in such cases for the ULBs will be to at least intercept the sewage outfalls and provide adequate STPs and follow the recommended quality criteria for the treated sewage.

Treated Sewage into Non-Perennial / Dry River Courses

There are locations where the rivers are not perennial or almost dry throughout the year except some monsoon runoff. In this case the discharged treated sewage sinks into the aquifer zone and is extracted by infiltration wells or galleries. The advantage of direct dilution from surface water is lost, but the additional purification in the soil and dilution from the aquifer water are

happening. An example is the case of the Palar river course in Tamil Nadu. The surface water flow in this occurs only for about a week if the monsoon is normal and if the water spills beyond the upstream impoundments. The aquifer however supports the public water supply of over 30 habitations along its dry tract of nearly 80 km before the sea. The partly treated sewage of the en-route habitations does reach this river course as intervals. So far, no epidemics have been met with. This may be due to the above said additional purification in the soil and dilution by aquifer water. However, if these are exceeded by the contamination load, there can be immediate health problems. The guiding principle in such cases for the ULBs will be (a) to keep a check on the raw water quality from the infiltration wells to detect sudden increase in contaminants and (b) at least intercept the sewage outfalls and provide adequate STPs.

Appendix 14: Sample Outline Spoil Management Plan

- The Spoil Management Plan should be site specific and be part of the monthly Construction Management Plan.
- The contractor, in consultation with the ULB, has to find out appropriate location/s for the disposal of the excess soil generated. The spoils should be deposited only at these sites.
- Further precautions need to be taken in case of the contaminated spoils
- The vehicle carrying the spoil should be covered properly.
- The spoils generating from each site should be removed on the same day or immediately after the work is complete. The site / road should be restored to the original condition.

I. Spoils information

The spoil information contains the details like a) The type/material, b) Potential contamination by that type, c) Expected volume (site/component specific), d) Spoil Classification etc.

II. Spoils management

The Spoil Management section gives the details of a) Transportation of spoil b) disposal site details c) Precautions taken d) Volume of contaminated spoil, if present, d) Suggested reuse of disposal of the spoil

III. Documentation

The volume of spoil generated (site specific, date wise), site disposed, reuse / disposal details should be documented properly.

Appendix 15: Sample Outline Traffic Management Plan

A. Principles for TMP around the Water Pipes/Sewer Construction Sites

1. One of the prime objectives of this TMP is to ensure the safety of all the road users along the work zone, and to address the following issues:
 - (i) the safety of pedestrians, bicyclists, and motorists travelling through the construction zone;
 - (ii) protection of work crews from hazards associated with moving traffic;
 - (iii) mitigation of the adverse impact on road capacity and delays to the road users;
 - (iv) maintenance of access to adjoining properties; and
 - (v) Addressing issues that may delay the project.

B. Operating Policies for TMP

2. The following principles will help promote safe and efficient movement for all road users (motorists, bicyclists, and pedestrians, including persons with disabilities) through and around work zones while reasonably protecting workers and equipment.
 - (i) Make traffic safety and temporary traffic control an integral and high-priority element of project from planning through design, construction, and maintenance.
 - (ii) Inhibit traffic movement as little as possible.
 - (iii) Provide clear and positive guidance to drivers, bicyclists, and pedestrians as they approach and travel through the temporary traffic control zone.
 - (iv) Inspect traffic control elements routinely, both day and night, and make modifications when necessary.
 - (v) Pay increased attention to roadside safety in the vicinity of temporary traffic control zones.
 - (vi) Train all persons that select, place, and maintain temporary traffic control devices.
 - (vii) Keep the public well informed.
 - (viii) Make appropriate accommodation for abutting property owners, residents, businesses, emergency services, railroads, commercial vehicles, and transit operations.
3. **Figure A2 to Figure A12** illustrates the operating policy for TMP for the construction of water pipes and the sewers along various types of roads.

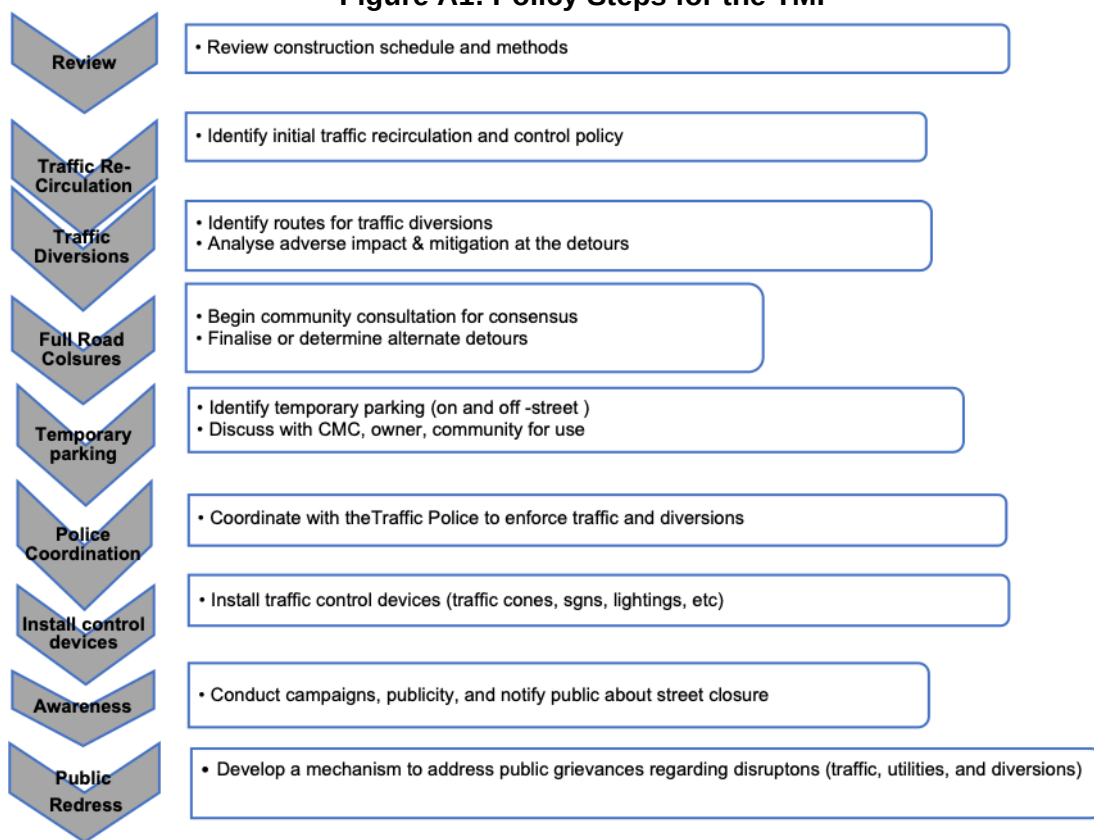
C. Analyze the impact due to street closure

4. Apart from the capacity analysis, a final decision to close a particular street and divert the traffic should involve the following steps:
 - (i) approval from the ULB/Public Works Department (PWD) to use the local streets as detours;
 - (ii) consultation with businesses, community members, traffic police, PWD, etc., regarding the mitigation measures necessary at the detours where the road is diverted during the construction;
 - (iii) determining of the maximum number of days allowed for road closure, and incorporation of such provisions into the contract documents;

- (iv) determining if additional traffic control or temporary improvements are needed along the detour route;
- (v) considering how access will be provided to the worksite;
- (vi) contacting emergency service, school officials, and transit authorities to determine if there are impacts to their operations; and
- (vii) developing a notification program to the public so that the closure is not a surprise. As part of this program, the public should be advised of alternate routes that commuters can take or will have to take as result of the traffic diversion.

5. If full road-closure of certain streets within the area is not feasible due to inadequate capacity of the detour street or public opposition, the full closure can be restricted to weekends with the construction commencing on Saturday night and ending on Monday morning prior to the morning peak period.

Figure A1: Policy Steps for the TMP



D. Public awareness and notifications

6. As per discussions in the previous sections, there will be travel delays during the constructions, as is the case with most construction projects, albeit on a reduced scale if utilities and traffic management are properly coordinated. There are additional grounds for travel delays in the area, as most of the streets lack sufficient capacity to accommodate additional traffic from diverted traffic as a result of street closures to accommodate the works.

6. The awareness campaign and the prior notification for the public will be a continuous activity which the project will carry out to compensate for the above delays and minimize public claims as result of these problems. These activities will take place sufficiently in advance of the time when the roadblocks or traffic diversions take place at the particular streets. The reason for this is to allow sufficient time for the public and residents to understand the changes to their travel plans. The project will notify the public about the roadblocks and traffic diversion through public notices, ward level meetings and city level meeting with the elected representatives.

7. The PIU will also conduct an awareness campaign to educate the public about the following issues:

- (i) Traffic control devices in place at the work zones (signs, traffic cones, barriers, etc.);
- (ii) Defensive driving behaviour along the work zones; and
- (iii) Reduced speeds enforced at the work zones and traffic diversions.

8. It may be necessary to conduct the awareness programs/campaigns on road safety during construction.

9. The campaign will cater to all types of target groups i.e. children, adults, and drivers. Therefore, these campaigns will be conducted in schools and community centres. In addition, the project will publish a brochure for public information. These brochures will be widely circulated around the area and will also be available at the PIU, and the contractor's site office. The text of the brochure should be concise to be effective, with a lot of graphics. It will serve the following purpose:

- (i) explain why the brochure was prepared, along with a brief description of the project;
- (ii) advise the public to expect the unexpected;
- (iii) educate the public about the various traffic control devices and safety measures adopted at the work zones;
- (iv) educate the public about the safe road user behaviour to emulate at the work zones;
- (v) tell the public how to stay informed or where to inquire about road safety issues at the work zones (name, telephone, mobile number of the contact person; and
- (vi) indicate the office hours of relevant offices.

E. Install traffic control devices at the work zones and traffic diversion routes

10. The purpose of installing traffic control devices at the work zones is to delineate these areas to warn, inform, and direct the road users about a hazard ahead, and to protect them as well as the workers. As proper delineation is a key to achieve the above objective, it is important to install good traffic signs at the work zones. The following traffic control devices are used in work zones:

- Signs
- Pavement Markings
- Channelizing Devices
- Arrow Panels
- Warning Lights

11. Procedures for installing traffic control devices at any work zone vary, depending on road configuration, location of the work, construction activity, duration, traffic speed and volume, and pedestrian traffic. Work will take place along major roads, and the minor internal roads. As such, the traffic volume and road geometry vary. The main roads carry considerable traffic; internal roads in the new city areas are wide but in old city roads very narrow and carry considerable traffic. However, regardless of where the construction takes place, all the work zones should be cordoned off, and traffic shifted away at least with traffic cones, barricades, and temporary signs (temporary “STOP” and “GO”).

12. **Figure A2 to Figure A12** illustrates a typical set-up for installing traffic control devices at the work zone of the area, depending on the location of work on the road way, and road geometrics:

- Work on shoulder or parking lane
- Shoulder or parking lane closed on divided road
- Work in Travel lane
- Lane closure on road with low volume
- Lane closure on a two-line road with low volume (with yield sign)
- Lane closure on a two-line road with low volume (one flagger operation)
- Lane closure on a two lane road (two flagger operation)
- Lane closure on a four lane undivided Road
- Lane closure on divided roadway
- Half road closure on multi-lane roadway
- Street closure with detour

13. The work zone should take into consideration the space required for a buffer zone between the workers and the traffic (lateral and longitudinal) and the transition space required for delineation, as applicable. For the works, a 30 cm clearance between the traffic and the temporary STOP and GO signs should be provided. In addition, at least 60 cm is necessary to install the temporary traffic signs and cones.

14. Traffic police should regulate traffic away from the work zone and enforce the traffic diversion result from full street closure in certain areas during construction. Flaggers/ personnel should be equipped with reflective jackets at all times and have traffic control batons (preferably the LED type) for regulating the traffic during night time.

16. In addition to the delineation devices, all the construction workers should wear fluorescent safety vests and helmets in order to be visible to the motorists at all times. There should be provision for lighting beacons and illumination for night constructions.

Figure A2&A3: Work on shoulder or parking lane & Shoulder or parking lane closed on divided road

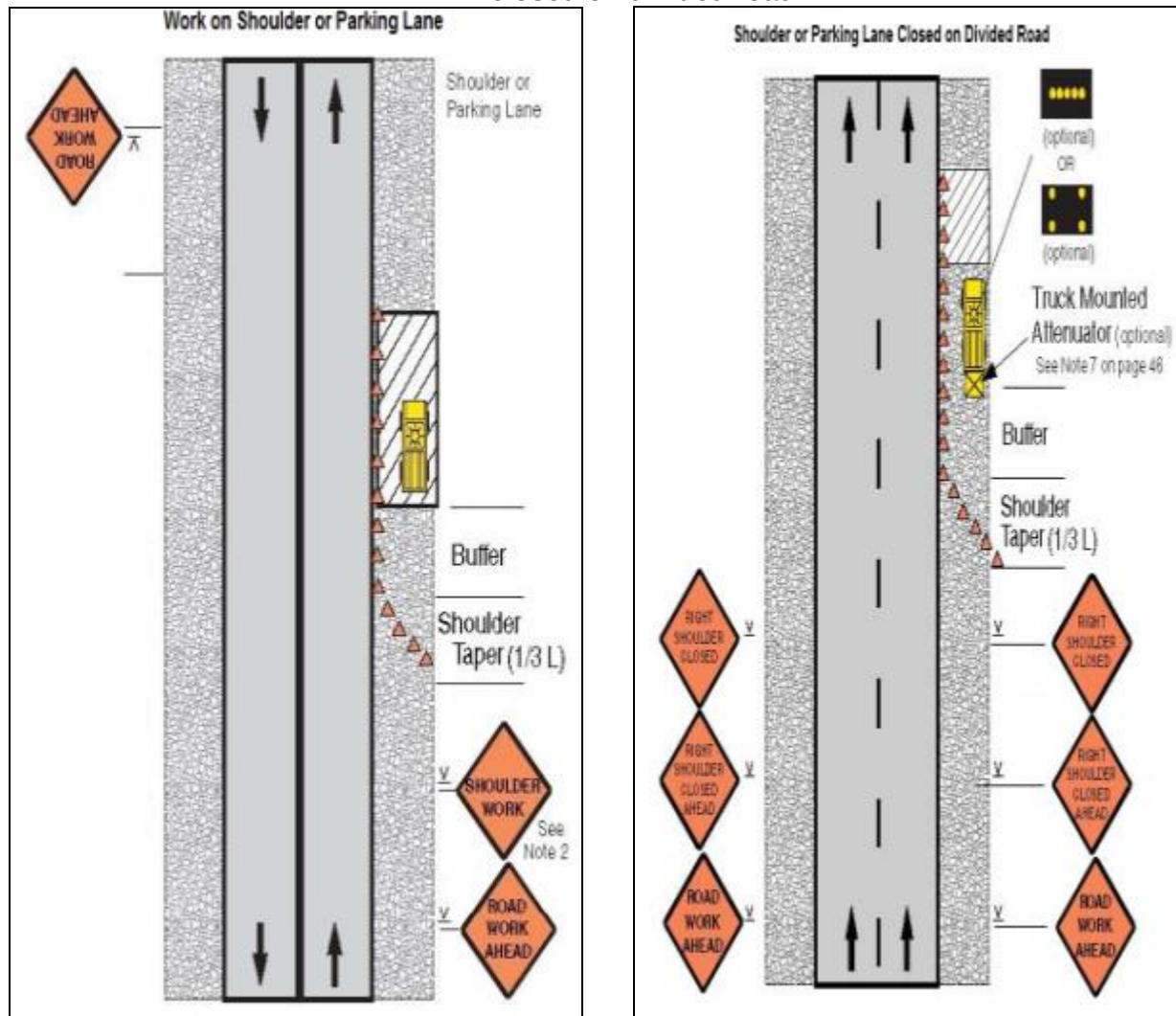


Figure A4&A5: Work in Travel lane & Lane closure on road with low volume

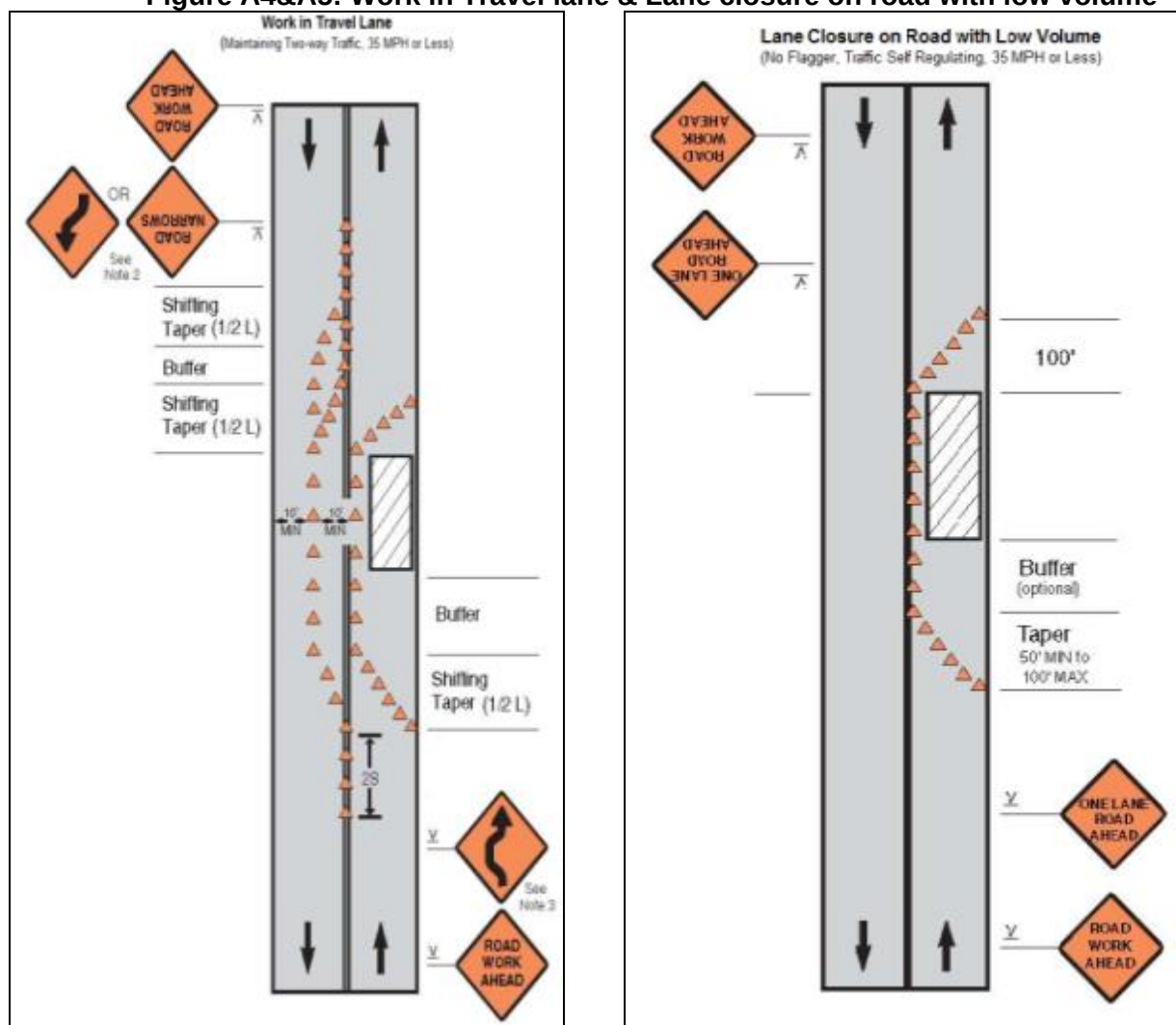


Figure A6&A7: Lane closure on a two-line road with low volume (with yield sign) & Lane closure on a two-line road with low volume (one flagger operation)

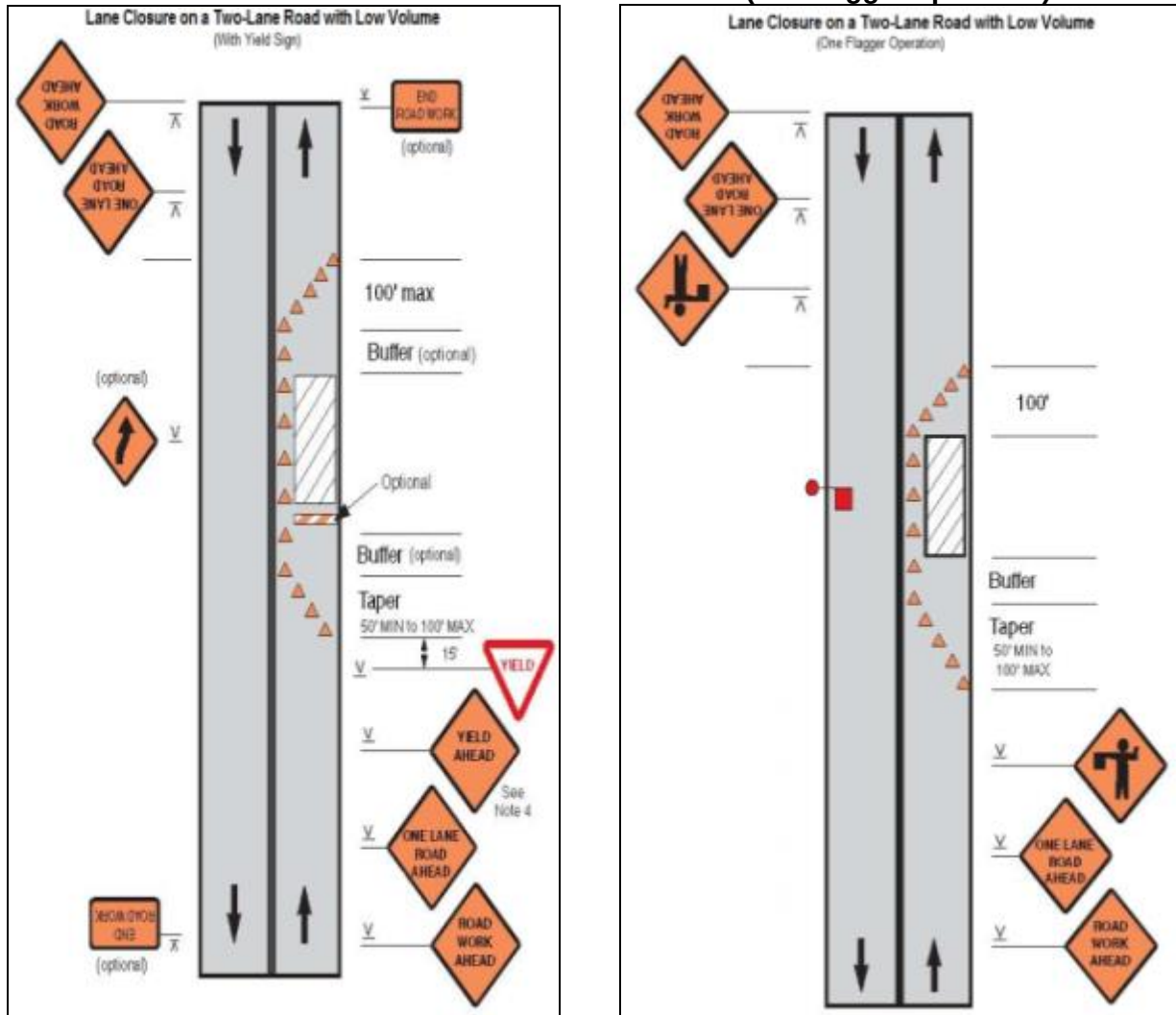


Figure A8&A9: Lane Closure on a Two-Lane Road (Two Flagger Operation) & Lane Closure on a Four-Lane Undivided Road

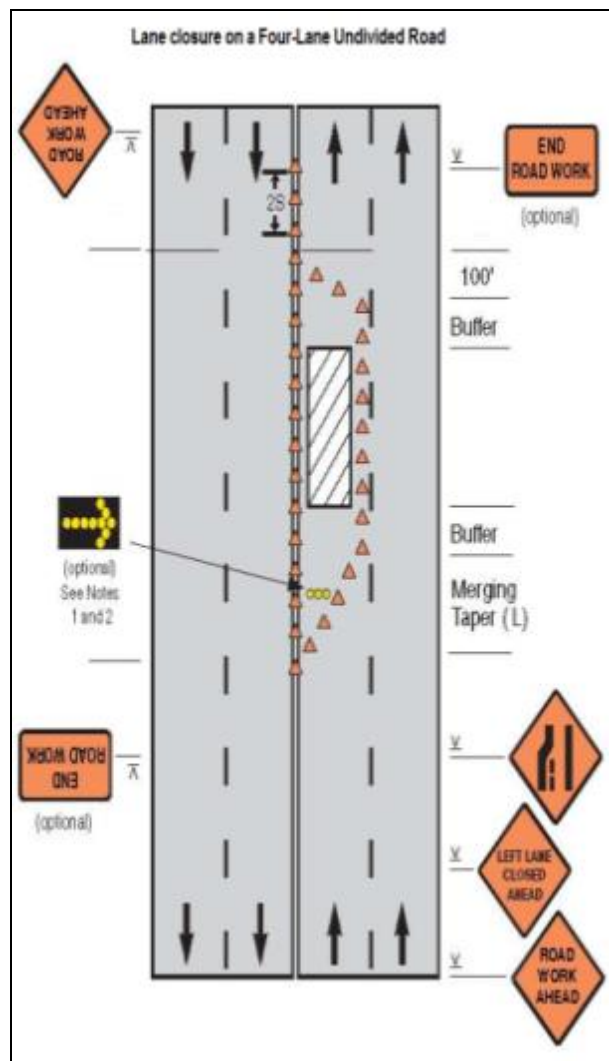
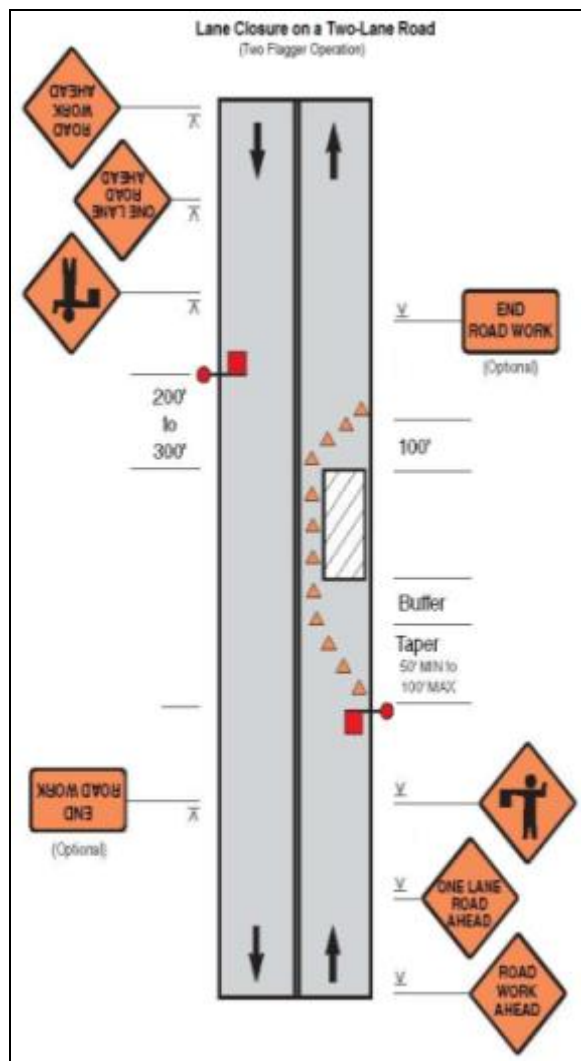


Figure A10&A11: Lane Closure On Divided Roadway & Half Road Closure On Multi-Lane Roadway

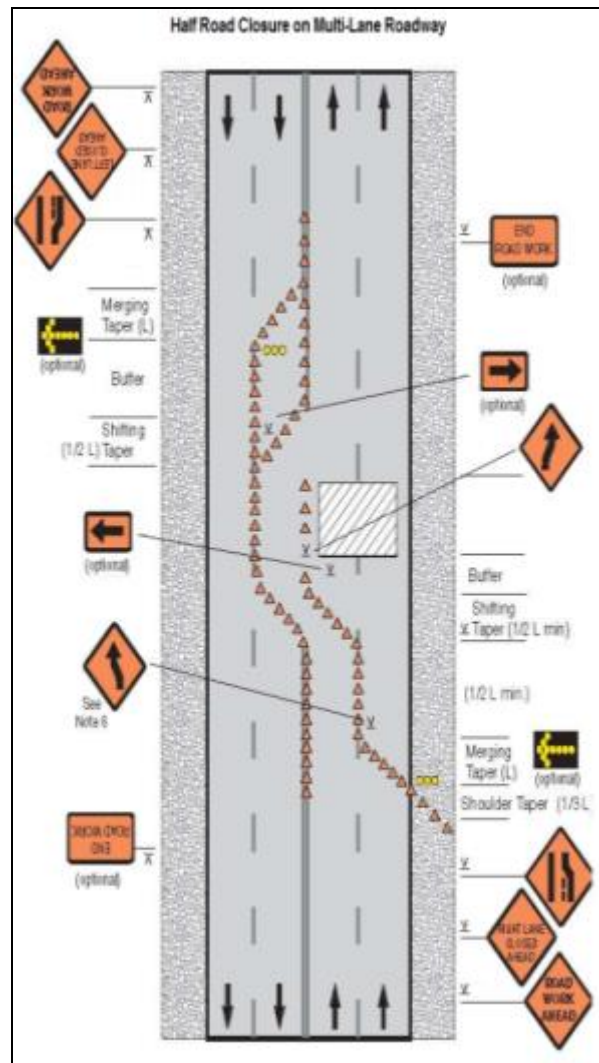
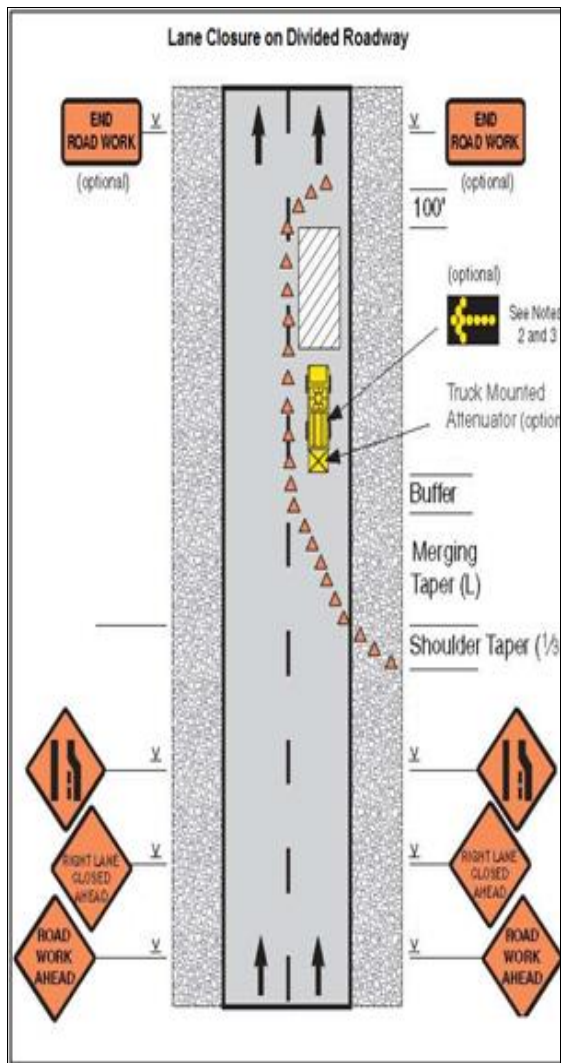
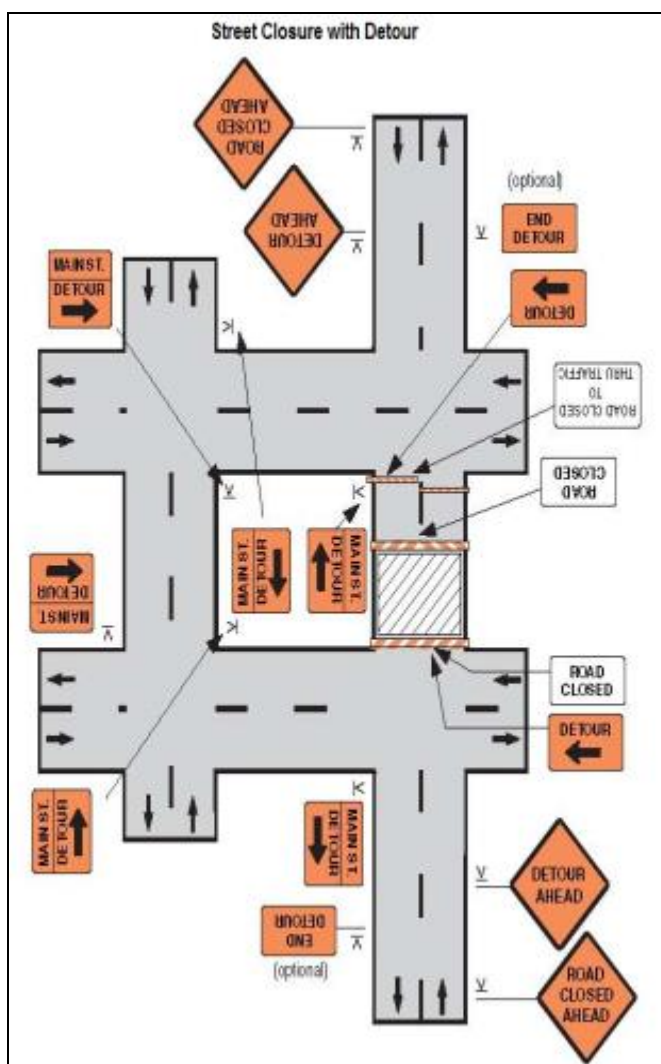


Figure A12: Street closure with detour



Appendix 16: IFC benchmark standards for workers accommodation

August 2009

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PART II: STANDARDS FOR AND MANAGEMENT OF WORKERS' ACCOMMODATION

I. Standards for workers' accommodation

This section looks at the principles and standards applicable to the location and construction of workers' accommodation, including the transport systems provided, the general living facilities, rooms/dormitories facilities, sanitary facilities, canteen and cooking facilities, food safety, medical facilities and leisure/social facilities.

A. National/local standards

The key standards that need to be taken into consideration, as a baseline, are those contained in national/local regulations. Although it is quite unusual to find regulations specifically covering workers' accommodation, there may well be general construction standards which will be relevant. These may include the following standards:

- **Building construction:** for example, quality of material, construction methods, resistance to earthquakes.
- **Housing and public housing:** in some countries regulations for housing and public housing contain requirements on issues such as the basic amenities, and standards of repair.
- **General health, safety and security:** requirements on health and safety are often an important part of building standards and might include provisions on occupation density, minimal air volumes, ventilation, the quality of the flooring (slip-resistant) or security against intrusion.
- **Fire safety:** requirements on fire safety are common and are likely to apply to housing facilities of any type. This can include provision on fire extinguishers, fire alarms, number and size of staircases and emergency exits, restrictions on the use of certain building materials.
- **Electricity, plumbing, water and sanitation:** national design and construction standards often include very detailed provisions on electricity or plumbing fixtures/fittings, water and sanitation connection/equipment.

Benchmark

1. The relevant national and local regulations have been identified and implemented.

B. General living facilities

Ensuring good standards in living facilities is important in order to avoid safety hazards and to protect workers from diseases and/or illness resulting from humidity, bad/stagnant water (or lack of water), cold, spread of fungus, proliferation of insects or rodents, as well as to maintain a good level of morale. The location of the facilities is important to prevent exposure to wind, fire, flood and other natural hazards. It is also important that workers' accommodation is unaffected by the environmental or operational impacts of the worksite (for example noise, emissions or dust) but is sufficiently close that workers do not have to spend undue amounts of time travelling from their accommodation to the worksite. Living facilities should be built using adequate materials and should always be kept in good repair, clean and free from rubbish and other refuse.

Benchmarks

1. Living facilities are located to avoid flooding and other natural hazards.
2. Where possible, living facilities are located within a reasonable distance from the worksite.
3. Transport from the living facilities to worksite is safe and free.
4. The living facilities are built with adequate materials, kept in good repair and kept clean and free from rubbish and other refuse.

Drainage

The presence of stagnant water is a factor of proliferation of potential disease vectors such as mosquitoes, flies and others, and must be avoided.

Benchmarks

1. The building site is adequately drained to avoid the accumulation of stagnant water.

Heating, air conditioning, ventilation and light

Heating, air-conditioning and ventilation should be appropriate for the climatic conditions and provide workers with a comfortable and healthy environment to rest and spend their spare time.

Benchmarks

1. For facilities located in cold weather zones, the temperature is kept at a level of around 20 degrees Celsius notwithstanding the need for adequate ventilation.
2. For facilities located in hot weather zones, adequate ventilation and/or air conditioning systems are provided.
3. Both natural and artificial lighting are provided and maintained in living facilities. It is best practice that the window area represents not less than 5% to 10% of the floor area. Emergency lighting is provided.

Water

Special attention to water quality and quantity is absolutely essential. To prevent dehydration, water poisoning and diseases resulting from lack of hygiene, workers should always have easy access to a source of clean water. An adequate supply of potable water must be available in the same buildings where bedrooms or dormitories are provided. Drinking water must meet local or WHO drinking water standards⁷ and water quality must be monitored regularly. Depending on the local context, it could either be produced by dedicated catchment and treatment facilities or tapped from existing municipal facilities if their capacity and quality are adequate.

Benchmarks

1. Access to an adequate and convenient supply of free potable water is always available to workers. Depending on climate, weather conditions and accommodation standards, 80 to 180 litres per person per day are available.
2. Drinking water meets national/local or WHO drinking water standards.⁸
3. All tanks used for the storage of drinking water are constructed and covered as to prevent water stored therein from becoming polluted or contaminated.

4. Drinking water quality is regularly monitored.

Wastewater and solid waste

Wastewater treatment and effluent discharge as well as solid waste treatment and disposal must comply with local or World Bank effluent discharge standards⁹ and be adequately designed to prevent contamination of any water body, to ensure hygiene and to avoid the spread of infections and diseases, the proliferation of mosquitoes, flies, rodents, and other pest vectors. Depending on the local context, treatment and disposal services can be either provided by dedicated or existing municipal facilities.

Benchmarks

1. Wastewater, sewage, food and any other waste materials are adequately discharged, in compliance with local or World Bank standards – whichever is more stringent – and without causing any significant impacts on camp residents, the biophysical environment or surrounding communities.
2. Specific containers for rubbish collection are provided and emptied on a regular basis. Standards range from providing an adequate number of rubbish containers to providing leak proof, non-absorbent, rust and corrosion-resistant containers protected from insects and rodents. In addition it is best practice to locate rubbish containers 30 metres from each shelter on a wooden, metal, or concrete stand. Such containers must be emptied at regular intervals (to be determined based on temperatures and volumes generated) to avoid unpleasant odours associated with decaying organic materials.
3. Pest extermination, vector control and disinfection are carried out throughout the living facilities in compliance with local requirements and/or good practice. Where warranted, pest and vector monitoring should be performed on a regular basis.

7. www.who.int/water_sanitation_health/dwq/en/
8. *Ibid*

9. As per the "Pollution Prevention and Abatement Handbook", World Bank Group, July 1998, available from www.worldbank.org

C. Room/dormitory facilities

The standards of the rooms or dormitory facilities are important to allow workers to rest properly and to maintain good standards of hygiene. Overcrowding should be avoided particularly. This also has an impact on workers' productivity and reduces work-related accidents. It is generally acknowledged that rooms/dormitories should be kept clean and in a good condition. Exposure to noise and odour should be minimised. In addition, room/dormitory design and equipment should strive to offer workers a maximum of privacy. Resorting to dormitories should be minimised and single or double rooms are preferred. Dormitories and rooms must be single-sex.

Benchmarks

1. Rooms/dormitories are kept in good condition.
2. Rooms/dormitories are aired and cleaned at regular intervals.
3. Rooms/dormitories are built with easily cleanable flooring material.
4. Sanitary facilities are located within the same buildings and provided separately for men and women.
5. Density standards are expressed either in terms of minimal volume per resident or of minimal floor space. Usual standards range from 10 to 12,5 cubic metres (volume) or 4 to 5,5 square metres (surface).
6. A minimum ceiling height of 2.10 metres is provided.
7. In collective rooms, which are minimised, in order to provide workers with some privacy, only a reasonable number of workers are allowed to share the same room. Standards range from 2 to 8 workers.
8. All doors and windows should be lockable, and provided with mosquito screens where conditions warrant.
9. There should be mobile partitions or curtains to ensure privacy.
10. Every resident is provided with adequate furniture such as a table, a chair, a mirror and a bedside light.
11. Separate sleeping areas are provided for men and women, except in family accommodation.

Additional issue

Irrespective of whether workers are supposed to keep their facilities clean, it is the responsibility of the accommodation manager to ensure that rooms/dormitories and sanitary facilities are in good condition.

Bed arrangements and storage facilities

The provision of an adequate numbers of beds of an appropriate size is essential to provide workers with decent, safe and hygienic conditions to rest and sleep. Here again, particular attention should be paid to privacy. Consideration should be given to local customs so beds could be replaced by hammocks or sleeping mats for instance.

Benchmarks

1. A separate bed for each worker is provided. The practice of "hot-bedding" should be avoided.
2. There is a minimum space between beds of 1 metre.
3. Double deck bunks are not advisable for fire safety and hygiene reasons, and their use is minimised. Where they are used, there must be enough clear space between the lower and upper bunk of the bed. Standards range from 0.7 to 1.10 metres.
4. Triple deck bunks are prohibited.
5. Each worker is provided with a comfortable mattress, pillow, cover and clean bedding.
6. Bed linen is washed frequently and applied with repellents and disinfectants where conditions warrant (malaria).
7. Facilities for the storage of personal belongings for workers are provided. Standards vary from providing an individual cupboard for each worker to providing 475-litre big lockers and 1 metre of shelf unit.
8. Separate storage for work boots and other personal protection equipment, as well as drying/airing areas may need to be provided depending on conditions.

D. Sanitary and toilet facilities

It is essential to allow workers to maintain a good standard of personal hygiene but also to prevent contamination and the spread of diseases which result from inadequate sanitary facilities. Sanitary and toilet facilities will always include all of the following: toilets, urinals, washbasins and showers. Sanitary and toilet facilities should be kept in a clean and fully working condition. Facilities should also be constructed of materials that are easily cleanable and ensure privacy. Sanitary and toilet facilities are never shared between male and female residents, except in family accommodation. Where necessary, specific additional sanitary facilities are provided for women.

Benchmarks

1. Sanitary and toilet facilities are constructed of materials that are easily cleanable.
2. Sanitary and toilet facilities are cleaned frequently and kept in working condition.
3. Sanitary and toilet facilities are designed to provide workers with adequate privacy, including ceiling to floor partitions and lockable doors.
4. Sanitary and toilet facilities are not shared between men and women, except in family accommodation.

Toilet facilities

Toilet arrangements are essential to avoid any contamination and prevent the spread of infectious disease.

Benchmarks

1. An adequate number of toilets is provided to workers. Standards range from 1 unit to 15 persons to 1 unit per 6 persons. For urinals, usual standards are 1 unit to 15 persons.
2. Toilet facilities are conveniently located and easily accessible. Standards range from 30 to 60 metres from rooms/dormitories. Toilet rooms shall be located so as to be accessible without any individual passing through any sleeping room. In addition, all toilet rooms should be well-lit, have good ventilation or external windows, have sufficient hand wash basins and be conveniently located. Toilets and other sanitary facilities should be ("must be" in cold climates) in the same building as rooms and dormitories.

Showers/bathrooms and other sanitary facilities

Hand wash basins and showers should be provided in conjunction with rooms/dormitories. These facilities must be kept in good working condition and cleaned frequently. The flooring for shower facilities should be of hard washable materials, damp-proof and properly drained. Adequate space must be provided for hanging, drying and airing clothes. Suitable light, ventilation and soap should be provided. Lastly, hand washing, shower and other sanitary facilities should be located within a reasonable distance from other facilities and from sleeping facilities in particular.

Benchmarks

1. Shower/bathroom flooring is made of anti-slip hard washable materials.
2. An adequate number of handwash facilities is provided to workers. Standards range from 1 unit to each 15 persons to 1 unit per 6 workers. Handwash facilities should consist of a tap and a basin, soap and hygienic means of drying hands.
3. An adequate number of shower/bathroom facilities is provided to workers. Standards range from 1 unit to 15 persons to 1 unit per 6 persons.
4. Showers/bathrooms are conveniently located.
5. Shower/bathroom facilities are provided with an adequate supply of cold and hot running water.

E. Canteen, cooking and laundry facilities

Good standards of hygiene in canteen/dining halls and cooking facilities are crucial. Adequate canteen, cooking and laundry facilities and equipments should also be provided. When caterers are contracted to manage kitchens and canteens, special attention should be paid to ensure that contractors take into account and implement the benchmarks below, and that adequate reporting and monitoring mechanisms are in place. When workers can individually cook their meals, they should be provided with a space separate from the sleeping areas. Facilities must be kept in a clean and sanitary condition. In addition, canteen, kitchen, cooking and laundry floors, ceilings and walls should be made of easily cleanable materials.

Benchmarks

1. Canteen, cooking and laundry facilities are built in adequate and easy to clean materials.
2. Canteen, cooking and laundry facilities are kept in a clean and sanitary condition.
3. If workers can cook their own meals, kitchen space is provided separate from sleeping areas.

Laundry facilities

Providing facilities for workers to wash both work and non-work related clothes is essential for personal hygiene. The alternative is for the employer to provide a free laundry service.

Benchmarks

1. Adequate facilities for washing and drying clothes are provided. Standards range from providing sinks or tubs with hot and cold water, cleaning soap and drying lines to providing washing machines and dryers.
2. When work clothes are used in contact with dangerous substance (for example, application of pesticide), special laundry facilities (washing machines) should be provided.

Additional issue

When workers are provided with facilities allowing them to individually do their laundry or cooking, it should be the responsibility of each worker to keep the facilities in a clean and sanitary condition. Nonetheless, it is the responsibility of the accommodation manager to make sure the standards are respected and to provide an adequate cleaning, disinfection and pest/vector control service when necessary.

Additional issue

When the employer provides family accommodation, it is best practice to provide each family with a private kitchen or the necessary cooking equipment to allow the family to cook on their own.

Canteen and cooking facilities

Canteen and cooking facilities should provide sufficient space for preparing food and eating, as well as conform to hygiene and safety requirements.

Benchmarks

1. Canteens have a reasonable amount of space per worker. Standards range from 1 square metre to 1.5 square metres.
2. Canteens are adequately furnished. Standards range from providing tables, benches, individual drinking cups and plates to providing special drinking fountains.
3. Places for food preparation are designed to permit good food hygiene practices, including protection against contamination between and during food preparation.
4. Kitchens are provided with facilities to maintain adequate personal hygiene including a sufficient number of washbasins designated for cleaning hands with clean, running water and materials for hygienic drying.
5. Wall surfaces adjacent to cooking areas are made of fire-resistant materials. Food preparation tables are also equipped with a smooth durable washable surface. Lastly, in order to enable easy cleaning, it is good practice that stoves are not sealed against a wall, benches and fixtures are not built into the floor, and all cupboards and other fixtures and all walls and ceilings have a smooth durable washable surface.
6. All kitchen floors, ceiling and wall surfaces adjacent to or above food preparation and cooking areas are built using durable, non-absorbent, easily cleanable, non-toxic materials.
7. Wall surfaces adjacent to cooking areas are made of fire-resistant materials. Food preparation tables are equipped with a smooth, durable, easily cleanable, non-corrosive surface made of non-toxic materials. Lastly, in order to enable easy cleaning, it is good practice that stoves are not sealed against a wall, benches and fixtures are not built into the floor, and all cupboards and other fixtures have a smooth, durable and washable surface.
8. Adequate facilities for cleaning, disinfecting and storage of cooking utensils and equipment are provided.
9. Food waste and other refuse are to be adequately deposited in sealable containers and removed from the kitchen frequently to avoid accumulation.

F. Standards for nutrition and food safety

When cooking for a number of workers, hygiene and food safety are absolutely critical. In addition to providing safe food, providing nutritious food is important as it has a very direct impact on workers' productivity and well-being. An ILO study demonstrates that good nutrition at work leads to gains in productivity and worker morale, prevention of accidents and premature deaths and reductions in health care costs.¹⁰

Benchmarks

1. The WHO 5 keys to safer food or an equivalent process is implemented (see Box 6 below).
2. Food provided to workers contains an appropriate level of nutritional value and takes into account religious/cultural backgrounds; different choices of food are served if workers have different cultural/religious backgrounds.
3. Food is prepared by cooks. It is also best practice that meals are planned by a trained nutritionist.

Box 6 - Five keys to safer food

Keep clean

Wash your hands before handling food and often during food preparation.
Wash your hands after going to the toilet.
Wash and sanitise all surfaces and equipment used for food preparation.
Protect kitchen areas and food from insects, pests and other animals.

While most micro organisms do not cause disease, dangerous micro organisms are widely found in soil, water, animals and people. These micro organisms are carried on hands, wiping cloths and utensils, especially cutting boards and the slightest contact can transfer them to food and cause food borne diseases.

Separate raw and cooked

Separate raw meat, poultry and seafood from other foods.
Use separate equipment and utensils such as knives and cutting boards for handling raw foods.
Store food in containers to avoid contact between raw and prepared foods.

Raw food, especially meat, poultry and seafood, and their juices, can contain dangerous micro organisms which may be transferred onto other foods during food preparation and storage.

Cook thoroughly

Cook food thoroughly, especially meat, poultry, eggs and seafood.
Bring foods like soups and stews to boiling to make sure that they have reached 70°C. For meat and poultry, make sure that juices are clear, not pink. Ideally, use a thermometer.
Reheat cooked food thoroughly.

Proper cooking kills almost all dangerous micro organisms. Studies have shown that cooking food to a temperature of 70°C can help ensure it is safe for consumption. Foods that require special attention include minced meats, rolled roasts, large joints of meat and whole poultry.

Keep food at safe temperatures

Do not leave cooked food at room temperature for more than 2 hours.
Refrigerate promptly all cooked and perishable food (preferably below 5°C).
Keep cooked food piping hot (more than 60°C) prior to serving.
Do not store food too long even in the refrigerator.
Do not thaw frozen food at room temperature.

Micro organisms can multiply very quickly if food is stored at room temperature. By holding at temperatures below 5°C or above 60°C, the growth of micro organisms is slowed down or stopped. Some dangerous micro organisms still grow below 5°C.

Use safe water and raw materials

Use safe water or treat it to make it safe.
Select fresh and wholesome foods.
Choose foods processed for safety, such as pasteurised milk.
Wash fruits and vegetables, especially if eaten raw.
Do not use food beyond its expiry date.

Raw materials, including water and ice, may be contaminated with dangerous micro organisms and chemicals. Toxic chemicals may be formed in damaged and mouldy foods. Take care in selection of raw materials and implement simple measures such as washing.

Source: World Health Organization, Food Safety
www.who.int/foodsafety/publications/consumer/en/5keys_en.pdf

10. C. Wanjek (2005). "Food at Work – Workplace solutions for malnutrition, obesity and chronic disease", International Labour Organization, Geneva.

G. Medical facilities

Access to adequate medical facilities is important to maintain workers' health and to provide adequate responses in case of health emergency situations. The availability or level of medical facilities provided in workers' accommodation is likely to depend on the number of workers living on site, the medical facilities already existing in the neighbouring communities and the availability of transport. However, first aid must always be available on site.

First aid facilities

Providing adequate first aid training and facilities can save lives and prevent minor injuries becoming major ones.

Other medical facilities

Depending on the number of workers living on site and the medical services offered in the surrounding communities, it is important to provide workers with additional medical facilities. Special facilities for sick workers and medical services such as dental care, surgery, a dedicated emergency room can, for instance, be provided.

Benchmarks

1. A number of first aid kits adequate to the number of residents are available.
2. First aid kits are adequately stocked. Where possible a 24/7 first aid service/facility is available.
3. An adequate number of staff/workers is trained to provide first aid.
4. Where possible and depending on the medical infrastructures existing in the community, other medical facilities are provided (nurse rooms, dental care, minor surgery).

Box 7 - UK/HSE First Aid facilities

What should be in a first aid kit?

There is no standard list and it very much depends on the assessment of the needs in a particular workplace:

- a leaflet giving general guidance on first aid, for example HSE leaflet *Basic advice on first aid at work*
- individually wrapped sterile adhesive dressings (assorted sizes)
- two sterile eye pads
- four individually wrapped triangular bandages (preferably sterile)
- six safety pins
- six medium-sized (approximately 12 cm x 12 cm) individually wrapped sterile unmedicated wound dressings
- two large (approximately 18 cm x 18 cm) sterile individually wrapped unmedicated wound dressings
- one pair of disposable gloves.

What should be kept in the first aid room?

The room should contain essential first aid facilities and equipment. Typical examples of these are:

- a sink with hot and cold running water
- drinking water and disposable cups
- soap and paper towels
- a store for first aid materials
- foot-operated refuse containers, lined with disposable yellow clinical waste bags or a container for the safe disposal of clinical waste
- a couch with waterproof protection, clean pillows and blankets
- a chair
- a telephone or other communication equipment
- a record book for recording incidents where first aid has been given.

Source: UK Health and Safety Executive

H. Leisure, social and telecommunication facilities

Basic leisure and social facilities are important for workers to rest and also to socialise during their free time. This is particularly true where workers' accommodation is located in remote areas far from any communities. Where workers' accommodation is located in the vicinity of a village or a town, existing leisure or social facilities can be used so long as this does not cause disruption to the access and enjoyment of local community members. But in any case, social spaces should also be provided on site. Exercise and recreational facilities will increase workers' welfare and reduce the impact of the presence of workers in the surrounding communities. In addition it is also important to provide workers with adequate means to communicate with the outside world, especially when workers' accommodation is located in a remote location or where workers live on site without their family or are migrants. Consideration of cultural attitudes is important. Provision of space for religious observance needs to be considered, taking account of the local context and potential conflicts in certain situations.

Benchmarks

1. Basic collective social/rest spaces are provided to workers. Standards range from providing workers multi-purpose halls to providing designated areas for radio, TV, cinema.
2. Recreational facilities are provided. Standards range from providing exercise equipment to providing a library, swimming pool, tennis courts, table tennis, educational facilities.
3. Workers are provided with dedicated places for religious observance if the context warrants.
4. Workers have access to public phones at affordable/public prices (that is, not inflated).
5. Internet facilities can also be provided, particularly where large numbers of expatriates/Third Country Nationals (TCNs) are accommodated.

Box 8 - Examples of social/leisure facilities

In Qatar there is a newly built 170-hectare complex which accommodates contractors and more than 35,000 workers for a project run by a major oil company. At the heart of this complex, the recreation area includes extensive sport facilities, a safety-training centre, an outdoor cinema and a park. The purpose of those facilities goes beyond providing adequate accommodation to the large numbers of contractors and workers on this project but is designed to provide the same level of services as a small town. The accommodation complex has a mayor, as well as a dedicated welfare team which is responsible for the workers' welfare, cultural festivals and also acts as the community's advocates.

II. Managing workers' accommodation

Once the living facilities have been constructed and are operational, effective ongoing management of living facilities is essential. This encompasses issues such as the physical maintenance of buildings, security and consultation with residents and neighbouring communities in order to ensure the implementation of the housing standards in the long term.

A. Management and staff

Worker camps and housing facilities should have a written management plan, including management policies or plans on health and safety, security, living conditions, workers' rights and representation, relationships with the communities and grievance processes. Part of those policies and plans can take the form of codes of conduct. The quality of the staff managing and maintaining the accommodation facilities will have a decisive impact on the level of standards which are implemented and the well-being of workers (for instance on the food safety or overall hygiene standards). It is therefore important to ensure that managers are competent and other workers are adequately skilled. The manager will be responsible for overseeing staff, for ensuring the implementation of the accommodation standards and for the implementation of the management plans. It is important the accommodation manager has the corresponding authority to do so.

If the facility is being managed by a contractor, as is often the case, the expected housing and management standards should be specified in the relevant contract, and mechanisms to ensure that those standards are implemented should be set up. As part of this process, the accommodation manager (or contractor) should have a duty to monitor the application of the accommodation standards and to report frequently on their implementation to the client.

Benchmarks

1. There are management plans and policies especially in the field of health and safety (with emergency responses), security, workers' rights, relationships with the communities.
2. An appointed person with the adequate background and experience is in charge of managing the workers' accommodation.
3. If contractors are being used, there are clear contractual management responsibilities and monitoring and reporting requirements.
4. Depending on the size of the accommodation, there is a sufficient number of staff in charge of cleaning, cooking and of general maintenance.
5. Such staff are recruited from the local communities.
6. Staff have received basic health and safety training.
7. Persons in charge of the kitchen are trained in nutrition and food-handling and adequately supervised.

B. Charging fees for accommodation and services

Charging fees for the accommodation or the services provided to workers such as food or transport should be avoided where workers do not have the choice to live or eat anywhere else, or if deemed unavoidable, should take into account the specific nature of workers' accommodation. Any charges should be transparent, discussed during recruitment and specified in workers' contracts. Any such charges should still leave workers with sufficient income and should never lead to a worker becoming indebted to an employer.

Benchmarks

1. When fees are charged, workers are provided with clear information and a detailed description of all payments made such as rent, deposit and other fees.
2. When company housing is considered to be part of workers' wages, it is best practice that workers are provided with an employment contract clearly specifying housing arrangements and regulations, in particular rules concerning payments and fees, facilities and services offered and rules of notice.
3. When fees are charged, the renting arrangements are fair and do not cost the worker more than a small proportion of income and never include a speculative profit.
4. Food and other services are free or are reasonably priced, never above the local market price.
5. The provision of accommodation or other services by employers as a payment for work is prohibited.

Additional issue

To avoid that fair renting arrangements turn into unfair ones, any deposit of advance should be set at a reasonable level and it is best practice that renting prices include a fixed fee covering the water needed and the use of the energy required to the functioning of the heating/cooling/ventilation/cooking systems. However, in such cases it might be necessary to raise workers' awareness to ensure that workers will use the facilities responsibly, particularly in areas where water is scarce.

C. Health and safety on site

The company or body in charge of managing the workers' accommodation should have the prime responsibility for ensuring workers' physical well-being and integrity. This involves making sure that the facilities are kept in good condition (ensuring that sanitary standards or fire regulations are respected for instance) and that adequate health and safety plans and standards are designed and implemented.

Benchmarks

1. Health and safety management plans including electrical, mechanical, structural and food safety have been carefully designed and are implemented.
2. The person in charge of managing the accommodation has a specific duty to report to the health authorities the outbreak of any contagious diseases, food poisoning and other important casualties.
3. An adequate number of staff/workers is trained to provide first aid.
4. A specific fire safety plan is prepared, including training of fire wardens, periodic testing and monitoring of fire safety equipment and periodic drills.
5. Guidance on the detrimental effects of the abuse of alcohol and drugs and other potentially harmful substances and the risk and concerns relating to HIV/AIDS and of other health risk-related activities is provided to workers. It is best practice to develop a clear policy on this issue.
6. Workers have access to adequate preventive measures such as contraception (condoms in particular) and mosquito nets.
7. Workers have easy access to medical facilities and medical staff. Where possible, female doctors/nurses should be available for female workers.
8. Emergency plans on health and fire safety are prepared. Depending on the local context, additional emergency plans are prepared as needed to handle specific occurrences (earthquakes, floods, tornadoes).

D. Security of workers' accommodation

Ensuring the security of workers and their property on the accommodation site is of key importance. To this end, a security plan must be carefully designed including appropriate measures to protect workers against theft and attacks. Policies regarding the use of force (force can only be used for preventive and defensive purposes in proportion to the nature and the extent of the threat) should also be

carefully designed. To implement those plans, it may be necessary to contract security services or to recruit one or several staff whose main responsibility is to provide security to safeguard workers and property. Before making any security arrangements, it is necessary to assess the risks of such arrangements to those within and outside the workers' accommodation and to respect best international practices, including IFC PS4 and EBRD PR4 and applicable law.¹¹ Particular attention should be paid to the safety and security of women workers.

Benchmarks

1. A security plan including clear measures to protect workers against theft and attack is implemented.
2. A security plan including clear policies on the use of force has been carefully designed and is implemented.
3. Security staff have been checked to ensure that they have not been implicated in any previous crimes or abuses. Where appropriate, security staff from both genders are recruited.
4. Security staff have a clear mandate and have received clear instruction about their duties and responsibilities, in particular their duties not to harass, intimidate, discipline or discriminate against workers.
5. Security staff have received adequate training in dealing with domestic violence and the use of force.
6. Security staff have a good understanding about the importance of respecting workers' rights and the rights of the communities.
7. Body searches are only allowed in specific circumstances and are performed by specially trained security staff using the least-intrusive means possible. Pat down searches on female workers can only be performed by female security staff.
8. Security staff adopt an appropriate conduct towards workers and communities.
9. Workers and members of the surrounding communities have specific means to raise concerns about security arrangement and staff.

11. See for instance the Voluntary Principles on Security and Human Rights, www.voluntaryprinciples.org/principles

E. Workers' rights, rules and regulations on workers' accommodation

Freedoms and human rights of workers should be recognised and respected within their living quarters just as within the working environment. House rules and regulations should be reasonable and non discriminatory. It is best practice that workers' representatives are consulted about those rules. House rules and regulations should not prevent workers from exercising their basic rights. In particular, workers' freedom of movement needs to be preserved if they are not to become effectively "trapped". To this end it is good practice to provide workers with 24/7 access to the accommodation and free transport services to and from the surrounding communities. Any restriction to this freedom of movement should be limited and duly justified. Penalties for breaking the rules should be proportional and implemented through a proper procedure allowing workers to defend themselves and to challenge the decision taken. The relationship between continuing employment and compliance with the rules of the workers' accommodation should be clear and particular attention should be paid to ensure that housing rules do not create indirect limitation of the right to freedom of association. Best practice might include a code of conduct relating to the accommodation to be signed together with the contract of employment.

Box 9 - Dole housing plantation regulation in Costa Rica

In every plantation there is an internal accommodation regulation that every worker is required to sign together with his/her employment contract. That document describes the behaviour which is expected from workers at all times and basic rules such as the prohibition of alcohol and the interdiction to make noise after a certain time at night. In case there is any problem concerning the application of those internal rules, a set of disciplinary procedures which have been designed with the workers' representatives can be enforced. Workers are absolutely free to enter or leave the site and do not have any restrictions in relation to accessing their living quarters. Families are not allowed in the living quarters unless they have been registered for a visit.

Benchmarks

1. Restriction of workers' freedom of movement to and from the site is limited and duly justified. It is good practice to provide workers 24/7 access to the accommodation site. Any restrictions based on security reasons should be balanced by the necessity to respect workers' freedom of movement.
2. Where possible, an adequate transport system to surrounding communities is provided. It is good practice to provide workers with free transportation to and from local communities.
3. Withholding workers' ID papers is prohibited.
4. Freedom of association is expressly respected. Provisions restricting workers' rights on site should take into account the direct and indirect effect on workers' freedom of association. It is best practice to provide trade union representatives access to workers in the accommodation site.
5. Workers' gender and religious, cultural and social backgrounds are respected. In particular, workers should be provided with the possibility of celebrating religious holidays and observances.
6. Workers are made aware of their rights and obligations and are provided with a copy of the internal workers' accommodation rules, procedures and sanction mechanisms in a language or through a media which they understand.
7. Housing regulations, including those relating to allocation of housing, should be non-discriminatory. Any justifiable discriminatory rules – for example all-male dormitories – should be strictly limited to the rules which are necessary to ensure the smooth running of the worker camp and to maintain a good relationship with the surrounding communities.
8. Where possible, visitor access should be allowed.
9. Decisions should be made on whether to prohibit alcohol, tobacco and third party access or not from the camp and the relevant rules should be clearly communicated to all residents and workers.
10. A fair and non-discriminatory procedure exists to implement disciplinary procedures including the right of workers to defend themselves (see also next section).

F. Consultation and grievance mechanisms

All residents should be made aware of any rules governing the accommodation and the consequences of breaking such rules. Processes that allow for consultation between site management and the resident workers will assist in the smooth running of an accommodation site. These may include a dormitory or camp committee as well as formal processes that allow workers to lodge any grievances about their accommodation.

Benchmarks

1. Mechanisms for workers' consultation have been designed and implemented. It is best practice to set up a review committee which includes representatives elected by workers.
2. Processes and mechanisms for workers to articulate their grievances are provided to workers. Such mechanisms are in accordance with PS2/PR2.
3. Workers subjected to disciplinary proceedings arising from behaviour in the accommodation should have access to a fair and transparent hearing with the possibility to contest decisions and refer the dispute to independent arbitration or relevant public authorities.
4. In case conflicts between workers themselves or between workers and staff break out, workers have the possibility of easily accessing a fair conflict resolution mechanism.
5. In cases where more serious offences occur, including serious physical or mental abuse, there are mechanisms to ensure full cooperation with the police authority (where adequate).

Additional issue

Alcohol is a complex issue and requires a very clear policy from the workers' accommodation management. If a non-alcohol policy is taken, special attention should be paid to clearly communicate the interdiction, how it applies and the consequences for breaching this rule. Special attention should also be paid to enforce it adequately.

G. Management of community relations

Workers' living facilities have various ongoing impacts on adjacent communities. In order to manage these, it is good practice to design a thorough community relations management plan. This plan will contain the processes to implement the findings of the preliminary community impact assessment and to identify, manage, mitigate or enhance ongoing impacts of the workers' accommodation on the surrounding communities. Issues to be taken into consideration include:

- community development – impact of workers' camp on local employment, possibility of enhancing local employment and income generation through local sourcing of goods and services
- community needs – ways to identify and address community needs related to the arrival of specific infrastructures such as telecommunications, water sanitation, roads, health care, education, housing
- community health and safety – addressing and reducing the risk in the increase in communicable diseases, corruption, trade in illegal substances such as drugs, alcohol (in the Muslim context), petty crimes and other sorts of violence, road accidents
- community social and cultural cohesion – ways to mitigate the impact of the presence of large numbers of foreign workers, often males, with different cultural and religious background, ways to mitigate the possible shift in social, economic and political structures due to changes in access to income generation opportunities.

Benchmarks

1. Community relations plans addressing issues around community development, community needs, community health and safety and community social and cultural cohesion have been designed and implemented.
2. Community relations plans include the setting up of a liaison mechanism allowing a constant exchange of information and consultation with the local communities in order to identify and respond quickly to any problems and maintain good working relationships.
3. A senior manager is in charge of implementing the community relations management plan and liaising with the community.

-
4. The impacts of workers' accommodation on local communities are periodically reviewed, mitigated or enhanced.
 5. Community representatives are provided with an easy means to voice their opinions and to lodge complaints.
 6. There is a transparent and efficient process for dealing with community grievances, in accordance with PS1/PR10.

Box 10 - Examples of community relations management

Community consultation in the Baku-Tbilisi-Ceyhan (BTC) pipeline

The BTC pipeline's Environment and Social Management Plans incorporated a Worker Camp Management Plan to be implemented by the construction contractor. As part of ongoing community liaison over the project as a whole, community liaison officers were appointed for worker camps who were responsible for meeting regularly with communities, identifying issues and addressing community concerns. A particular responsibility was to review HR records and disciplinary logs at worker camps to assess that rules were being implemented effectively and that any community liaison after any incidents was effective.

Appendix-17: Management Plan for Night works at Project Sites

Following requirements should be fulfilled for construction works at night hours:

1. Night works should be avoided at construction sites specially in residential areas and should be performed only when day works are not possible due to excessive traffic/public/pedestrian movement, site of cultural or religious importance, where there is huge crowd during day hours or any other unavoidable circumstances.
2. Contractor should plan for night works only after directions from PMU/PIU/DSC
3. Contractor should submit plan for night works for approval from PIU.
4. PIU should ensure that prior written information should be given to local authorities such as district administration, Police/traffic police, line agencies concerned, residents welfare association/business association/vyaparmandal of the affected areas and their consents/permissions should be taken prior to start of night works.
5. PIU/DSC engineers should check and ensure that all the preparation as per management plan is done by contractor and contractor is having all the necessary equipments and materials for night works.
6. Contractor is required to have following equipments/arrangements for night works-

- Contractors should have hand held noise level meter for measurement of noise during night hours.
- Contractors should have hand held lux meter for the measurement of illumination during night hours.
- Preferably electrical connections is available for running equipments otherwise sound proof/super silent Diesel Generator set should be available.
- Sound level should not increase as per following-

Type of area of work	Maximum noise level dB(A)
Industrial	70
Commercial	55
Residential	45
Silence zone	40

- Illumination should be as follows-

Minimum illumination (lx)	Areas to be illuminated	Type of work activity
54	Illumination throughout the work area	General work area lighting, and performance of visual tasks of large size, or medium contrast, or low require accuracy
108	Illumination of work area and areas adjacent to equipment	Performance of visual tasks of medium size, or low to medium contrast, or medium required accuracy
216	Illumination of task	Performance of visual tasks of small size, or low contrast or high required accuracy or fine finish

- As far as possible ready mix concrete from batching plant to be used, otherwise the concrete should be prepared away from residential areas and brought to the site
- All the noise activity like hammering, cutting, crushing, running of heavy equipments should be done in day time and avoided in night time

- Workers engaged in night works should have adequate rest/sleep in day time before start of night works
 - Worker engaged for night works should have previous experience of night works and should be physically fit for such works including clear vision in night
 - All the necessary provisions of traffic aids such as traffic signals, road signage, barricades, cautions boards, traffic diversion boards etc. should be available with fluorescent/retro-reflective arrangements
 - Workers should be trained before start of night works about risks and hazards of night works and their mitigation measures and should be provided all the protective aids (PPEs) including fluorescent/retro-reflective vests
 - Horns should not be permitted by equipments and vehicles
 - Workers should not shout and create noise
 - First aid and emergency vehicles should be available at site
 - Emergency preparedness plan should be operative during night works
 - Old persons and pregnant women and women having small kids should not work in night time
 - All the vehicles and equipments being used at night works should have adequate type of silencers/enclosures/mufflers to reduce noise
 - All the vehicles should be checked for working head lamps, tail lamps, inner lights etc. before start of night works
1. PIU/DSC site engineers and contractors safety personnel should closely monitor the safety of works continuously and noise and illumination levels on hourly basis and maintain photographic and videographic records as well as register the observations
 2. Night works should be stopped early in the morning at least one hour before start of pedestrian/traffic movement
 3. After completion of night works all the site should be cleaned and maintained obstruction free for day time movement of vehicles and pedestrians
 4. Drivers and workers should be alert and responsive during night works
 5. All the wages to workers working in night hours should be as per the applicable labour acts.
 6. Avoid any nuisance which may create problems to nearby habitants and work peacefully during night hours
- Night works should not be conducted near hospitals and during peak seasons such as peak tourist season, students' exam times etc.

Appendix-18: Environmental Monitoring for Ambient Air, Noise, Water and soil

1. Under RUIDP works Environmental Monitoring will done for ambient air, noise, surface water, ground water and soils with following parameters-
 - A. **Ambient Air Quality-** Particulate Matters PM₁₀, Particulate Matter PM_{2.5}, SO_x, NO_x, Carbon Monoxide (CO) as per methods and norms approved by CPCB
 - B. **Ambient Noise Quality-** L_{day} and L_{night} (in Leqdba) 24 hrs basis as per methods and norms approved by CPCB
 - C. **Surface Water Quality-** pH, Turbidity, Total Hardness, DO, BOD, COD, Chloride, Hg, Iron, TDS, TSS, Calcium, Zn, Cr⁺⁶, Magnesium, Copper, Manganese, Sulphate, Cyanide, Nitrate, Sodium, Potassium, Fluoride, Cadmium, Arsenic, Lead, Boron, Selenium, Aluminium, Total residual Chlorine
 - D. **Ground Water Quality-** pH, TDS, Total Hardness, Zn, Chloride, Iron, Copper, DO, Manganese, Sulphate, Nitrate, Fluoride, Hg, Cadmium, Cr⁺⁶, Arsenic, Lead, Total Alkalinity, Phosphate, Phenolic compound
 - E. **Soil quality-** pH, Elect. Conductivity (at 25°C), Moisture (at 105°C), Texture (silt, clay, sand), Calcium (as CaO), Magnesium (as Mg), Permeability, Nitrogen (as N), Sodium (as Na), Phosphate (as PO₄), Potassium (as K), Organic Matter, oil and grease
2. During pre-construction stage monitoring is required to establish baseline at following sites-

Environmental Monitoring in Pre-Construction Period

S.N.	Type of monitoring and Parameters	Location of monitoring and no. of samples	Total No. of samples
1	Ambient Air Monitoring	STPsite-1 SPSS-2 Pipe laying site within the town preferably near sensitive receptor - 2	5
2.	Ambient Noise monitoring	STPsite-1 SPSS-2 Pipe laying site within the town preferably near sensitive receptor - 2	5
3	Ground Water quality	STPsite-1 SPSS-2 Pipe laying site-1	4
4.	Soil Quality	STPsite-1 SPSS-2 Pipe laying site-1	4

3. During construction stage below monitoring should be done on minimum quarterly basis at the following sites-

Environmental Monitoring in Construction Period

Proposed sites	Ambient Air quality	Ambient Noise quality	Surface water quality	Ground Water Quality	Soil Quality
STP site	One	One	Nil	One	One
SPS site (1)	One	One	Nil	One	One
SPS site (2)	One	One	Nil	One	One
Pipe laying site within the town preferably near sensitive receptor*	1	1	Nil	Nil	One
Construction camp/ storage yard/	One	One	Nil	One	One
Total number of samples in each quarter (A)	5	5	Nil	4	5
Total number of samples in construction period (B)	40	40	Nil	32	40

Calculation of total Number of samples-

Project duration= 4 years=12 quarters

Pre-construction phase= 3 months=1quarter

Monsoon period in each year=3 months=1 quarter (July-Sept)

Monsoon period in project duration=3 quarter

Effective period of environmental monitoring (C) = 12-1-3=8 quarters

Total number of samples in construction period (B) = A x C

Note:-

- All the tests should be done by labs approved by CPCB and/or RPCB and should be accredited by NABL.
- All the tests should be done as per the norms and methods approved by CPCB/RPCB.
- All the meteorological data like weather, wind, location, nearby features etc. should be recorded during sampling and indicated in the report for ambient air quality.
- For air quality monitoring, if any two sites are within the distance of 2 kms from each other, only one sampling can be done at any site.

*sensitive receptors are hospitals, schools, any major religious place etc.

Appendix 19: Guidelines and Emergency plan for handling and storing chlorine

Instructions for Storage and Handling of Chlorine Cylinders (Based on the 'Manual on Operation and Maintenance of Water Supply Systems' published by the Central Public Health and Environmental Engineering Organization (CPHEEO) in 2005)

1.1 Storage Area

- a) Obtain storage license from controller of explosives under Gas Cylinder Rules 2004 if the quantity of Cl₂ containers to be stored is more than 5 Nos.
- b) Storage area should be cool, dry, well ventilated, and clean of trash and protected from external heat sources. Please refer to Manual on "Water Supply and Treatment", (1999 Edition), for further details.
- c) Ventilation must be sufficient to prevent accumulation of vapour pockets. The exhaust should be located either near the floor or duct be provided extending to the floor. All fan switches should be outside the storage area.
- d) Do not store container directly under the sun.
 - e) Weather cock should be installed near the storage to determine wind direction.
- f) The storage building should be of non-combustible construction with at least two exits opening outside.
- g) Neutralization system should be provided.
- h) Continuous monitoring of chlorine leak detection equipment with alarm should be installed in the storage area.
- i) The area should be free and remote from elevators, gangways or ventilating system to avoid dangerous concentration of Chlorine during leak.
- j) Two portable foam type fire extinguishers should be provided in the premises.
- k) Corrosive substances shall not be stored nearby which react violently with each other.
- l) Unauthorized person should not be allowed to enter into the storage area.
- m) The floor level of storage shed should be preferably 30 cms (at least one foot) higher from the ground level to avoid water logging.
- n) Ensure that all containers are properly fitted with safety caps or hooks.

1.2. Cylinder & Drum Containers

- a. Store chlorine cylinders upright and secure them so that they do not fall.
- b. Drum containers should be stored on their sides on rails, a few inches above the floor. They should not be stacked one upon the other. They should be stored such that the valves are in vertical plane.
- c. Keep enough space between containers so as to have accessibility in case of emergency.
- d. Store the containers in a covered shed only. Keep them away from any source of heat as excessive heat may increase the pressure in container which will result into burst.
- e. Do not store explosives, acids, turpentine, ether, anhydrous ammonia, finely divided metals or other flammable material in the vicinity of Chlorine.
- f. Do not store containers in wet and muddy areas.
- g. Store filled and empty containers separately.
- h. Protective covers for valves are secured even when the containers are empty, except during use in the system.
- i. Never use containers as a roller to move other equipment.
- j. Never tamper with fusible plugs of tonners.
- k. Check leakages every day by means of ammonia torch. However, it should not be touched to brass components like valves of container for safety.

l. Never carry out any welding work on the chlorine system as combustion of steel takes place at 2510C in presence of chlorine.

m. The boxes containing emergency kit, safety applications and self contained breathing apparatus should be kept in working order in an easily approachable area.

1.3. Use of Cylinders & Drum Containers in Process System

a. Use containers in the order of their receipt, as valve packing can get hardened during prolonged storage and cause gas leaks.

b. Do not use oil or lubricant on any valve of the containers.

c. Badly fitting connections should not be forced and correct tool should always be used for opening and closing valves. They should never be hammered.

d. The area should be well ventilated with frequent air changes.

e. Transport the cylinders to the process area by using crane, hoist or railings etc.

f. The drum containers should be kept in a horizontal position in such a way that the valves are in a vertical plane. The upper valve gives out gas and the lower one gives out liquid chlorine.

g. The cylinder should be kept in upright position in order to release gas from the valve. For liquid chlorine withdrawal, it should be inverted with the help of an inverted rack.

h. Connect the containers to the system by using approved accessories.

i. Use copper flexible tube, with lead washer containing 2 to 4% antimony or bonded asbestos or teflon washer. Use yoke clamp for connecting chlorine container.

j. Never use rubber tubes, PVC tubes etc. for making connections.

k. Use the right spanner for operating the valve. Always keep the spanner on the valve spindle. Never use ill fitting spanner.

l. After making the flexible connection, check for the leakage by means of ammonia torch but it should not come in contact with a valve.

m. Keep minimum distance between the container valve and header valve so that during change-over of the container, minimum amount of gas leaks.

n. The material of construction of the adapter should be same as that of valve outlet threads. o. The valve should not be used as a regulator for controlling the chlorine. During regulation due to high velocity of Chlorine, the valve gets damaged which in turn can cause difficulty in closing.

p. The tools and other equipment used for operating the container should be clean and free of grease, dust or grit.

q. Wear breathing apparatus while making the change-over of the container from the process header.

r. Do not heat the container to withdraw more gas at faster rate.

s. Use pressure gauge and flow measuring device to control the flow and to know the quantity of gas left in the container.

t. Use an inverted U type barometric leg or vacuum breaking arrangement for connecting the container to the process piping.

u. Withdrawal of the gas should be stopped when the gas pressure inside the container is between 0.1 to 0.5 kg/cm² approximately.

v. If withdrawal of the gas from the container connected to the process system has to be suspended for long intervals, it should be disconnected from the system, and the valve cap and hood replaced.

w. Gas containers should be handled by trained persons only.

1.4. Disconnecting Containers from Process System

a. Use breathing apparatus before disconnecting the container.

b. First close the container valve fully. After removal of chlorine the process valve should be closed.

- c. Remove the flexible connection, plug the flexible connection in order to avoid entry of humid air. Replace the valve cap or hood on the container.
- d. Put the tag on the empty container & bring it to storage area marked for empties.
- e. Check for the leakage.

1.5. Loading and Unloading of Containers

- a. The handling of containers should be done under the supervision of trained and competent person.
- b. It should be done carefully with a crane, hoist or slanted ramp. Do not use magnet or sharp object for lifting the containers.
- c. Small cylinders should not be lifted by means of valve caps as these are not designed to carry the weight.
- d. The containers should not be allowed to strike against each other or against any hard object.
- e. Vehicles should be braked and isolated against any movement.
- f. After loading, the containers should be secured properly with the help of wooden wedges, rope or sling wire so that they do not roll away.
- g. The containers should never be dropped directly to the ground or on the tyre from the vehicle.
- h. There should be no sharp projection in the vehicle.
- i. Containers must have valve caps and plugs fitted properly.
- j. Check containers for leakage before loading/unloading.

1.6. Transportation of Container

- a. The name of the chemical along with diamond pictorial sign denoting the dangerous goods should be marked on the vehicle.
- b. The name of the transporter, his address and telephone number should be clearly written on the vehicle.
- c. The vehicle should not be used to transport any material other than what is written on it.
- d. Only trained drivers and cleaners should transport hazardous chemical
- e. The driver should not transport any leaking cylinder.
- f. The cylinder should not project outside the vehicle.
- g. The transporter must ensure that every vehicle driver must carry "Trem Card" (Transport Emergency Card) and 'Instructions in writing booklet' and follow them.
- h. Every driver must carry safety appliances with him, viz; Emergency kit, breathing apparatus etc.
- i. The vehicles must be driven carefully, specially in crowded localities and on bumpy roads. Do not apply sudden brakes.
- j. Check for the leakage from time to time.
- k. In the case of uncontrollable leakage the vehicle should be taken to an open area where there is less population.

1.7. Emergency Kit It consists of various tools and appliances like gaskets, yokes, studs, tie rods hoods, clamps, spanners, mild steel channels, screws, pins, wooden pegs etc. of standard sizes. Separate kits are used for cylinders and tonners. All the gadgets are designed for using in controlling or stopping the leakages from valves, fusible plug and side walls of cylinders and containers used for handling chlorine.

- a. Leakage may occur through the valve. There are basically four types of valve leaks.
 - I. Valve packing
 - II. Valve seat
 - III. Defective inlet thread
 - IV. Broken valve thread

b. Leakage may occur through container wall. For controlling such leakages, clamps are used for cylinders and chain and yoke arrangement is used for tonner. Sometimes wooden peg is used by driving into the leaking hole as a temporary arrangement.

c. Leakage may occur through fusible plug.

i. If the leakage is through the threads of fusible plug, yoke, hood and cap nut arrangement is used to control the leak.

ii. If fusible metal itself in the plug is leaking, yoke and stud arrangement is used to control the leak.

1. First Aid to be Provided for a Person Affected by Chlorine

a. General Remove the affected person immediately to an uncontaminated area. Remove contaminated clothing and wash contaminated parts of the body with soap and plenty of water. Lay down the affected person in cardiac position and keep him warm. Call a physician for medical assistance at the earliest. Caution: Never attempt to neutralize chlorine with other chemicals.

b. Skin Contact Remove the contaminated clothes, wash the affected skin with large quantity of water. Caution: No ointment should be applied unless prescribed by the physician.

c. Eye Contact If eyes get affected with liquid chlorine or high concentration of chlorine gas, they must be flushed immediately with running water for atleast 15 minutes keeping the eyelids open by hand. Caution: No ointment should be used unless prescribed by an eye specialist.

d. Inhalation If the victim is conscious, take him to a quiet place and lay him down on his back, with head and back elevated (cardiac position). Loosen his clothes and keep him warm using blankets. Give him tea, coffee, milk, peppermint etc. for making good effect on breathing system. If the victim is unconscious, but breathing, lay him down in the position mentioned above and give oxygen at low pressure until the arrival of doctor. If breathing has stopped, quickly stretch him out on the ground or a blanket if available, loosen his collar and belt and start artificial respiration without delay. Neilson arm lift back pressure method is useful. Automatic artificial respiration is preferable if available. Continue the respiration until the arrival of the doctor. Amboo bag can also be used for this purpose.

3. On-Site Emergency Plan to Cover the Leakage of Chlorine

3.1. Introduction As chlorine is a hazardous chemical, handling and storage of it demand adequate precautions to avoid possible hazards. Leakage of chlorine may develop into a major emergency. Therefore the emergency procedure to cover this eventuality is essential. It is drawn in the form of on-site emergency plan. The elements of onsite emergency plan are as follows:

3.2. Identification of Hazard Chart

In this case the site risk is evaluated by the expert and the extent of the probable damage is calculated on the basis of stored chlorine quantity, nearby population, wind direction, type of equipment failure etc. For this purpose hazard analysis is conducted in which case all the hazardous properties of chlorine are considered. If evacuation is required, the range of it is calculated.

3.3. Appointing Key Persons In order to control the incident like chlorine leakage, it is essential to appoint various persons with their well-defined responsibilities. Taking into account the various activities likely to be involved, the following key persons are appointed (i) Site Controller, (ii) Incident controller, (iii) Shift Executive In charge, (iv) Communication Officer, (v) Safety Officer, (vi) Fire and Security Officer, (vii) Utilities and Services In charge, (viii) Traffic Controller, (ix) First Aider

3.4. Assembly Points These points are set up where persons from the plant would assemble in case of chlorine leakage. At these points the in-charge for counting the heads will be available.

3.5. Emergency Control Center

The control centre is the focal point in case of an emergency from where the operations to handle the emergency from are directed and coordinated. It contains site plan, telephone lines, public address system, safety equipment, first aid boxes, loud speaker, torches, list of essential telephone numbers, viz. fire brigade, police, hospital, civil defence, collector, factory inspector, organizational authorities, chlorine suppliers, mutual aid group, social workers, list of key persons and their addresses, copy of chemical fact sheet, location plan of fire hydrant, details of dispersion model of chlorine gas, population distribution pattern, location of alarm system.

3.6. Procedure to Meet Emergency

The actions to be taken by the staff and authority are given below; Emergency Alarm: An audible emergency alarm system is installed throughout the plant. On hearing the alarm the incident controller will activate the public address system to communicate with the staff about the emergency and give specific instructions for evacuations etc. anyone can report the occurrence of chlorine leakage to section in-charge or incident controller through telephone or intercom or in person.

3.7. Communication

Communication officer shall establish the communication suitable to that incident.

3.8. Services

For quickness and efficient operation of emergency plan the plant is divided into convenient number of zones and clearly marked on the plan. These are emergency services viz. fire fighting, first aid, rescue, alternative source of power supply, communication with local bodies etc. The incident controller will hand over the charge to the site controller of all these coordinating activities, when the site controller appears on the site. The site controller will coordinate all the activities of the key persons. On hearing the emergency alarm system all the key persons will take their charge. In case of their absence other alternatives are nominated. The person nominated for personnel and administration purposes will be responsible for informing all statutory authorities, keeping account of all persons in the plant including contract labour, casual workers and visitors. He will be responsible for giving information to press or any outside agencies. He is also responsible for organizing canteen facilities and keeping informed the families of affected persons. The person nominated as security officer should guide police, fire fighting and control the vehicle entries. The site controller or any other nominated person will announce resumption of normalcy after everything is brought under control. The onsite emergency plan needs to be evaluated by mock drill. Any weaknesses noticed during such drills should be noted and the plan is modified to eliminate the weaknesses.

3.9. Emergency

Measures In case of leakage or spillage of Chlorine, the following emergency measures should be taken:

- a) Take a shallow breath and keep eyes opened to a minimum.
- b) Evacuate the area.
- c) Investigate the leak with proper gas mask and other appropriate Personal protection.
- d) The investigator must be watched by a rescuer to rescue him in emergency.
- e) If liquid leak occurs, turn the containers so as to leak only gas.
- f) In case of major leakage, all persons including neighbours should be warned.
- g) As the escaping gas is carried in the direction of the wind all persons should be moved in a direction opposite to that of the wind. Nose should be covered with wet handkerchief.
- h) Under no circumstances should water or other liquid be directed towards leaking containers, because water makes the leak worse due to corrosive effect.
- i) The spillage should be controlled for evaporation by spraying chilled water having temperature below 9.4°C. With this water crystalline hydrates are formed which will temporarily avoid evaporation. Then try to neutralize the spillage by caustic soda or soda ash or hydrated lime

solution carefully. If fluoroprotein foam is available, use for preventing the evaporation of liquid chlorine.

- j) Use emergency kit for controlling the leak.
- k) On controlling the leakage, use the container in the system or neutralize the contents in alkali solution such as caustic soda, soda ash or hydrated lime. Caution: Keep the supply of caustic soda or soda ash or hydrated lime available. Do not push the leaking container in the alkali tank. Connect the container to the tank by barometric leg.
- l) If container commences leak during transport, it should be carried on to its destination or manufacturer or to remote place where it will be less harmful. Keeping the vehicle moving will prevent accumulation of high concentrations.
- m) Only specially trained and equipped workers should deal with emergency arising due to major leakage.
- n) If major leak takes place, alert the public nearby by sounding the siren.
- o) Any minor leakage must be attended immediately or it will become worse.
- p) If the leakage is in the process system, stop the valve on the container at once.

3.10. Safety Systems Required at Chlorination Plant

The following safety systems should be kept ready at the chlorination plant:

- a. Breathing apparatus.
- b. Emergency kit.
- c. Leak detectors.
- d. Neutralisation tank.
- e. Siren system.
- f. Display of boards in local language for public cautioning, first aid and list of different authorities with phone numbers.
- g. Communication system.
- h. Tagging system for equipments.
- i. First aid including tablets and cough mixtures.
- j. Exhaust fans.
- k. Testing of pressure vessels, chlorine lines etc. every year as per factory act.
- l. Training & mock drill.
- m. Safety showers.
- n. Eye fountain.
- o. Personal protective equipment.
- p. Protecting hoods for ton-containers.
- q. Fire extinguishers.
- r. Wind cock.

Appendix 20: Details of Public Consultations

A. Stakeholder Consultation Conducted on 30th January 2018

S.No	Name of Persons	Location	Topic Discussed	Outcome
1	Mr. Shaukat Ali, (Chairman, Municipal Council, Makrana), Mr. Anil jataw, AEN, Mr. Aftab Alam, Computer Operator, Municipal Council, Makrana and Mr. Avinash Singh, J.En. RUDSICO, Makrana	Municipal Council, Makrana	Present water supply in town, Understanding about the project, Religious place in Makrana town, Industrial development in town, employment status, Solid Waste Management conditions, Wild life (flora and fauna) found in town, Transport facilities, History and culture	• It was informed that presently Water Supply is being done once in 15 days, for half hour to one hour. • People are not aware about the project but Municipal Council is well aware about the project. • Presently STP (6.0MLD) is constructed under RUDSICO project and 72% area of town is covered by sewerage networks, but full house connections has not done due to which only 2 MLD flow is being received at STP. Due to incomplete house connections, in most of the houses septic tank is being used, open defecation is not uncommon. • Solid waste management in town is done through 20 SW collection and transport tipper and 2 tractor, SW is collected manually from houses and dumped open at Manglana road, in the allotted land fill site through open and crude dumping without any segregation. Congested roads in old city but old city area is covered by sewerage networks and only outer area is uncovered. • Road transport is the major means of transport, railway stations is there in Makrana through which town is connected to capital Jaipur and other major cities of Rajasthan and India. • Mostly agriculture and business activities exist in town. Makrana is famous for marble mining and related activities like, cutting, carving, polishing, sculpture and selling, where many people provide their service as employee, worker and business. • There are no any tourism activities in Makrana.
2	Mr. Noor Hasan, Abdul latif, Firoz, Iftar, Suraj Narayan, residents and corporators,	Makrana	• Present Status of Water Supply and sewerage in the town • Work Proposed by RUIDP • Quality of present Water Supply and present sewerage system	• Present system of water supply is not reliable and water is supplied once in 15 days for one hour • People are concerned about the poor supply of drinking water

S.No	Name of Persons	Location	Topic Discussed	Outcome
	Makrana		• Willingness to pay for improved services	(intermittent supply once in 15 days) and quality of water. • People are not aware about the project but supportive of the project. • People are willing to pay for improved services. • No functional sewerage system exist in town
3	Mr. Kailash Meena, Plant Supervisor, Prakash Yadav, Lab Assistant, existing STP		• Present Status of sewerage treatment at STP • Work Proposed by RUIDP • Land availability at existing campus. • Disposal of treated effluent and sludge from existing STP and feasibility in future for proposed STP • Existence of wildlife near STP site	• Present capacity of STP is 6 MLD but maximum flow of 2 MLD is being received at inlet of STP due to house connections are not completed • Flow of municipal nallah is also mixed with sewer due to which high BOD, COD and TSS is received at inlet • Vacant land is available at STP campus but plantations has been done on open land and pond is also created to store the treated effluent • Treated sewage is collected in pond from where nearby farmers pump the treated effluent into their agriculture fields for growing crops • Sludge from STP is also being taken by farmers. • Treated effluent and sludge is given to farmers without any cost at present as Municipal council has not developed any tariff and mechanism to sell it out • No wildlife exist near STP site
4	Ranjit Singh, Chandra Prakash, Shakti Singh, farmers nearby the existing STP		• Use of treated effluent and sludge from STP into agriculture • Is the treated effluent and sludge help in crop improvement • Awareness about the project • Willingness to pay for treated effluent and sludge in future	• They are using treated effluent through their own pump in to their agriculture fields and also taking sludge to use as manure • Effluent and sludge in proved to increase crop yield and beneficial for agriculture as there were no agriculture practices at these site before start of STP due to scarcity of water • People are well aware about the project • They are willing to pay for treated effluent and sludge in future as it is beneficial for their agriculture

Photographs of consultations



Consultation with AEN at Municipal Council office



Consultation with Chairman, cooperators and citizens about the proposed works



Consultation with farmers near STP site



Consultations with farmers and plant operator at STP site

B. Consultation during Social and Environment Impact Assessment

Consultation with local public as well as shop owners was held and information disseminated about project work, Need and advantage of works was discussed and request for support for smooth execution of sewer works. Focus group discussion and small group meeting with women group was held and they are ready for cooperate for smooth execution of works. Health and Hygiene Issues was also discussed.



Consultation with stakeholders in Ward no-14	Consultation with stakeholders in Ward no-40 (Railway Station)
	
Consultation with stakeholders in Ward no-28	Consultation with Female in Ward no-1
	
Consultation with Female in Ward no-29	

Attendance Sheet of Consultations

Topic Discussed: (वि. भुवनेश्वरी) मंडलना

Date: 03-08-2018

परिचोपना डे चारे मे समुदाय मे जानकारी दी गई एवं उनके सोच बर्तमान व्यवस्था पर विचार डर अवगत है।
पानी की समस्या एवं सोकरत समस्या के समाधान डर।

S.No	Name	Father name	Occupation	Signature
1	पारसीना वानो	मे. रीमान	-	पारसीना
2	आबीया जी	अबुल फादर	-	आबीया
3	बलबुम	अबुल सलाम	-	बलबुम
4	फरमाना	मो. डुखेन	-	फरमाना
5	आरसीना	अबुल खासीड	-	आरसीना
6	अफ्फाना	शतादत अली	-	अफ्फाना
7	नरामा	अबुल हमीद	-	नरामा
8	पेमीया अनवर	अनवर फा	-	पेमीया
9	अबुल सलाम	बलबुम मंडलना	0252093815	अबुल सलाम

Topic Discussed: परियोजना के बारे में जानकारी की गई है
उनके हाथ परियोजना पर विचार कर सकते हैं

S.No	Name	Father name Husband	Occupation Signature	Signature
1	लहीरा बनो	मो० अदुल	गादीगा	-
2	मेहरनगीरा	अब्दुल रज्जाक	मेहरनगीरा	-
3	रेहाना	इरफाक हकीम	रीयाना	-
4	लहीरन	शहील अहमद	वर्गद्वारा	-
5	नसीम	अब्दुल रज्जाक	नसीम	-
6	फीखरा	नायसीद	फीखरा	-
7	समीन	निशार सेन	समीन	-
8	सुफीया	साहीद अकबर	सुफीया	-
9	हिना	समीन रेहिस	हिना	-
10	अफसाना	समीन	समीन	-

PUBLIC CONSULTATIONS IN PROPOSED PROJECT SITES IN MAKRANA ON 28/12/2018

S.No	Name of Persons	Location	Topic Discussed	Outcome
1	RupnarayanMalakar, Chandra PrakashSaini, Shakti Singh, Ranjeet Singh, Ummed Singh &Jalim Singh	STP within existing STP campus	Awareness of the project– including Project Coverage area, Present condition of Sewerage in the town Presence of any forest, wild life or any sensitive/ unique environmental components nearby the project, Presence of historical/ cultural/ religious sites nearby. Unfavorable climatic condition Present solid waste collection and disposal problem Dust and noise pollution and disturbances during construction work	Some People are aware of the proposed Project. People are concerned about the poor sewerage conditions in the area/town. There are not any forest, wildlife or any sensitive /unique environmental, component nearby the project. There are not any historical/cultural and religious sites in nearby the subproject area. Climate is dry except during monsoon season. Solid waste collection facility is poor in this area. Contractor should use

S.No	Name of Persons	Location	Topic Discussed	Outcome
			Safety of residents during construction phase and applying of vehicle for construction activities Requirement of enhancement of other facilities Treated water management released from STP Sludge Management Willingness to pay for improved services	modern machinery and water sprinkler to control dust and noise during construction phase. The contractor should take care of the safety arrangement during construction phase and should provide traffic diversion routes to avoid the vehicle congestion. People should be made aware through CAPC and outreach team of contractor before start of work in particular area. The locals feel that Parks, play grounds and Community halls are required in this town and in addition. Treated water will be reuse in agricultural activities in nearby area. Sludge will be reuse as manure in agricultural fields. People are interested to pay for improved services in the town.
2	Thakur Chandraveer Singh, Hema Ram, Chouthu ram, Sona Ram, Bhawani, Mohammad Taleem, Mohammad Liyakat, Abdul Kayuum, Chand, Mohammad Hussain & Mohammad Firoz	SPS & Sewer laying network near Shetla Mata Seva Samiti (Matabhar Road)	Awareness of the project-including Project Coverage area, Present condition of Sewerage In what way they may associate with the project Presence of any forest, wild life or any sensitive/ unique environmental components nearby the project Presence of historical/ cultural/ religious sites nearby. Occurrence of flood /earthquake etc. Drainage and sewerage	Some People are aware of the proposed Project. People are concerned about the poor sewerage conditions in the area. They want to engage with the project as a job opportunity and want to become beneficiaries. There is not any forest, wildlife or any sensitive /unique environmental, component nearby the project. There are not any historical/cultural and

S.No	Name of Persons	Location	Topic Discussed	Outcome
			problem facing Present drinking water problem-quantity and quality Dust and noise pollution and disturbances during construction work Public Health by proposed water supply subproject Plantation measures nearby the area Safety of residents during construction phase and applying of vehicle for construction activities Foul Smell and Vector borne diseases Requirement of enhancement of other facilities Willingness to pay for improved services	religious sites in nearby the subproject area. The area is not prone to flood/earthquake etc. No such incidences of natural disaster occurred in recent past. Drainage and sewerage condition is poor in the town and flow in open drains. People are concerned about the poor supply (intermittent supply on alternate days) and quality of water. Water supply is erratic. People demand 24x7 supply connections to be provided to their area under the proposed. They are willing to pay for getting regular potable water. Contractor should use modern machinery and water sprinkler to control dust and noise during construction phase. By the proposed project of water supply & sewerage in the town, health of public will be improved. By the proposed project, people get better quality of water will improves the public health. People want to plantation programme in the town and ensure the aftercare measures such as watering and manuringetc The contractor should take care of the safety arrangement during construction phase and should provide traffic diversion routes to avoid the vehicle congestion. People should be made

S.No	Name of Persons	Location	Topic Discussed	Outcome
				aware through CAPC and outreach team of contractor before start of work in particular area. By the proposed project of sewerage in the town, environmental health and hygiene conditions will be improved. By the proposed project of sewerage, SPS will mitigate the problem of foul smell and vector borne diseases in the area. The locals feels that Parks, play grounds and Community halls are required in this town and in addition People are interested to pay for improved services in the town.
3	Sona, Yogendra, Poonam, Kanaram, Poonam Chand Jangid, Bhanwarlal Sharma, Hari Ram, Kalu Ram, Kishore Singh, Kheta Ram, Amar Chand, Pooran, Mohd. Salim&Birma Ram	SPS & Sewer laying Network near Jhalra Pond	Awareness of the project-including Project Coverage area, Present condition of Sewerage In what way they may associate with the project Presence of any forest, wild life or any sensitive/ unique environmental components nearby the project Presence of historical/ cultural/ religious sites nearby. Drainage and sewerage problem facing Environmental Health & Hygiene Present solid waste collection and disposal problem Safety of residents during construction phase and applying of vehicle for construction activities Dust and noise pollution and disturbances during construction work Foul smell and vector borne	People are aware about the subproject proposed in the town. People are concerned about the poor sewerage conditions. They want to engage with the project as a job opportunity and want to become beneficiaries. There is no such environmental sensitive components nearby the project. No historical/ cultural religious sites nearby the subproject area. Drainage and Sewerage are major problems in this area. These should be sort out immediately. By the proposed project sewerage in the town, environmental health and hygiene condition will be improved. Solid waste collection

S.No	Name of Persons	Location	Topic Discussed	Outcome
			diseases Setting up worker camp site within the village/ project locality Willingness to pay for improved services	facility is poor in this area. The contractor should take care of the safety arrangement during construction phase and should provide traffic diversion routes to avoid the vehicle congestion. Contractor should use modern machinery and water sprinkler to control dust and noise during construction phase. People should be made aware through CAPC and outreach team of contractor before start of work in particular area. By the proposed SPS, foul smell and vector borne disease will be mitigated/ removed. There is enough space available nearby the project area to establish labour camp. People suggested to establish the worker camp away from the habitation so there is no conflict and disturbances. People are interested to pay for improved services in the town.
4	Abdul Salam, Abdul Hameed, Mahboob Ali, Chhotu, Abdul Sattar, Nawab Ali, Fayaz Ahmed, Abdul Gaffar&Shabbir Ahmed	Sewer laying Network at Adarsh Nagar	Awareness of the project-including Project Coverage area, Present condition of Sewerage in the town. Presence of any forest, wild life or any sensitive/ unique environmental components nearby the project, Presence of historical/ cultural/ religious sites nearby.	People are aware about the subproject proposed in the town. People are concerned about the poor sewerage conditions. Sewage flow in open drains and cause nuisance and vector borne diseases. There are no such environmental sensitive components nearby the project. No historical/ cultural

S.No	Name of Persons	Location	Topic Discussed	Outcome
			Unfavorable climatic condition Environmental Health and Hygiene Present solid waste collection and disposal problem Availability of Labour during construction time Dust and noise pollution and disturbances during construction work Safety of residents during construction phase and applying of vehicle for construction activities Requirement of enhancement of other facilities Willingness to pay for improved services	religious sites nearby the subproject area. Climate is dry except during monsoon season. Environmental Health and Hygiene condition is poor in the town. By the proposed project of Water supply and sewerage, will improves the quality of environment, health & sanitation. Solid waste collection facility is poor in this area. Sufficientlabour is available in nearby communities. People requested to engage the local people during construction phase. Contractor should use modern machinery and water sprinkler to control dust and noise during construction phase. All the measures of environment and person protection will be strictly followed. PPE's will be adopted at site. The contractor should take care of the safety arrangement during construction phase and should provide traffic diversion routes to avoid the vehicle congestion. People should be made aware through CAPC and outreach team of contractor before start of work in particular area. The locals feel that Parks play grounds and Community halls are required in this town and in addition. Peoples are interested to pay for improved services.

S.No	Name of Persons	Location	Topic Discussed	Outcome
5	SubhashAgarwal, Prem Chand Mali, Om prakashAgarwal, Kistur Mal SantoshAgarwal, Saini, Saini, Vishal Saini, RohitSaini, Laxman, Bhanwarlal, Sanjay Saini, Mahaveer Prasad &Jeet Mal Saini	Sewer laying Network at Mali Mohalla	Awareness of the project- including Project Coverage area, Present condition of water supply & Sewerage Unfavorable climatic condition In what way they may associate with the project Presence of any forest, wild life or any sensitive/ unique environmental components nearby the project. Presence of historical/ cultural/ religious sites nearby. Occurrence of flood /earthquake etc. Present solid waste collection and disposal problem Ambient air quality, soil and groundwater problems etc. Drainage and sewerage problem facing. Dust and noise pollution and disturbances during construction work Safety of residents during construction phase and applying of vehicle for construction activities Setting up worker camp site within the village/ project locality Requirement of enhancement of other facilities Willingness to pay for improved services	People are aware about the subproject proposed in the town. People are concerned about the poor sewerage & water quality conditions. Sewage flow in open drains and cause nuisance and vector borne diseases. People are concerned about the poor supply (intermittent supply on alternate days) and quality of water. Water supply is erratic. People demand 24x7 supply connections to be provided to their area. Climate of Makrana is dry with high temperature during summer creating unfavorable condition for work. Sewerage condition is poor in the town. They want to engage with the project as a job opportunity and want to become beneficiaries. There is no such environmental sensitive components nearby the project. No historical/ cultural religious sites nearby the subproject area. The area is not prone to flood/earthquake etc. No such incidences of natural disaster occurred in recent past. Solid waste collection facility is poor in this area, Line department is not serious about the solid waste collection in this area.

S.No	Name of Persons	Location	Topic Discussed	Outcome
				Environmental monitoring will be conducted during construction work. All the mitigation measure of environment will be strictly followed. Drainage and Sewerage are major problems in this area. These should be sort out immediately. Contractor should use modern machinery and water sprinkler to control dust and noise during construction phase. The contractor should take care of the safety arrangement during construction phase and should provide traffic diversion routes to avoid the vehicle congestion. People should be made aware through CAPC and outreach team of contractor before start of work in particular area. There is enough space available nearby the project area to establish labour camp. People suggested to establish the worker camp away from the habitation so there is no conflict and disturbances. The locals feel that Parks, play grounds and Community halls are required in this town and in addition. People are interested to pay for improved services.

Photographs of Public Consultation-Makrana Town Dated 28.12.2018







Sewer laying Network, Adarsh Nagar, Makrana



Sewer laying Network at Mali Mohalla, Makrana

Component - SPS, Sewerlaying
Network near
Shella Mats Sewer
Samiti (Matashar Road)

Dt-28/12/2018

Town-Makrana

G. Photographs of the Public Consultation Meeting/(s)

Component - Sewer Laying Network
at Adash Nagar

Town-Makrana

[illegible]

G. Photographs of the Public Consultation Meeting/(s)

Appendix 21: Minutes of City level Stakeholder Committee (CLC) Meeting**City Level Committee (CLC) Meeting with Stakeholders (Dtd. 21.03.2018)**

A town-level stakeholder consultation meeting was conducted to discuss various issues like land availability, scope of works etc. under the chairmanship of District Collector in which representatives of primary and secondary stakeholders were invited. The feedback and concerns of the stakeholders have taken into consideration in detail designs of the project. City level Committee meeting was held on 21.03.2018 under the Chairmanship of District Collector, Nagaur for finalization of works of Sewerage in Makrana City. Additional Collector, Nagaur presided the meeting on behalf of District Collector, Nagaur. Proposed works were approved by CLC members in this meeting. Minutes of Meeting of CLC vide dated 26.03.2018 are given below:

Minutes of CLC Meeting



Office of the Executive Engineer
Rajasthan Urban Sector Development Investment Programs
 IPIU, Shastri Bhawan, 2/66-67 J.N Vyas Colony, Nagaur
 Phone:- 01582-244280 ipiu.ngr@rediffmail.com
 No.E.E./NGR/2017-18] 299 Date: 26/03/2018

Minutes of City Level Committee meeting held on 21.03.2018 under chairmanship of District Collector, Nagaur for finalization of works of water supply in Kuchaman city & sewerage works in Ladnun, Makrana, Kuchaman city & Deedwana towns under RUIDP Phase-IV

City Level Committee meeting was held on 21.03.2018 under chairmanship of District Collector, Nagaur for finalization of works of water supply in Kuchaman city & sewerage works in Ladnun, Makrana, Kuchaman city & Deedwana towns under RUIDP Phase-IV. Additional Collector, Nagaur presided the meeting on behalf of District Collector, Nagaur.

List of Officials, public representative & stock holders, who attended the meeting, is enclosed at Annexure 'A'.

It was initially briefed out that RUIDP will take up water supply works in Kuchaman city and sewerage works in Ladnun, Kuchaman city, Makrana & Deedwana towns under Phase-IV under ADB assistance. Water supply works in other towns (Ladnun/ Makrana & Deedwana) has already been sanctioned/ taken up by PHED.

Important provisions considered in water supply/ sewerage works in towns were informed to all Stack-holders as below:

General Provision:

- Full coverage of town under municipal boundary.
- Digitization of all assets on GIS map.
- Road restoration in full width of up to 4 M wide road.
- Operation & maintenance for 10 years under the contract.
- Performance based management contract.
- O & M charges during 10 years O & M period will be borne by concerned line agency

Water Supply Works:

- Continuous pressurized water supply.
- Single combined contract of water supply & sewerage works to have better execution planning of water supply/ sewerage works to avoid repeated damage of roads.
- Reduction in Non-Revenue Water (NRW) on DMA based approach.
- SCADA for fully centralized control for operation and monitoring of water production & distribution.
- 100% metered water connection.

Sewerage Works :

- 80% of water supply is considered as sewage generation.
- Sewerage in Makrana & Deedwana towns has partly been covered under 7 town projects. Remaining sewerage works to cover the uncovered



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No.E.E./NGR/2017-18/399

Date: 26/03/2018

portion with integration of existing system and new STPs for balance capacity have been taken up in these towns.

- Installation of sensors in manholes to detect overflow of manholes.
- Provisions of trenchless method for laying of pipe lines for deep sewers/ road crossings/ busy road etc for safety reasons and to minimize inconvenience to public.
- House sewer connection inside house property included in the contract for fully utilization of assets.
- Provision of Over Head Reservoir (OHSR) for reuse of treated effluent in agriculture etc.
- 33% charges of water bills as sewerage charges to be collected by concerned ULB.
- Revenue of ULB through sale of treated effluent and collection of sewerage charges for self-sustainability.

Power Point Presentation of scope of works considered in the DPRs of water supply/ sewerage works with tentative cost of project in the towns were made. It was also informed that land for proposed head-works/ Pumping stations/ STPs have been made available.

During presentation, following suggestions/ comments were received as below:

Kuchaman City :

Chairman/ EO, Kuchaman informed, there is large number of institutions in the town and so large number of students are studying in the town; which is not included in the population census and therefore, there is need to consider for institutional water demand.

EO, Kuchaman was requested to provide the details of institutional population so that it may be considered in the proposal.

Ladnun :

MLA, Ladnun requested to take up water supply works also by RUIDP in place of PHED in single combined contract.

It was briefed out in the meeting that PHED has already sanctioned the works in the town and accordingly, RUIDP has not taken up water supply works in the town.

Makrana :

EO, Makrana informed that there is some old sewer line system laid about 15 years before; which is in damaged/ bad condition and need replacement and O&M of this old laid system should be integrated in this DPR.

3



Office of the Executive Engineer
Rajasthan Urban Sector Development Investment Programs
 IPIU, Shastri Bhawan, 2/66-67 J.N Vyas Colony, Nagaur

Phone:- 01582-244280

ipiu.ngr@rediffmail.com

No.E.E./NGR/2017-18 / 399

Date: 26/03/2018

It was assured that assessment of condition of old laid system will be carried out and accordingly, proposal for repair/ replacement with integration to existing system will be taken in this DPR.

EO, Makrana informed that Gram Panchayats are adjoining to the town and proposal to include these in the municipal limit is under consideration/ process.

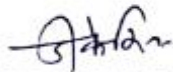
It was informed that ULB may inform the population of each in writing so that flow may be included in the system design but sewerage network may only be executed after inclusion in the municipal area; which may also be taken up during execution of work.

Deedwana :

SE, PWD, Deedwana requested to lay sewer line on both side of 4-lane road/ highway.

It was informed that main sewer line will be laid on one side and lateral sewer line shall be laid on the other side of road; which may be connected with Main sewer line at crossings to avoid cross cutting of road for house property pipe lines.

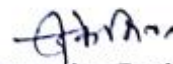
Meeting ended with vote of thanks to the chair


Executive Engineer
(Member Secretary)
RUIDP, IPIU Nagaur
 Date: 26/03/2018

No. E.E./NGR/2017-18 / 400-420

Copy to following for information and necessary action please:

1. Hon'ble Member of Parliament, Nagaur
2. Hon'ble MLA, Ladnun/ Kuchaman/ Makrana/ Deedwana
3. PA to Project Director, RUIDP, Jaipur
4. PA to District Collector, Nagaur
5. Chairman, Municipal Council/ Board, Ladnun/ Kuchaman/ Makrana/ Deedwana
6. Superintending Engineer, PHED, Circle Nagaur
7. Superintending Engineer, PWD, Circle Nagaur/ Deedwana
8. Superintending Engineer, WRD, Circle Merta City
9. EO, Municipal Council/ Board, Ladnun/ Kuchaman/ Makrana/ Deedwana
10. Town Planner, Nagaur
11. Consultant M/s Exceltech, Jaipur


Executive Engineer,
RUIDP, IPIU Nagaur

Attendance Sheet of CLC Meeting

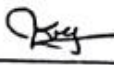
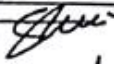
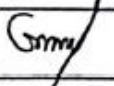
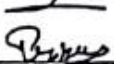
Annexure A)

City Level Committee Meeting for DPR of Water Supply/ Sewerage Works in Makrana/
Kuchaman/ Ladnun/ Dildwana towns of Nagaur District under RUIDP Phase-IV

Date: 21/03/2018

Attendance Sheet

S. No.	Name	Designation & Department	Contact No.	Signature
1.				
2.	Ashok Kumar	ADM		SL
3.	Smt. Azi	Chairman Nagar Panval Makrana	9829078306	Smt. Azi
4.	Rakeshyam Gaheri	Chairman Nagar Palika Kuchaman	9414484652	R. G.
5.	Jitendra Kr. Meena	Nagar Palika Dildwana	9460133581	J. Meena
6.	M. R. D.	MLA, Ladnun	9414413190	M. R. D.
7.	J.			
8.	Dr. D R Jangiel	SE(WW) RUIDP, JPR	9166002200	Dr. Jangiel
9.	Pooveen Ankodia	SE (NS), RUIDP, JPR	9414057444	P. Ankodia
10.	D.K. Mittal	EE, RUIDP NGR	9783079996	D. K. Mittal
11.	Mansingh Meera	JE, RUIDP NGR	9414992211	M. Meera
12.	DINESH CHAUDHARY	Smt. Engg. RUIDP NGR	9414060487	D. Chaudhary
13.	Tofik Ahmed	Executive Officer Ladnun	9414984174	T. Ahmed
14.	Ravendra Singh	GA N. PLdm	9982221101	R. Singh
15.	L. R. Panwar	A.E.N. & T. A Water Resources	9414495498	L. R. Panwar
16.	Devendra Kumar	EE Panval	9414003317	D. Kumar

S. No.	Name	Designation & Department	Contact No.	Signature
17.	J. P. Yadav	EE, PWD, Dn Bidwara	9199298171	
~~18.~~	~~Rashmi Singh~~	~~Charan Nagan~~	~~9414184552~~	~~~~
19.	KASHAR LAL	SI NP Kcity	9460929938	
20.	Sumil	Commissioner Mawana	9082332146	
~~21.~~	~~Sumit~~	~~Charan Nagan~~	~~9829078306~~	~~~~
22.	D. K. Choudhary	BE, PHED.	9414426189	
23.	Prabul gupt	P.R.O office	9782302681	
24.				
25.				
26.				
27.				
28.				
29.				

Photographs of CLC Meeting



Appendix 22: Sample Grievance Registration Form

Annexure 1

SAFEGUARD GRIEVANCE REGISTRATION FORM

(To be available in Hindi and English)

The RUDP Project welcomes complaints, suggestions, queries and comments regarding project implementation. We encourage persons with grievance to provide their name and contact information to enable us to get in touch with you for clarifications and feedback.

Should you choose to include your personal details but want that information to remain confidential, please inform us by writing/typing (Confidential) above your name. Thank you.

Date	Place of registration	Project town:		
		Project:		
Contact information / personal details				
Name		Gender	*Male *Female	Age
Home Address				
Place				
Phone No.				
E-mail				
Complaint/ suggestions/ comments/questions Please provide the details (Who, what, where and how) of your grievance below:				
If included as attachment/note/letter, please tick here				
How do you want us to reach you for feedback or update on your comments/grievance?				

FOR OFFICIAL USE ONLY

Registered by (Name of official registering grievance)	
Mode of communication Note/letter E-Mail Verbal/Telephonic	
Reviewed by: (Name/ position of officials reviewing grievance)	
Action Taken:	
Whether action taken disclosed:	Yes No
Means of Disclosure	

Appendix 23: Officer order for establishing GRM

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RUIDP
Government of Rajasthan
Office of Project Director
Rajasthan Urban Infrastructure Development Project
 AVS Building, Jawahar Circle, JLN Marg, Jaipur - 302017
 Tel No.: 0141-2721966, Fax No.: 0141-2721919, email : mail@ruidp.gov.in, web site : www.ruidp.gov.in
 F3(301)(50)RUIDP/PMU/PH-IV/WS/GENERAL/ 1282 Dated: 04.2018
 04/05/18

Office - Order

Subject:- Grievance Redress Mechanism for Rajasthan Secondary Town Development Investment Program (RSTDIP) - RUIDP Phase IV

Reference:- Agreed Resettlement & Environmental framework -3183 IND (RUIDP Phase III) - <https://www.adb.org/projects/42267-026/main/project-documents>

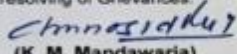
It is directed that Grievance Mechanism of RUIDP Phase III will be replicated in RUIDP Phase IV and accordingly, PIU will maintain/ ensure proper records of safeguard related Grievances received in their town. PIU will also ensure that the safeguard related Grievances received are resolved as per Grievance Redress Mechanism (GRM) prescribed in RP which is summarized as under (for ready reference) :-

Methodology of multi-tier GRM	Responsibility/Action to be taken	Time Frame	Record Keeping
1st level: Grievances that are immediate and urgent in the perception of the complainant, the contractor, and supervision personnel from PIU will provide the most easily accessible or first level of contact for quick resolution of grievances	SE/EE PIU will resolve issues in consultation with supervision personnel, Contractor.	PIU will resolve issues within 3 days of receipt of a complaint/ grievance.	The grievance register will be endorsed by all field agencies involved in implementation of EMP and RP.
2nd level: All grievances that cannot be redressed within 3 days at field will be referred to PMU through PO Social/Environment by PIU.	Project Officers (Environment/Social) PMU in consultation with PMU, PIU and the Contractor will resolve the issues referred.	PMU will resolve issues within 7 days of receipt of a complaint/ grievance	PIU will keep records of the matter referred to PMU and will documents the outcome of each grievance resolved in the Grievance Register
3rd level: All the grievances that are not addressed by PMU within 7 days, will be brought to the notice of Grievance Redress Committee (GRC). The City Level Committee (CLC), which will be established in every project town will act as GRC	SE/EE PIU will coordinate with PO Social/ Environment or other official of PMU and will prepare agenda for the GRC meeting accordingly and ensure keeping the same in GRC.	The GRC will resolve the grievance within 15 days of receiving the complaint	PIU will be responsible to see through the process of redress of each grievance and document the outcomes.
4th level: Very major issues that are beyond the jurisdictional authority of the CLC or those that have the potential to cause social conflicts or environmental damage or those that remain unresolved at PMU/CLC level, will be referred to the Empowered Committee (EC).	SE/EE PIU will assist PMU officials to prepare agenda for the Empowered committee meeting.		SE/EE PIU will keep records of Empowered committee meeting and will ensure documentation of outcome.

Please note that an aggrieved person shall have access to the country's legal system at any stage, and accessing the country's legal system can run parallel to accessing the GRM and is not dependent on the negative outcome of the GRM.

PIUs will be responsible to ensure redressal of grievances as per GRM procedures summarized above and intimate to the complainant.

Contractor's will keep information board depicting Grievance registration numbers at each working site, Grievance registration form and will maintain Grievance Registers (refer annexure 1 & 2).


 (G. S. Hada)
 Addl. Project Director, RUIDP
 Dated: 04.2018
 04/05/18

 (K. M. Mandawaria)
 PO (Co-ord. & Social)

F3(301)(50)RUIDP/PMU/PH-IV/WS/GENERAL/ 1283-84
 Copy to following for information and necessary action.
 1) PA to PD /CE /FA/DyPD(A)/SE(WS)/SE(WW)/PO(Environment)/PO(Social)/, RUIDP, Jaipur
 2) All EE, PIU, Phase-IV for ensuring maintenance of the Grievance register and helpline and for resolving of Grievances.

Appendix 24: Sample Environmental Site Inspection Checklist

Project Name _____
Contract Number _____

NAME: _____ DATE: _____
TITLE: _____ DMA: _____
LOCATION: _____ GROUP: _____

WEATHER: _____

Project Activity Stage	Survey	
	Design	
	Implementation	
	Pre-Commissioning	
	Guarantee Period	

Monitoring Items	Compliance
Compliance marked as Yes / No / Not applicable (NA) / Partially Implemented (PI)	
EHS supervisor appointed by contractor and available on site	
Construction site management plan (spoils, safety, schedule, equipment etc..) prepared	
Traffic management plan prepared	
Dust is under control	
Excavated soil properly placed within minimum space	
Construction area is confined; no traffic/pedestrian entry observed	
Surplus soil/debris/waste is disposed without delay	
Construction material (sand/gravel/aggregate) brought to site as & when required only	
Tarpaulins used to cover sand & other loose material when transported by vehicles	
After unloading , wheels & undercarriage of vehicles cleaned prior to leaving the site	
No chance finds encountered during excavation	
Work is planned in consultation with traffic police	
Work is not being conducted during heavy traffic	
Work at a stretch is completed within a day (excavation, pipe laying & backfilling)	
Pipe trenches are not kept open unduly	
Road is not completely closed; work is conducted on edge; at least one line is kept open	
Road is closed; alternative route provided & public informed, information board provided	
Pedestrian access to houses is not blocked due to pipe laying	
Spaces left in between trenches for access	
Wooden planks/metal sheets provided across trench for pedestrian	
No public/unauthorized entry observed in work site	

Children safety measures (barricades, security) in place at works in residential areas	
Prior public information provided about the work, schedule and disturbances	
Caution/warning board provided on site	
Guards with red flag provided during work at busy roads	
Workers using appropriate PPE (boots, gloves, helmets, ear muffs etc)	
Workers conducting or near heavy noise work is provided with ear muffs	
Contractor is following standard & safe construction practices	
Deep excavation is conducted with land slip/protection measures	
First aid facilities are available on site and workers informed	
Drinking water provided at the site	
Monitoring Items	Compliance
Toilet facility provided at the site	
Separate toilet facility is provided for women workers	
Workers camps are maintained cleanly	
Adequate toilet & bath facilities provided	
Contractor employed local workers as far as possible	
Workers camp set up with the permission of PIU	
Adequate housing provided	
Sufficient water provided for drinking/washing/bath	
No noisy work is conducted in the nights	
Local people informed of noisy work	
No blasting activity conducted	
Pneumatic drills or other equipment creating vibration is not used near old/risky buildings	

Signature

Sign off

Name
Position

Name
Position

Appendix 25: Semi Annual Environmental Monitoring Report Format

I. INTRODUCTION

- Overall project description and objectives
- Environmental category as per ADB Safeguard Policy Statement, 2009
- Environmental category of each subproject as per national laws and regulations
- Project Safeguards Team

Name	Designation/Office	Email Address	Contact Number
1. PMU			
2. PIUs			
3. Consultants			

- Overall project and sub-project progress and status
- Description of subprojects (package-wise) and status of implementation (preliminary, detailed design, on-going construction, completed, and/or O&M stage)

Package Number	Components/List of Works	Status of Implementation (Preliminary Design/Detailed Design/On-going Construction/Completed/O&M) ^a	Contract Status (specify if under bidding or contract awarded)	On-going Construction	
				%Physical Progress	Expected Completion Date

^a If on-going construction, include %physical progress and expected date of completion.

- Identify the role/s of Safeguards Team including schedule of on-site verification of reports submitted by consultants and contractors.
- For each package, provide name/s and contact details of contractor/s' nodal person/s for environmental safeguards.
- Include as appendix all supporting documents including **signed** monthly environmental site inspection reports prepared by consultants and/or contractors.
- With reference to approved EMP/site-specific EMP/construction EMP, complete the table below
- Provide the monitoring results as per the parameters outlined in the approved EMP (or site-specific EMP/construction EMP when applicable).
- In addition to the table on EMP implementation, the main text of the report should discuss in details the following items:
 - (i) **Grievance Redress Mechanism.** Provide information on establishment of grievance redress mechanism and capacity of grievance redress committee to address project-related issues/complaints. Include as appendix Notification of the GRM (town-wise if applicable).
 - (ii) **Complaints Received during the Reporting Period.** Provide information on number, nature, and resolution of complaints received during reporting period. Attach records as per GRM in the approved IEE. Identify safeguards team member/s involved in the GRM process. Attach minutes of meetings (ensure English translation is provided).
- Confirm if any dust was noted to escape the site boundaries and identify dust suppression techniques followed for site/s.
- Identify muddy water was escaping site boundaries or muddy tracks were seen on adjacent roads.
- Identify type of erosion and sediment control measures installed on site/s, condition of erosion and sediment control measures including if these were intact following heavy rain;
- Identify designated areas for concrete works, chemical storage, construction materials, and refueling. Attach photographs of each area.
- Confirm spill kits on site and site procedure for handling emergencies.
- Identify any chemical stored on site and provide information on storage condition. Attach photograph.
- Describe management of stockpiles (construction materials, excavated soils, spoils, etc.). Provide photographs.
- Describe management of solid and liquid wastes on-site (quantity generated, transport, storage and disposal). Provide photographs.
- Provide information on barricades, signages, and on-site boards. Provide photographs.
- Checking if there are any activities being under taken out of working hours and how that is being managed.

Summary of Environmental Monitoring Activities (for the Reporting Period)^a

Impacts (List from IEE)	Mitigation Measures (List from IEE)	Parameters Monitored (As a minimum those identified in the IEE should be monitored)	Method of Monitoring	Location of Monitoring	Date of Monitoring Conducted	Name of Person Who Conducted the Monitoring
Design Phase						
Pre-Construction Phase						
Construction Phase						
Operational Phase						

^a Attach Laboratory Results and Sampling Map/Locations

Overall Compliance with CEMP/EMP

No.	Sub-Project Name	EMP/ CEMP Part of Contract Documents (Y/N)	CEMP/ EMP Being Implemented (Y/N)	Status of Implementation (Excellent/ Satisfactory/ Partially Satisfactory/ Below Satisfactory)	Action Proposed and Additional Measures Required

V. APPROACH AND METHODOLOGY FOR ENVIRONMENTAL MONITORING OF THE PROJECT

- Brief description on the approach and methodology used for environmental monitoring of each sub-project

VI. MONITORING OF ENVIRONMENTAL IMPACTS ON PROJECT SURROUNDINGS (ambient air, water quality and noise levels)

- Brief discussion on the basis for monitoring
- Indicate type and location of environmental parameters to be monitored
- Indicate the method of monitoring and equipment to be used
- Provide monitoring results and an analysis of results in relation to baseline data and statutory requirements

As a minimum the results should be presented as per the tables below.

Air Quality Results

Site No.	Date of Testing	Site Location	Parameters (Monitoring Results)			
			PM10 µg/m ³	PM2.5 µg/m ³	SO2 µg/m ³	NO2 µg/m ³

Surface Water Quality Results

S.No.	Parameters	Results		
		Location-1 (Name)	Location-2 (Name)	Location-3 (Name)
1.	pH			
2.	Turbidity			
3.	Total Hardness			
4.	DO			
5.	BOD			
6.	COD			
7.	Chloride			
8.	Iron			
9.	TSS			
10.	Arsenic			
11.	Cadmium			
12.	Fluoride			
13.	Potassium			
14.	Sodium			

15.	Calcium			
16.	Zn			
17.	Cr ⁺⁶			
18.	Magnesium			
19.	Copper			
20.	Manganese			
21.	Sulphate			
22.	Cyanide			
23.	Nitrate			
24.	Lead			
25.	Boron			
26.	Selenium			
27.	Aluminium			
28.	Total residual Chlorine			

Ground water Quality Results

S.No.	Parameters	Results		
		Location-1 (Name)	Location-2 (Name)	Location-3 (Name)
1.	pH			
2.	Total Alkalinity			
3.	Total Hardness			
4.	Chloride			
5.	Iron			
6.	TDS			
7.	Arsenic			
8.	Fluoride			
9.	Zn			
10.	Cr+6			
11.	Copper			
12.	Manganese			
13.	Sulphate			
14.	Phosphate			
15.	Nitrate			
16.	Lead			
17.	Phenolic Compound			

Noise Quality Results

Site No.	Date of Testing	Site Location	LA _{eq} (dBA) (Monitoring Results)	
			Day Time	Time

VII. SUMMARY OF KEY ISSUES AND REMEDIAL ACTIONS

- Summary of follow up time-bound actions to be taken within a set timeframe.

APPENDIXES

- Photos
- Summary of consultations
- Copies of environmental clearances and permits
- Sample of environmental site inspection report
- Other

Appendix-26: Environmental Audit Report of Existing STP, Makrana

1. Name of Plant : Sewage Treatment Plant, Makrana, Nagaur (Raj.)
2. Capacity : 6 MLD
3. Technology :SBR
4. Executing agency :Rajasthan Urban Infrastructure Finance Development Corporation (RUIFDCO), Govt. of Rajasthan, Jaipur
5. Implementing agency : Municipal Council, Makrana
6. Project name under which this STP was constructed: **7 CITIES SEWERAGE PROJECTS**
7. Name of contractor :Envirad Projects Pvt. Ltd., Kanpur
8. Date of start of the construction of STP:**12.04.2013**
9. Status of work progress of STP : **Completed**
10. Sewerage networks laid under the project (type, dia and length):
11. Nos., locations and capacities of SPS: **1 No behind of Nagar Parishad, 5.6 MLD**
12. Cumulative Progress % (including STP/SPs/Network): **100% completed**
13. Areas of different units of plant (sq. mtrs) : **14400 sqm**
14. Total Area of land used for STP : **sqm**
15. Land ownership details: (khasra nos.) : **661**
16. Estimated/Final cost of STP : **837 Lacs**
17. O&M period of contract :**10 years**
18. Tree plantations done under this project (nos. and types of trees): **Yes**
19. Date of completion of construction works of STP : **25.04.2016**
20. Reasons of delay, if any: **Clear vacant site, ban in supply of sand, delay in inspection of decanter, delay in payments & delay in approval of drawings & delay in availability of sewage & power.**
21. Status of Consent to Establish (CTE) from Pollution Control Board: **obtained**
22. Validity of CTE: **31.07.2013-30.06.2016 vide**
23. Status of Consent to Operate (CTO) from Pollution Control Board :**TO BE OBTAINED**
24. Validity of CTO : **To be applied**
25. Status of sewerage networks : **Completed**
26. Total area of city covered with this STP : **40%**
27. Details of total covered area with this STP : **(ward nos.)**
28. Total Population covered (number and %) : **41000, 40%**
29. Whether trial run completed, if yes give date, if no give tentative date: **25.02.2016-25.04.2016**
30. Estimated date of commissioning of this STP: **25.02.2016**
31. What are the parameters of discharge of treated effluent:**BOD<10, COD<100,TSS<10**
32. What are the proposals/methods for reuse/disposal of treated effluent from STP: **PRPOSED FOR SELL**
33. What are the proposals/methods for reuse/disposal of treated sludge from STP: **882KG/DAY to be sold for agriculture but not started selling yet**

34. Is this plant anywhere related/dependent on proposed STP (7MLD) under RUIDP Phase-4 project:- **NO except common premises and common pond for storage of treated effluent for further reuse**
35. Status and type of electricity connection: (connection number and approved load, KW):
305 KW/HR
36. Whether DG set installed, if yes give capacity and type of DG set: **YES**
37. Whether consent from Pollution Control Board taken for DG set: **TO BE APPLIED**
38. Fresh water requirements/day (for domestic use) and type of water supply: **500 LTR**
39. If tube well installed, provide number and capacity of tube well and status of clearance from Ground Water Board for tube well: **NO**
40. Numbers of employees proposed for operation of plant (designation wise numbers of employees): **11**
41. Is rain water harvesting system established, if yes, details and cost of rain water harvesting : **NO**
42. Power generation system installed, if yes, give details: **NO**
43. O&M manual prepared by contractor (submitted/approved): **YES**
44. Emergency operating system prepared for O&M:
45. Whether provisions for odour control taken in design, if yes give details: **NO**
46. If provisions taken to protect inconvenience to nearby habitants, give details: **NO**

EXISTING STP PHOTOGRAPHS-MAKRANA





Appendix-27: Letter of Land Availability by Municipal Council, Makrana Dated: 10.01.2018



कार्यालय नगर परिषद, मकराना जिला नागौर

Email-npmakrana@gmail.com

फोन:- 01588-240107, फैक्स :-01588-241380

क्रमांक :- नपम/निर्माण/2017-18 / 3110

दिनांक :- 10.1-2018

श्रीमान प्रोजेक्टर डायरेक्टर
RUIDP, जयपुर।



विषय:- सीवरेज परियोजना के लिए 02 पम्पिंग स्टेशन एवं 01 सीवरेज ट्रीटमेन्ट प्लान्ट हेतु भूमि उपलब्ध कराने बाबत।

महोदय,

उपरोक्त विषय में निवेदन है कि सीवरेज परियोजना के अन्तर्गत नगर परिषद मकराना द्वारा 02 सीवरेज पम्पिंग स्टेशन एवं 01 सीवरेज ट्रीटमेन्ट प्लान्ट हेतु भूमि उपलब्ध करवाई जानी है, जिसका विवरण निम्नानुसार है:-

1. 01 पम्पिंग स्टेशन हेतु झालरा तालाब पर खसरा नम्बर 743 की भूमि में से 30x30 मीटर।
2. 01 पम्पिंग स्टेशन हेतु खसरा नम्बर 684/146/161 भूमि में से प्रत्येक खसरों में से 30x30 मीटर भूमि।
3. 01 एसटीपी हेतु खसरा नम्बर 661 में 14.19 बीघा भूमि (एसटीपी जहां वर्तमान में चल रहा है उसी कैम्पस में प्रस्तावित एसटीपी के लिए 14.19 बीघा जमीन नगर परिषद के पास उपलब्ध है)
4. वर्तमान में स्थापित एसटीपी एवं प्रस्तावित एसटीपी कैम्पस में जो पानी साफ किया जायेगा उस पानी को पुनः उपयोग में लेने हेतु एक उच्च जलाशय का निर्माण उसी कैम्पस में करवाया जाना उचित रहेगा। जिससे की एसटीपी द्वारा साफ पानी को कृषि कार्य एवं अन्य कार्य हेतु उपलब्ध करवाया जा सकें क्योंकि साफ जल को दूर तक पुनः उपयोग में लिया जा सकेगा।

उपरोक्त क्षेत्र नगर परिषद मकराना क्षेत्र के अन्तर्गत आता है जिनकी भूमि नगर परिषद मकराना सीवरेज प्रोजेक्ट के कार्य हेतु उपलब्ध करवा दी जायेगी। भूमि का विवरण जमाबन्दी की नकल व खसरा मैप संलग्न है।

(Signature)

(शौकत अली)
सभापति
नगर परिषद मकराना

(Signature) 10/01/2018

(अनिल जाटव)

आयुक्त
नगर परिषद, मकराना

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Excellent Consultancy and Projects Pvt Ltd, Jaipur



WATER
MTR

Swachh Bharat
Mission



संलग्न - ANNEXURE
जल स्वावलम्बन
अभियान

Transcript in English
Land Availability from Municipal Council, Makrana regarding Sewerage Project including
2 SPS Location and 1 STP Site Dated 10.01.2018

1. Land is available for SPS-1 at JhalaraTalab on Khasra No.-743 is 30m x 30m.
2. Land is available for SPS-2 at Khasra No.-684/146/161 out of which land is available in 30m x 30m from every khasra Nos.
3. For Proposed STP-01 at Khasra No.-661, Area-14.19 Bigha land is available at Municipal Council at Makrana, in which land there are already an existing STP is operating.
4. In future existing and proposed STP, treated effluent will be used by suitable storage facilities for reuse by making a overhead storage tank within the existing premises. By which treated water of STP will be made available for reuse in agricultural and other activities in remote areas/locations.

The above said area/land comes under the jurisdiction of Municipal Council of Makrana. The given land will be made available for work of proposed project of Sewerage by Municipal Council, Makrana.

Shaukat Ali
Chairman,
Municipal Council, Makrana

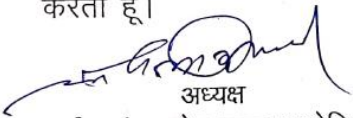
Anil Jatav
Commissioner
Municipal Council, Makrana

Appendix-28: MOU for reuse of treated effluent from STP

 कार्यालय नगर परिषद, मकराना नागौर (राज0) Email-npmakrana@gmail.com	फोन:- 01588-240107, फैक्स 241380 दिनांक:- 13/04/2020
कमांक:-N.P.M / 2020-21 / 34	

सहमति-पत्र

नगरपरिषद् मकराना द्वारा RUIDP के चतुर्थ चरण के तहत प्रस्तावित सीवरेज परियोजना के अन्तर्गत एक एसटीपी (6MLD Existing S.T.P किदवाई स्टेडियम के पास, मकराना) में प्रस्तावित है। उक्त एस.टी.पी से निकलने वाले ट्रीटेड जल का पुनः उपयोग हमारे द्वारा उद्योगों में जैसे कि मार्बल एवं स्टोन कटर इकाईयों, प्लांटेशन (वृक्षारोपण) में एवं धूल के शमन (Dust Suppression) उपायों में काम में लिया जाएगा यह मै मार्बल एवं स्टोन कटर एसोसिएशन, मकराना के अध्यक्ष के तौर पर नगरपरिषद् मकराना को आश्वत करता हूँ।


 अध्यक्ष
 मार्बल एवं स्टोन कटर एसोसिएशन
 मकराना


 आयुक्त
 नगरपरिषद् मकराना

Transcript in English**Office of Municipal Council, Makrana, Distt. Nagaur, Rajasthan**

No: NPM/2010-21/34
13.04.2020

Dated:

MOU

A Sewage Treatment Plant (6 MLD, near existing STP near Kidwai Stadium, Makrana) is proposed under RUIDP Phase-4 works by Municipal Council, Makrana. I, as President of Marble and Stone Cutter Association, Makrana, hereby assure to Municipal Council, Makrana; that all the treated water from this STP shall be reused in the industries in various purposes such as marble and stone cutter units, plantation and dust suppression etc.

Jointly Signed by-

President
Marble and Stone Cutter Association

Commissioner
Municipal Council, Makrana

Appendix 29: WHO Interim Guidance on Water, Sanitation, Hygiene and Waste Management for the COVID-19 virus



Water, sanitation, hygiene, and waste management for the COVID-19 virus

Interim guidance
19 March 2020

Background

This interim guidance supplements the infection prevention and control (IPC) documents by summarizing WHO guidance on water, sanitation and health care waste relevant to viruses, including coronaviruses. It is intended for water and sanitation practitioners and providers and health care providers who want to know more about water, sanitation and hygiene (WASH) risks and practices.

The provision of safe water, sanitation, and hygienic conditions is essential to protecting human health during all infectious disease outbreaks, including the COVID-19 outbreak. Ensuring good and consistently applied WASH and waste management practices in communities, homes, schools, marketplaces, and health care facilities will help prevent human-to-human transmission of the COVID-19 virus.

The most important information concerning WASH and the COVID-19 virus is summarized here.

- Frequent and proper hand hygiene is one of the most important measures that can be used to prevent infection with the COVID-19 virus. WASH practitioners should work to enable more frequent and regular hand hygiene by improving facilities and using proven behavior-change techniques.
- WHO guidance on the safe management of drinking-water and sanitation services applies to the COVID-19 outbreak. Extra measures are not needed. Disinfection will facilitate more rapid die-off of the COVID-19 virus.
- Many co-benefits will be realized by safely managing water and sanitation services and applying good hygiene practices.

Currently, there is no evidence about the survival of the COVID-19 virus in drinking-water or sewage. The morphology and chemical structure of the COVID-19 virus are similar to those of other human coronaviruses for which there are data about both survival in the environment and effective inactivation measures. This document draws upon the evidence base and WHO guidance on how to protect against viruses in sewage and drinking-water. This document will be updated as new information becomes available.

1. COVID-19 transmission

There are two main routes of transmission of the COVID-19 virus: respiratory and contact. Respiratory droplets are generated when an infected person coughs or sneezes. Any person who is in close contact with someone who has respiratory symptoms (sneezing, coughing) is at risk of being exposed to potentially infective respiratory droplets.¹ Droplets may also land on surfaces where the virus could remain viable; thus, the immediate environment of an infected individual can serve as a source of transmission (contact transmission).

Approximately 2–10% of cases of confirmed COVID-19 disease present with diarrhoea,^{2,4} and two studies detected COVID-19 viral RNA fragments in the faecal matter of COVID-19 patients.^{5,6} However, only one study has cultured the COVID-19 virus from a single stool specimen.⁷ There have been no reports of faecal-oral transmission of the COVID-19 virus.

2. Persistence of the COVID-19 virus in drinking-water, faeces and sewage and on surfaces

Although persistence in drinking-water is possible, there is no evidence from surrogate human coronaviruses that they are present in surface or groundwater sources or transmitted through contaminated drinking water. The COVID-19 virus is an enveloped virus, with a fragile outer membrane. Generally, enveloped viruses are less stable in the environment and are more susceptible to oxidants, such as chlorine. While there is no evidence to date about survival of the COVID-19 virus in water or sewage, the virus is likely to become inactivated significantly faster than non-enveloped human enteric viruses with known waterborne transmission (such as adenoviruses, norovirus, rotavirus and hepatitis A). For example, one study found that a surrogate human coronavirus survived only 2 days in dechlorinated tap water and in hospital wastewater at 20°C.⁸ Other studies concur, noting that the human coronaviruses transmissible gastroenteritis coronavirus and mouse hepatitis virus demonstrated a 99.9% die-off in from 2 days⁹ at 23°C to 2 weeks¹⁰ at 25°C. Heat, high or low pH, sunlight, and common disinfectants (such as chlorine) all facilitate die off.

It is not certain how long the virus that causes COVID-19 survives on surfaces, but it seems likely to behave like other coronaviruses. A recent review of the survival of human

coronaviruses on surfaces found large variability, ranging from 2 hours to 9 days.¹¹ The survival time depends on a number of factors, including the type of surface, temperature, relative humidity, and specific strain of the virus. The same review also found that effective inactivation could be achieved within 1 minute using common disinfectants, such as 70% ethanol or sodium hypochlorite (for details, see Cleaning practices).

3. Keeping water supplies safe

The COVID-19 virus has not been detected in drinking-water supplies, and based on current evidence, the risk to water supplies is low.¹² Laboratory studies of surrogate coronaviruses that took place in well-controlled environments indicated that the virus could remain infectious in water contaminated with faeces for days to weeks.¹⁰ A number of measures can be taken to improve water safety, starting with protecting the source water; treating water at the point of distribution, collection, or consumption; and ensuring that treated water is safely stored at home in regularly cleaned and covered containers.

Conventional, centralized water treatment methods that use filtration and disinfection should inactivate the COVID-19 virus. Other human coronaviruses have been shown to be sensitive to chlorination and disinfection with ultraviolet (UV) light.¹³ As enveloped viruses are surrounded by a lipid host cell membrane, which is not robust, the COVID-19 virus is likely to be more sensitive to chlorine and other oxidant disinfection processes than many other viruses, such as coxsackieviruses, which have a protein coat. For effective centralized disinfection, there should be a residual concentration of free chlorine of ≥ 0.5 mg/L after at least 30 minutes of contact time at pH < 8.0 .¹² A chlorine residual should be maintained throughout the distribution system.

In places where centralized water treatment and safe piped water supplies are not available, a number of household water treatment technologies are effective in removing or destroying viruses, including boiling or using high-performing ultrafiltration or nanomembrane filters, solar irradiation and, in non-turbid waters, UV irradiation and appropriately dosed free chlorine.

4. Safely managing wastewater and faecal waste

There is no evidence that the COVID-19 virus has been transmitted via sewerage systems with or without wastewater treatment. Further, there is no evidence that sewage or wastewater treatment workers contracted the severe acute respiratory syndrome (SARS), which is caused by another type of coronavirus that caused a large outbreak of acute respiratory illness in 2003. As part of an integrated public health policy, wastewater carried in sewerage systems should be treated in well-designed and well-managed centralized wastewater treatment works. Each stage of treatment (as well as retention time and dilution) results in a further reduction of the potential risk. A waste stabilization pond (an oxidation pond or lagoon) is generally considered a practical and simple wastewater treatment technology particularly well suited to destroying pathogens, as relatively long retention times (20 days or longer) combined with sunlight, elevated pH levels, biological activity, and other factors serve to accelerate pathogen destruction. A final disinfection step may be considered if existing wastewater treatment plants are not optimized to remove viruses. Best practices for protecting the health of workers at sanitation treatment facilities should

be followed. Workers should wear appropriate personal protective equipment (PPE), which includes protective outerwear, gloves, boots, goggles or a face shield, and a mask; they should perform hand hygiene frequently; and they should avoid touching eyes, nose, and mouth with unwashed hands.

WASH in health care settings

Existing recommendations for water, sanitation and hygiene measures in health care settings are important for providing adequate care for patients and protecting patients, staff, and caregivers from infection risks.¹⁴ The following actions are particularly important: (i) managing excreta (faeces and urine) safely, including ensuring that no one comes into contact with it and that it is treated and disposed of correctly; (ii) engaging in frequent hand hygiene using appropriate techniques; (iii) implementing regular cleaning and disinfection practices; and (iv) safely managing health care waste. Other important measures include providing sufficient safe drinking-water to staff, caregivers, and patients; ensuring that personal hygiene can be maintained, including hand hygiene, for patients, staff and caregivers; regularly laundering bed sheets and patients' clothing; providing adequate and accessible toilets (including separate facilities for confirmed and suspected cases of COVID-19 infection); and segregating and safely disposing of health care waste. For details on these recommendations, please refer to Essential environmental health standards in health care.¹⁴

1. Hand hygiene practices

Hand hygiene is extremely important. Cleaning hands with soap and water or an alcohol-based hand rub should be performed according to the instructions known as "My 5 moments for hand hygiene".¹⁵ If hands are not visibly dirty, the preferred method is to perform hand hygiene with an alcohol-based hand rub for 20–30 seconds using the appropriate technique.¹⁶ When hands are visibly dirty, they should be washed with soap and water for 40–60 seconds using the appropriate technique.¹⁷ Hand hygiene should be performed at all five moments, including before putting on PPE and after removing it, when changing gloves, after any contact with a patient with suspected or confirmed COVID-19 infection or their waste, after contact with any respiratory secretions, before eating, and after using the toilet.¹⁸ If an alcohol-based hand rub and soap are not available, then using chlorinated water (0.05%) for handwashing is an option, but it is not ideal because frequent use may lead to dermatitis, which could increase the risk of infection and asthma and because prepared dilutions might be inaccurate.¹⁹ However, if other options are not available or feasible, using chlorinated water for handwashing is an option.

Functional hand hygiene facilities should be present for all health care workers at all points of care and in areas where PPE is put on or taken off. In addition, functional hand hygiene facilities should be available for all patients, family members, and visitors, and should be available within 5 m of toilets, as well as in waiting and dining rooms and other public areas.

2. Sanitation and plumbing

People with suspected or confirmed COVID-19 disease should be provided with their own flush toilet or latrine that has a door that closes to separate it from the patient's room. Flush toilets should operate properly and have functioning drain traps. When possible, the toilet should be flushed with the lid down to prevent droplet splatter and aerosol clouds. If it is not possible to provide separate toilets, the toilet should be cleaned and disinfected at least twice daily by a trained cleaner wearing PPE (gown, gloves, boots, mask, and a face shield or goggles). Further, and consistent with existing guidance, staff and health care workers should have toilet facilities that are separate from those used by all patients.

WHO recommends the use of standard, well-maintained plumbing, such as sealed bathroom drains, and backflow valves on sprayers and faucets to prevent aerosolized faecal matter from entering the plumbing or ventilation system,²⁰ together with standard wastewater treatment.²¹ Faulty plumbing and a poorly designed air ventilation system were implicated as contributing factors to the spread of the aerosolized SARS coronavirus in a high-rise apartment building in Hong Kong in 2003.²² Similar concerns have been raised about the spread of the COVID-19 virus from faulty toilets in high-rise apartment buildings.²³ If health care facilities are connected to sewers, a risk assessment should be conducted to confirm that wastewater is contained within the system (that is, the system does not leak) before its arrival at a functioning treatment or disposal site, or both. Risks pertaining to the adequacy of the collection system or to treatment and disposal methods should be assessed following a safety planning approach,²⁴ with critical control points prioritized for mitigation.

For smaller health care facilities in low-resource settings, if space and local conditions allow, pit latrines may be the preferred option. Standard precautions should be taken to prevent contamination of the environment by excreta. These precautions include ensuring that at least 1.5 m exists between the bottom of the pit and the groundwater table (more space should be allowed in coarse sands, gravels, and fissured formations) and that the latrines are located at least 30 m horizontally from any groundwater source (including both shallow wells and boreholes).²¹ If there is a high groundwater table or a lack of space to dig pits, excreta should be retained in impermeable storage containers and left for as long as feasible to allow for a reduction in virus levels before moving it off-site for additional treatment or safe disposal, or both. A two-tank system with parallel tanks would help facilitate inactivation by maximizing retention times, as one tank could be used until full, then allowed to sit while the next tank is being filled. Particular care should be taken to avoid splashing and the release of droplets while cleaning or emptying tanks.

3. Toilets and the handling of faeces

It is critical to conduct hand hygiene when there is suspected or direct contact with faeces (if hands are dirty, then soap and water are preferred to the use of an alcohol-based hand rub). If the patient is unable to use a latrine, excreta should be collected in either a diaper or a clean bedpan and immediately and carefully disposed of into a separate toilet or latrine used only by suspected or confirmed cases of COVID-19. In all health care settings, including those with suspected or confirmed COVID-19 cases, faeces must be treated as a biohazard and handled as little as possible. Anyone handling

faeces should follow WHO contact and droplet precautions¹⁸ and use PPE to prevent exposure, including long-sleeved gowns, gloves, boots, masks, and goggles or a face shield. If diapers are used, they should be disposed of as infectious waste as they would be in all situations. Workers should be properly trained in how to put on, use, and remove PPE so that these protective barriers are not breached.²⁵ If PPE is not available or the supply is limited, hand hygiene should be regularly practiced, and workers should keep at least 1 m distance from any suspected or confirmed cases.

If a bedpan is used, after disposing of excreta from it, the bedpan should be cleaned with a neutral detergent and water, disinfected with a 0.5% chlorine solution, and then rinsed with clean water; the rinse water should be disposed of in a drain or a toilet or latrine. Other effective disinfectants include commercially available quaternary ammonium compounds, such as cetylpyridinium chloride, used according to manufacturer's instructions, and peracetic or peroxyacetic acid at concentrations of 500–2000 mg/L.²⁶

Chlorine is ineffective for disinfecting media containing large amounts of solid and dissolved organic matter. Therefore, there is limited benefit to adding chlorine solution to fresh excreta and it is possible that this may introduce risks associated with splashing.

4. Emptying latrines and holding tanks, and transporting excreta off-site.

There is no reason to empty latrines and holding tanks of excreta from suspected or confirmed COVID-19 cases unless they are at capacity. In general, the best practices for safely managing excreta should be followed. Latrines or holding tanks should be designed to meet patient demand, considering potential sudden increases in cases, and there should be a regular schedule for emptying them based on the wastewater volumes generated. PPE (long-sleeved gown, gloves, boots, masks, and goggles or a face shield) should be worn at all times when handling or transporting excreta offsite, and great care should be taken to avoid splashing. For crews, this includes pumping out tanks or unloading pumper trucks. After handling the waste and once there is no risk of further exposure, individuals should safely remove their PPE and perform hand hygiene before entering the transport vehicle. Soiled PPE should be put in a sealed bag for later safe laundering (see Cleaning practices). Where there is no off-site treatment, in-situ treatment can be done using lime. Such treatment involves using a 10% lime slurry added at 1-part lime slurry per 10 parts of waste.

5. Cleaning practices

Recommended cleaning and disinfection procedures for health care facilities should be followed consistently and correctly.¹⁹ Laundry should be done and surfaces in all environments in which COVID-19 patients receive care (treatment units, community care centres) should be cleaned at least once a day and when a patient is discharged.²⁷ Many disinfectants are active against enveloped viruses, such as the COVID-19 virus, including commonly used hospital disinfectants. Currently, WHO recommends using:

- 70% ethyl alcohol to disinfect small areas between uses, such as reusable dedicated equipment (for example, thermometers);
- sodium hypochlorite at 0.5% (equivalent to 5000 ppm) for disinfecting surfaces.

All individuals dealing with soiled bedding, towels, and clothes from patients with COVID-19 infection should wear appropriate PPE before touching soiled items, including heavy duty gloves, a mask, eye protection (goggles or a face shield), a long-sleeved gown, an apron if the gown is not fluid resistant, and boots or closed shoes. They should perform hand hygiene after exposure to blood or body fluids and after removing PPE. Soiled linen should be placed in clearly labelled, leak-proof bags or containers, after carefully removing any solid excrement and putting it in a covered bucket to be disposed of in a toilet or latrine. Machine washing with warm water at 60–90°C (140–194°F) with laundry detergent is recommended. The laundry can then be dried according to routine procedures. If machine washing is not possible, linens can be soaked in hot water and soap in a large drum using a stick to stir and being careful to avoid splashing. The drum should then be emptied, and the linens soaked in 0.05% chlorine for approximately 30 minutes. Finally, the laundry should be rinsed with clean water and the linens allowed to dry fully in sunlight.

If excreta are on surfaces (such as linens or the floor), the excreta should be carefully removed with towels and immediately safely disposed of in a toilet or latrine. If the towels are single use, they should be treated as infectious waste; if they are reusable, they should be treated as soiled linens. The area should then be cleaned and disinfected (with, for example, 0.5% free chlorine solution), following published guidance on cleaning and disinfection procedures for spilled body fluids.²⁷

6. Safely disposing of greywater or water from washing PPE, surfaces and floors.

Current WHO recommendations are to clean utility gloves or heavy duty, reusable plastic aprons with soap and water and then decontaminate them with 0.5% sodium hypochlorite solution after each use. Single-use gloves (nitrile or latex) and gowns should be discarded after each use and not reused; hand hygiene should be performed after PPE is removed. If greywater includes disinfectant used in prior cleaning, it does not need to be chlorinated or treated again. However, it is important that such water is disposed of in drains connected to a septic system or sewer or in a soakaway pit. If greywater is disposed of in a soakaway pit, the pit should be fenced off within the health facility grounds to prevent tampering and to avoid possible exposure in the case of overflow.

7. Safe management of health care waste

Best practices for safely managing health care waste should be followed, including assigning responsibility and sufficient human and material resources to dispose of such waste safely. There is no evidence that direct, unprotected human contact during the handling of health care waste has resulted in the transmission of the COVID-19 virus. All health care waste produced during the care of COVID 19 patients should be collected safely in designated containers and bags, treated, and then safely disposed of or treated, or both, preferably on-site. If waste is moved off-site, it is critical to understand where and how it will be treated and destroyed. All who handle health care waste should wear appropriate PPE (boots, apron, long-sleeved gown, thick gloves, mask, and goggles or a face shield) and perform hand hygiene after removing it. For more information refer to the WHO guidance, Safe management of wastes from health-care activities.²⁸

Considerations for WASH practices in homes and communities.

Upholding best WASH practices in the home and community is also important for preventing the spread of COVID-19 and when caring for patients at home. Regular and correct hand hygiene is of particular importance.

1. Hand hygiene

Hand hygiene in non-health care settings is one of the most important measures that can prevent COVID 19 infection. In homes, schools and crowded public spaces – such as markets, places of worship, and train or bus stations – regular handwashing should occur before preparing food, before and after eating, after using the toilet or changing a child's diaper, and after touching animals. Functioning handwashing facilities with water and soap should be available within 5 m of toilets.

2. Treatment and handling requirements for excreta.

Best WASH practices, particularly handwashing with soap and clean water, should be strictly applied and maintained because these provide an important additional barrier to COVID-19 transmission and to the transmission of infectious diseases in general.¹⁷ Consideration should be given to safely managing human excreta throughout the entire sanitation chain, starting with ensuring access to regularly cleaned, accessible, and functioning toilets or latrines and to the safe containment, conveyance, treatment, and eventual disposal of sewage.

When there are suspected or confirmed cases of COVID-19 in the home setting, immediate action must be taken to protect caregivers and other family members from the risk of contact with respiratory secretions and excreta that may contain the COVID-19 virus. Frequently touched surfaces throughout the patient's care area should be cleaned regularly, such as beside tables, bed frames and other bedroom furniture. Bathrooms should be cleaned and disinfected at least once a day. Regular household soap or detergent should be used for cleaning first and then, after rinsing, regular household disinfectant containing 0.5% sodium hypochlorite (that is, equivalent to 5000 ppm or 1-part household bleach with 5% sodium hypochlorite to 9 parts water) should be applied. PPE should be worn while cleaning, including mask, goggles, a fluid-resistant apron, and gloves,²⁹ and hand hygiene with an alcohol-based hand rub or soap and water should be performed after removing PPE.

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WHO continues to monitor the situation closely for any changes that may affect this interim guidance. Should any factors change, WHO will issue a further update. Otherwise, this interim guidance document will expire 2 years after the date of publication.

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This interim guidance was written by staff from WHO and UNICEF. In addition, a number of experts and WASH practitioners contributed. They include Matt Arduino,

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