

Initial Environmental Examination

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November 2016

IND: Madhya Pradesh Urban Services Improvement Project – Water Supply Improvement Subproject in Khajuraho and Rajnagar

Package No.: MPUSIP – 6A

Prepared by Project Management Unit, Madhya Pradesh Urban Development Company, Government of Madhya Pradesh for the Asian Development Bank.

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CURRENCY EQUIVALENTS

(as of 7 November 2016)

Currency Unit	–	Indian Rupees (INR)
INR1.00	–	\$0.0149
\$1.00	=	INR 66.766

Abbreviations

AC	–	Asbestos Cement
ADB	–	Asian Development Bank
ASI	–	Archeological Survey of India
ASO	–	Assistant Safeguards Officer
CFE	–	Consent for Establishment
CFO	–	Consent for Operation
CPCB		Central Pollution Control Board
EA	–	Executing Agency
EAC	–	Expert Appraisal Committee
EC	–	Environmental Clearance
EHS	–	Environmental Health & Safety
EIA	–	Environmental Impact Assessment
EMP	–	Environmental Management Plan;
ESR	–	Elevated Service Reservoir
GOI	–	Government of India
GOMP	–	Government of Madhya Pradesh
IA	–	Implementing Agency
IEE	–	Initial Environmental Examination;
KNP	–	Khajuraho Nagar Parishad
LPCD	–	Liters per Capita per Day
MLD	–	Million Liters per Day
MOEF	–	Ministry of Environment and Forest
MPPCB	–	Madhya Pradesh Pollution Control Board
MPUDC	–	Madhya Pradesh Urban Development Company
NOC	–	No Objection Certificate
PE	–	Polyethylene
PHED	–	Public Health Engineering Department
PIU	–	Project Implementation Unit;
PMC	–	Project Management Consultant
PMU	–	Project Management Unit
PO	–	Project Officer
PPTA	–	Project Preparatory Technical Assistance
PWD	–	Public Works Department
REA	–	Rapid Environmental Assessment Checklist
RNP	–	Rajnagar Nagar Parishad
RoW	–	Right of Way
SEIAA	–	State Environmental Impact Assessment Authority
SPS	–	Safeguard Policy Statement, 2009
UDHD	–	Urban Development & Housing Department
ULB	–	Urban Local Body
WHO	–	World Health Organization
WTP	–	Water Treatment Plant

WEIGHTS AND MEASURES

°C	Degree Celsius
km	kilometre
lpcd	litres per capita per day
mm	milli meter
m	metre
MLD	million litres per day
mm	millimetre
Nos	Numbers
sq.km	Square Kilometer

NOTES

- (i) The fiscal year (FY) of the Government of India and its agencies ends on 31 March.
- (ii) In this report, "\$" refers to US dollars.

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TABLE OF CONTENTS

	<u>Page</u>
EXECUTIVE SUMMARY	
I. INTRODUCTION	1
A. Background	1
B. Purpose of this IEE Report	2
C. Report Structure	3
II. DESCRIPTION OF THE PROJECT	3
A. Project Area	3
B. Existing Water Supply Situation	4
C. Proposed Project	6
D. Implementation Schedule	8
III. POLICY, LEGAL AND ADMINISTRATIVE FRAMEWORK	14
A. ADB Policy	14
B. National Environmental Laws	14
IV. DESCRIPTION OF THE ENVIRONMENT	18
A. Methodology Used for Baseline Study	18
B. Physical Resources	18
C. Ecological Resources	23
D. Economic Development	24
E. Socio Cultural Resources	25
F. Subproject Site Environmental Features	27
V. ANTICIPATED ENVIRONMENTAL IMPACTS AND MITIGATION MEASURES	30
A. Pre-Construction Impacts – Design & Location	31
B. Construction Impacts	37
C. Operation and Maintenance Impacts	43
VI. PUBLIC CONSULTATION AND INFORMATION DISCLOSURE	44
A. Overview	44
B. Public Consultation	45
C. Information Disclosure	46
VII. GRIEVANCE REDRESS MECHANISM	46
A. Project Specific Grievance Redress Mechanism	46
VIII. ENVIRONMENTAL MANAGEMENT PLAN	49
A. Environmental Management Plan	49
B. Implementation Arrangements	70
C. Training Needs	73
D. Monitoring and Reporting	74
E. EMP Implementation Cost	75
IX. CONCLUSION AND RECOMMENDATIONS	76

Appendixes

1. REA Check list
2. National Ambient Air Quality Standards
3. Vehicle Exhaust Emission Norms
4. National Ambient Air Quality Standards in Respect of Noise
5. Construction & Demolition Waste Management Rules, 2016
6. Salient Features of Major Labor Laws Applicable to Establishments Engaged in Construction of Civil Works
7. Drinking Water Standards
8. Stakeholder Consultation
9. Sample Grievance Registration Form
10. Sample Outline Spoils (construction waste) Management Plan
11. Sample Outline Traffic Management Plan
12. Sample Environmental Site Inspection Report
13. Quarterly Reporting Format

EXECUTIVE SUMMARY

1. Government of Madhya Pradesh with loan funding from Asian Development Bank (ADB) has proposed to implement Madhya Pradesh Urban Services Improvement Project (MPUSIP), herein after referred as 'the Project'. Madhya Pradesh Urban Development Company Limited (MPUDC) shall be the Implementing Agency and the State Urban Development and Housing Department (UDHD) shall be the executing agency for the Project.

2. The Project outputs are as follows:

- (i) **Output 1: Improved water supply infrastructure in all project towns and integrated storm water and sewage infrastructure in two towns.** This will include (i) construction of water supply facilities, using DBO model, in all project towns (the facilities will include raw water intakes, water treatment plants, overhead tanks, and distribution networks including the metered household connections); (ii) construction of sewage and storm water management systems in two national heritage tourist towns (Khajuraho and Rajnagar); and (iii) the project implementation capacity strengthening. Based on the geographic location and the size, subprojects in project towns have been grouped into 23 procurement packages to achieve the economies of scale for the contract purposes. Surface water is the source in 60 towns, while groundwater is the source in the remaining four towns. In the four towns dependent on groundwater, the Project will support recharge of groundwater and monitor sustainable use of groundwater.
- (ii) **Output 2: Sustained urban infrastructure operation and management in all project towns.** This will include engagement of operators on performance-based, long-term O&M contracts and the monitoring and auditing of the service. After the construction (expected to be completed in 2 years), the contractors of the civil works packages will continue to operate and provide continuous water supply service for project towns for a period of 10 years (storm water drainage and sewage infrastructure in two towns will be managed by the respective ULBs). ADB will partially finance the O&M cost during the project period. MPUDC will pay the contractors the O&M cost on a monthly basis in both fixed fee and performance-linked variable fees according to the contract agreement. The contractor will ensure proper metering and billing, ensure adequate water pressure is maintained, and ensure supplied water complies with national standards for drinking water. The operator will also ensure that the services are responsive and ensure high customer satisfaction. The ULB's obligations include timely setting and adjusting the tariffs, collection of revenue, and managing the defaulters for ensuring cost recovery and fund management for ensuring timely payments to the contractors by MPUDC. After the O&M period of 10 years is completed, the water supply asset will be handed over to the ULBs. The contractor will also train the ULB staff so that adequate capacities are built in the ULBs to operate the transferred assets.
- (iii) **Output 3: Improved institutional effectiveness and strengthened capacity in all project towns and Madhya Pradesh Urban Development Company Limited.** This will include (i) setting up of geographic information system (GIS)-based asset management and service delivery monitoring system; (ii) develop information technology systems in 15 ULB to assist them in the day-to-day

management; (iii) improvement of septage management in project towns through implementation of sanitation safety plans; (iv) capacity building of MPUDC and the project towns on managing the DBO contracts, and building up own operation capacity for managing the assets after the contract completion; and (v) conduct awareness-raising activities on water conservation, environmental protection, and hygiene in project towns.

3. The key outcome envisaged from the project is “effective urban water service delivery model rolled out in selective urban clusters of the State with the objective of achieving the following performance indicators by the year 2022.

4. **The Subproject.** Khajuraho and Rajnagar are twin towns in Chhatarpur District in the northern part of the state. Improvement of water supply in Khajuraho and Rajnagar is one of the subprojects proposed under MPUSIP. The objective of the subproject is to achieve safe and sustainable water services both in terms of services to customers, cost recovery and conservation of precious water resources. The subproject envisages providing 100% coverage of population with continuous, pressurized and safe drinking water services and achieving progressively increasing cost recovery by expanding the coverage and increasing operating efficiency. The subproject includes civil works, project implementation and management, and non-physical investments. The physical investment includes the following (i) water intake structures in the existing Kutni Dam (14.6 million liter per day [MLD] capacity) and raw water transmission (23.9 km); (ii) water treatment plant (WTP) of 10 MLD capacity; (iii) 2 booster stations; (iv) 8 overhead tanks (OHTs) and 1 ground level service reservoir (GLSR); (iv) 24 km of feeder mains; (v) 133 km of distribution lines in Khajuraho and 44 km in Rajnagar; (vi) bulk flow meters; and (vii) house service connection including consumer meters.

5. **Screening and assessment of potential impacts.** 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 Checklist for Water Supply. Then potential negative impacts were identified in relation to pre-construction, construction and operation of the improved infrastructure.

6. The subproject is unlikely to cause significant adverse impacts because: (i) the components will involve straightforward construction and operation, so impacts will be mainly localized; (ii) predicted impacts are site-specific and likely to be associated with the construction process and are produced because the process is invasive, involving excavation and earth movements; and (iii) being located mainly in an existing built-up area, will not cause direct impact on terrestrial biodiversity values. Potential negative impacts mainly arise from disturbance of residents, businesses, increase in traffic, increase in noise level and dusts, and the need to dispose moderate quantities of waste soil during construction phase and generation of sludge from the WTP during operation and maintenance phase. However, there are well-developed methods for mitigation of these impacts to acceptable levels.

7. **Categorization.** Based on results of the assessment and ADB SPS, the subproject is classified as environmental Category B, i.e., the subproject is judged to be unlikely to have significant adverse environmental impacts. An initial environmental examination (IEE) is required to determine whether significant environmental impacts warranting an environmental impact assessment are likely.

8. This IEE aims to (i) provide critical facts, significant finding, and recommended actions; (ii) present the national and local legal and institutional framework within which the environmental assessment has been carried out; (iii) provide information on existing geographic, ecological, social and temporal context including associated facilities within the subproject's area of influence; (iv) assess the subproject's likely positive and negative direct and indirect impacts to physical, biological, socioeconomic, and physical cultural resources in the subproject's area of influence; (v) identify mitigation measures and any residual negative impacts that cannot be mitigated; (vi) describe the process undertaken during project design to engage stakeholders and the planned information disclosure measures and the process for carrying out consultation with affected people and facilitating their participation during project implementation; (vii) describe the subproject's grievance redress mechanism for resolving complaints about environmental performance; (viii) present the set of mitigation measures to be undertaken to avoid, reduce, mitigate, or compensate for adverse environmental impacts; (ix) to describe the monitoring measures and reporting procedures to ensure early detection of conditions that necessitate particular mitigation measures; and (x) identify indicative costs and who is responsible for carrying out the mitigation and monitoring measures.

9. **Description of the Environment.** The subproject components locations are in Khajuraho and Rajnagar towns. The proposed intake will be located within existing Kutni dam, and the WTP location is on a vacant government land (partly barren and partly cultivated) near the dam. The immediate surroundings were converted into urban use for many years ago, and there is no natural habitat left at the subproject sites. No components are to be located in any of the world heritage or protected monuments in Khajuraho town. All the locations of the OHTs and GLSR are government-owned barren land with no notable tree cover. The OHT locations in Achnar and Karrohi are adjacent to protected forests -- these forests are classified as open forest with very less tree cover and common wildlife -- (50 meters from the protected forest boundary) however construction activities will be confined to the identified sites, and will not encroach into the protected forests as these are clearly demarcated and separated by existing boundary fences.

10. **Environmental Management Plan.** An environmental management plan (EMP) has been developed to provide mitigation measures to reduce all negative impacts to acceptable levels. Locations and siting of the proposed infrastructures were considered to further reduce impacts. These include (i) locating facilities on government-owned land to avoid the need for land acquisition and relocation of people; and (ii) laying of pipes in RoW alongside main/access roads, to reduce acquisition of land and impacts on livelihoods specifically in densely populated areas of the town.

11. The EMP includes design measures such as (i) selection of construction methodology near protected monuments in discussion with the ASI, having the excavation observed by person with archaeological knowledge for chance finds, etc.; (ii) wash water recovery for the WTP to reduce effluent to be discharged; (iii) beneficial use of treated sludge; and (iv) quick leak detection and rectification to save the resources, etc. During construction, the EMP includes mitigation measures such as (i) implementation of traffic management plan in coordination with local traffic police to minimize traffic impacts; (ii) awareness campaigns and consultations to inform residents and businesses of potential disturbances; (iii) provision of walkways and planks over trenches to ensure access will not be impeded; (iv) appropriate scheduling of works to avoid peak tourist season in important places; (v) use of noise-dampening measures in areas with sensitive receptors such as hospitals, schools, places of worship and other silence-zones; (vi) use of dust-suppression methods such as watering and/or covering of stockpiles; and (vii) finding beneficial use of excavated materials to extent

possible to reduce the quantity that will be disposed off. As for the O&M phase, facilities will need to be repaired from time to time, but environmental impacts will be much less than those of the construction period as the work will be infrequent, affecting small areas only. Calculations conducted by the design engineers show that 360 tonnes per year of dry sludge is to be generated. The design of the WTP includes dewatering and drying areas as part of sludge management. The EMP includes mitigation measures and monitoring plan to ensure compliance to environmental standards during O&M phase.

12. The EMP will guide the environmentally-sound construction of the subproject and ensure efficient lines of communication between Madhya Pradesh Urban Development Company (MPUDC), project management unit (PMU), project implementing unit (PIU), consultants and contractors. The EMP will (i) ensure that the activities are undertaken in a responsible non-detrimental manner; (i) provide a pro-active, feasible and practical working tool to enable the measurement and monitoring of environmental performance on site; (ii) guide and control the implementation of findings and recommendations of the environmental assessment conducted for the subproject; (iii) detail specific actions deemed necessary to assist in mitigating the environmental impact of the subproject; and (iv) ensure that safety recommendations are complied with. The EMP includes a monitoring program to measure the environmental condition and effectiveness of implementation of the mitigation measures. It will include observations on- and off-site, document checks, and interviews with workers and beneficiaries.

13. The contractor will be required to submit to PMU, for review and approval, a site environmental plan (SEP) 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; (iii) monitoring program as per SEP; and (iv) budget for SEP implementation. No works are allowed to commence prior to approval of SEP.

14. A copy of the EMP/approved SEP will be kept on site during the construction period at all times. The EMP included in the bid and contract documents. Non-compliance with, or any deviation from, the conditions set out in this document constitutes a failure in compliance.

15. **Consultation, disclosure and grievance redress mechanism.** The stakeholders were involved in developing the IEE through discussions on-site and public consultation at several places in the town, after which views expressed were incorporated into the IEE and in 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 ADB, MPUDC and PMU websites. The consultation process will be continued and expanded during project implementation to ensure that stakeholders are fully engaged in the project and have the opportunity to participate in its development and implementation. A grievance redress mechanism is described within the IEE to ensure any public grievances are addressed quickly.

16. **Implementation Arrangements.** Urban Development and Housing Department (UDHD) of Government of Madhya Pradesh will be the Executing Agency. Implementing Agency will be Madhya Pradesh Urban Development Company (MPUDC). A central Project Management Unit (PMU) attached to MPUDC will be responsible for implementing the MPUSIP. The PMU will be supported by Program Implementation Units (PIUs). Several teams of Design Consultants, and a Project Management Consultant (PMC) centrally located in PMU and with field teams, will support PMU & PIUs. Infrastructure will be designed, built, and operated (DBO) by contractor for 10 years, after which it will be transferred to the ULB. Project Officer (Environment) at PMU and Assistant Safeguard Officer (ASO) at each of the PIU will be responsible for environment

safeguards tasks, and will be supported by Environment Specialist (ES) of PMC Team. Contractor personnel will include an Environment, Health and Safety (EHS) supervisor and an Archaeological Supervisor. While the ES will be primarily responsible for preparation of safeguard documents and supervising the EMP implementation, the PO (Environment) will review, approve and oversee the compliance. At each PIU, ASO will oversee the safeguards implementation and report to PO (Environment). Specifically ASO will coordinate public consultation, information disclosure, regulatory clearances and approvals, EMP implementation and grievance redress. EHS supervisor of DBO Contractor will provide all necessary assistance to ES of PMC in updating IEEs and will supervise day-to-day EMP implementation.

17. **Monitoring and Reporting.** The PMU and PMC will be responsible for monitoring. The PMDC will submit quarterly and semi-annual monitoring reports to PMU, and the PMU will review and send the semi-annual monitoring reports to ADB. ADB will post the environmental monitoring reports on its website.

18. **Conclusions and Recommendations.** The subproject is therefore 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. No further special study or detailed environmental impact assessment (EIA) needs to be undertaken to comply with ADB SPS (2009) or GoI EIA Notification (2006). Project will require following government permission/approvals: (i) permission of Water Resources Department (WRD), GoMP for water abstraction from Kutni Dam; (ii) permission of ASI for works within 300 m of protected monuments, and (iii) consent for establishment and consent for operation for WTP from Madhya Pradesh Pollution Control Board. These permissions/approvals shall be obtained prior to award of contracts.

(i)

19. This IEE will be updated during the detailed design stage by the DBO contractor to reflect any changes, amendments and will be reviewed and approved by PMU.

I. INTRODUCTION

A. Background

1. Government of Madhya Pradesh with loan funding from Asian Development Bank (ADB) has proposed to implement Madhya Pradesh Urban Services Improvement Project (MPUSIP), herein after referred as 'the Project'. Madhya Pradesh Urban Development Company Limited (MPUDC) shall be the Implementing Agency and the State Urban Development and Housing Department (UDHD) shall be the executing agency for the Project.

2. The Project outputs are as follows:

- (i) **Output 1: Improved water supply infrastructure in all project towns and integrated storm water and sewage infrastructure in two towns.** This will include (i) construction of water supply facilities, using DBO model, in all project towns (the facilities will include raw water intakes, water treatment plants, overhead tanks, and distribution networks including the metered household connections); (ii) construction of sewage and storm water management systems in two national heritage tourist towns (Khajuraho and Rajnagar); and (iii) the project implementation capacity strengthening. Based on the geographic location and the size, subprojects in project towns have been grouped into 23 procurement packages to achieve the economies of scale for the contract purposes. Surface water is the source in 60 towns, while groundwater is the source in the remaining four towns. In the four towns dependent on groundwater, the Project will support recharge of groundwater and monitor sustainable use of groundwater.
- (ii) **Output 2: Sustained urban infrastructure operation and management in all project towns.** This will include engagement of operators on performance-based, long-term O&M contracts and the monitoring and auditing of the service. After the construction (expected to be completed in 2 years), the contractors of the civil works packages will continue to operate and provide continuous water supply service for project towns for a period of 10 years (storm water drainage and sewage infrastructure in two towns will be managed by the respective ULBs). ADB will partially finance the O&M cost during the project period. MPUDC will pay the contractors the O&M cost on a monthly basis in both fixed fee and performance-linked variable fees according to the contract agreement. The contractor will ensure proper metering and billing, ensure adequate water pressure is maintained, and ensure supplied water complies with national standards for drinking water. The operator will also ensure that the services are responsive and ensure high customer satisfaction. The ULB's obligations include timely setting and adjusting the tariffs, collection of revenue, and managing the defaulters for ensuring cost recovery and fund management for ensuring timely payments to the contractors by MPUDC. After the O&M period of 10 years is completed, the water supply asset will be handed over to the ULBs. The contractor will also train the ULB staff so that adequate capacities are built in the ULBs to operate the transferred assets.
- (iii) **Output 3: Improved institutional effectiveness and strengthened capacity in all project towns and Madhya Pradesh Urban Development Company Limited.** This will include (i) setting up of geographic information system (GIS)-

based asset management and service delivery monitoring system; (ii) develop information technology systems in 15 ULB to assist them in the day-to-day management; (iii) improvement of septage management in project towns through implementation of sanitation safety plans; (iv) capacity building of MPUDC and the project towns on managing the DBO contracts, and building up own operation capacity for managing the assets after the contract completion; and (v) conduct awareness-raising activities on water conservation, environmental protection, and hygiene in project towns.

3. The key outcome envisaged from the project is “effective urban water service delivery model rolled out in selective urban clusters of the State with the objective of achieving the following performance indicators by the year 2022.

- (i) Access to piped water supply coverage increased to 95% of the households from 33% in 2015 in 64 towns;
- (ii) Women's drudgery for fetching water reduced by 80% (from spending an average of 55 minutes in 2015 to 10 minutes);
- (iii) Coverage of households with access to improved sanitation systems increased to 80% from 30% in 2015;
- (iv) Wastewater collection and/or safe sanitation service coverage increased to at least 80% of the households from 0% in 2015 in two towns;
- (v) Incidence of water logging/flooding reduced to two incidents per annum in four towns; and
- (vi) Women access to functioning sanitation systems increased to 95% from 25% in 2015 (in poor settlements) in four towns

4. Khajuraho and Rajnagar are twin towns in Chhatarpur District in the northern part of the state. Improvement of water supply in Khajuraho and Rajnagar is one of the subprojects proposed under MPUSIP. The objective of the subproject is to achieve safe and sustainable water services both in terms of services to customers, cost recovery and conservation of precious water resources. The subproject envisages providing 100% coverage of population with continuous, pressurized and safe drinking water services and achieving progressively increasing cost recovery by expanding the coverage and increasing operating efficiency. The subproject includes civil works, project implementation and management, and non-physical investments. A detailed description of the components is provided in Section III. The physical investment includes the following (i) water intake structures in the existing Kutni Dam (14.6 million liter per day [MLD] capacity) and raw water transmission (23.9 km); (ii) water treatment plant (WTP) of 10 MLD capacity; (iii) 2 booster stations; (iv) 8 overhead tanks (OHTs) and 1 ground level reservoir (GLSR); (iv) 24 km of feeder mains; (v) 133 km of distribution lines in Khajuraho and 44 km in Rajnagar; (vi) bulk flow meters; and (vii) house service connection including consumer meters.

B. Purpose of this IEE Report

5. 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 Checklist for Water Supply (**Appendix 1**). Then 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's requirements for environment category B projects.

6. This IEE is based on the detailed engineering report prepared by the PPTA team and will be finalized during implementation stage by DBO contractor to reflect any changes and latest subproject designs. 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.

C. Report Structure

7. This Report contains the following nine sections:

- (i) Executive summary;
- (ii) Introduction
- (iii) Description of the project
- (iv) Policy, legal and administrative framework
- (v) Description of the environment;
- (vi) Anticipated environmental impacts and mitigation measures;
- (vii) Public consultation and information disclosure;
- (viii) Grievance redress mechanism;
- (ix) Environmental management plan, and,
- (x) Conclusion and recommendation.

II. DESCRIPTION OF THE PROJECT

A. Project Area

8. Project area comprises the urban areas and surroundings of Khajuraho and Rajnagar municipalities in Chhatarpur District, in Bundelkhand Region of Madhya Pradesh State. Both the towns are located in close proximity, sharing the geographical boundaries. Khajuraho, with rich its heritage and culture, is a UNESCO world heritage site and a renowned tourist destination attracting tourists from the world over. Population of Khajuraho is 24,481 (2011 census) and has a geographical area of 59.8 sq. km, while Rajnagar has a population of 14,253 with an area of 28 sq. km. Project area is situated at about 360 km north of state capital Bhopal and is connected with highways, railways and airport.

9. The subproject components locations are in Khajuraho and Rajnagar towns. The proposed intake will be located within existing Kutni dam, and the WTP location is on a vacant government land (partly barren and partly cultivated) near the dam. The immediate surroundings were converted into urban use for many years ago, and there is no natural habitat left at the subproject sites. No components are to be located in any of the world heritage or protected monuments in Khajuraho town. All the locations of the OHTs and GLSR are government-owned barren land with no notable tree cover. The OHT locations in Achnar and Karrohi are adjacent to protected forests¹ (50 meters from the protected forest boundary)

¹ These forests are classified as open forests with very less tree cover and common wildlife.

however construction activities will be confined to the identified sites, and will not encroach into the protected forests as these are clearly demarcated and separated by existing boundary fences.

B. Existing Water Supply Situation

10. **Khajuraho.** Benisagar reservoir was the main source of water for Khajuraho till the recent past. Water from the reservoir used to treat at 0.68 million liters per day (MLD) capacity WTP near the reservoir and pumped to the city for supply. However, due to non-availability of water in the reservoir, the WTP is defunct from last 5 years. Normally, the reservoir dries up during the four summer months (March to June). To restore the water supply, Khajuraho Nagar Parishad (KNP) has drilled two tube wells on the downstream side of Benisagar, in the WTP compound. Ground water from the tube wells is pumped directly without any treatment to a ground level sump in the town. From the sump water is directly pumped to distribution system for supply to consumers. An elevated tank near the sump is currently unused as water is directly pumped from the sump to distribution network. In addition this, KNP has drilled 10 more tube wells in the town and provided 332 hand pumps to meet the water supply needs. Besides there are open dug wells in the town, which are used by local residents for water supply.

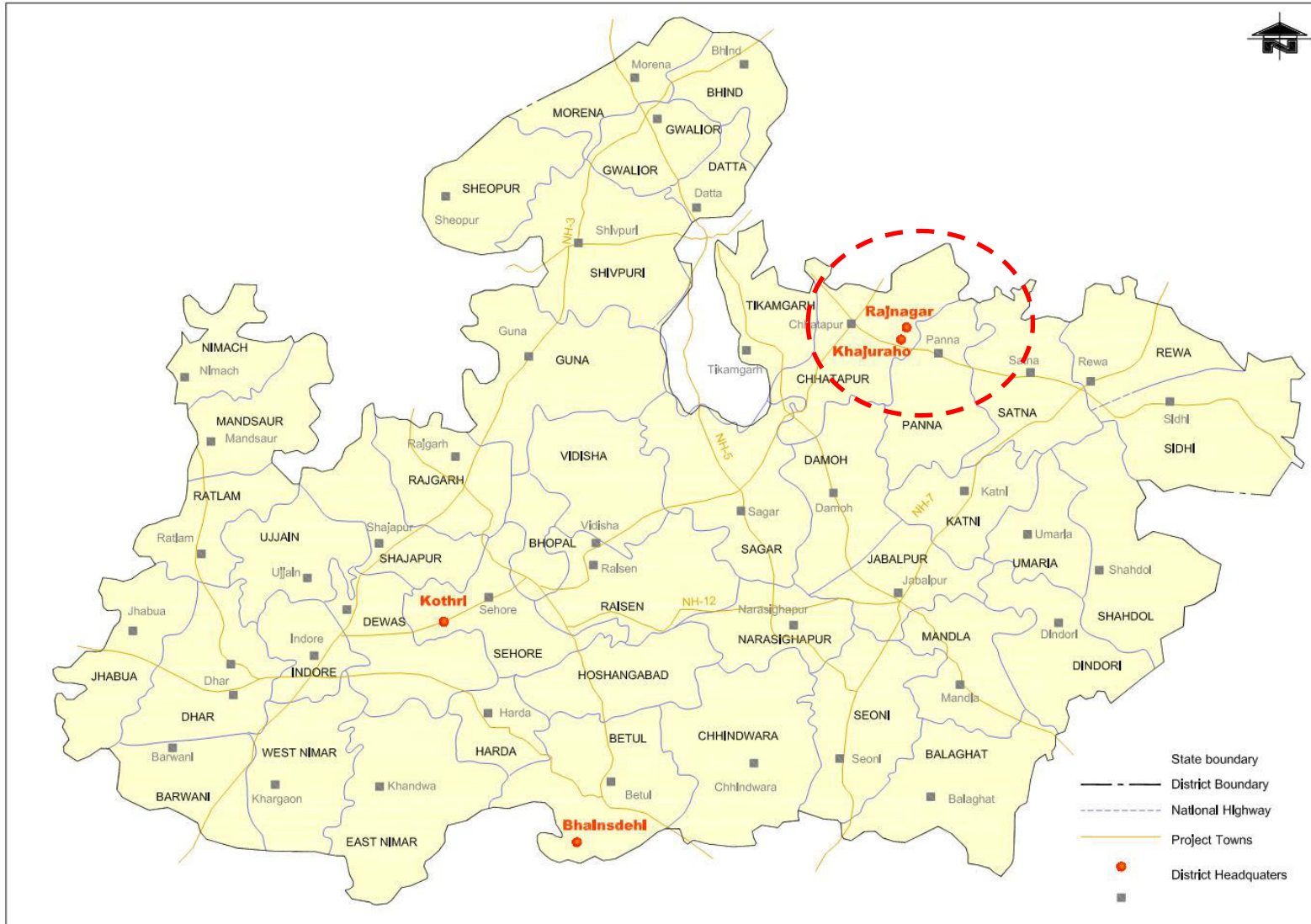
11. The raw water main from tube wells to sump is of 200 mm dia cast iron while the distribution network (~ 47 km length) in the town is of asbestos cement (AC), galvanized iron (GI) and of un-plasticized vinyl chloride (uPVC). Water supply is provided alternative days for about 1-1.5 hours. The existing distribution system mainly covers the core part of the town, and water connections coverage is about 12% households. The villages of Kharrohi, Jatcara, Lalguan and Achnar, which are part of KNP but located away from the town, solely dependent on hand pumps for their daily water needs.

12. Being popular tourist destination, there are a large number of hotels in Khajuraho. Presently, KNP has not provided any water supply, and these hotels mainly dependent on groundwater.

13. **Rajnagar.** The Rajnagar water supply system is completely groundwater based. There are 7 tube wells and 3 open dug wells in the city for water supply. In addition, 129 hand pumps are provided by Rajnagar Nagar Parishad (RNP) across the town to cater the needs of people. Water from tube wells is directly pumped to a ground level sump, and from sump to an elevated reservoir for supply. Water is supplied on alternate days for about an hour. With about 25km of distribution network (of AC and uPVC material), about 50% the households are covered with piped water supply. The rest of the population is primarily dependent on private tube wells or hand pumps provided by Nagar Parishad of Rajnagar (NPR) in the town.

14. Overall, the current water supply systems in both the towns suffer from unreliable sources, low coverage, inadequate storage, poor network efficiency and low management capability.

Figure 1: Location of Subproject Towns In Madhya Pradesh



C. Proposed Project

15. **Water Demand.** The current (2015) gross water demand of Khajuraho is estimated as 5.4 MLD, while the base year (2019) and ultimate design year (2049) demands are projected at 5.9 MLD and 11.2 MLD respectively. The demand figures of Rajnagar for current, base and ultimate are 2.4 MLD, 2.5 MLD and 3.7 MLD respectively. The combined demand of the towns for base (2019), intermediate (2034) and ultimate (2049) design years are 7.9 MLD, 10.7 MLD and 14.6 MLD respectively.

16. **Water Source.** An alternative source analysis has been conducted to select a feasible and sustainable source of water supply to meet the ultimate design demand. Three alternatives: (i) ground water; (ii) Benisagar reservoir; and (iii) Kutni feeder dam, have been studied, and Kutni feeder dam is selected based on the techno-economic and environment considerations.

17. **Proposed project components.** It is proposed to develop a combined bulk water facility based on Kutni dam as source for both the towns consisting of raw water abstraction, treatment, pumping and clear water storage. From the clear water storage at Rajnagar, there will be two separate systems consisting of clear water transmission, storage and distribution for Khajuraho and Rajnagar towns. It is also proposed that Karohi village part of Khajuraho will be provided water supply from the existing tubewells at Benisagar dam, with provision of transmission, storage and distribution infrastructure.

18. Table 1 shows the nature and size of the various components of the subproject. Location of subproject components and conceptual layout plans are shown in Figure 2 to Figure 7.

Table 1: Proposed Khajuraho & Rajnagar Water Supply Subproject Components

Infrastructure	Function	Description	Location
Water intake facilities	Raw water abstraction from Kutni Dam and supply to WTP	Jack well cum pump house (6 m diameter, 35 m deep in RCC) 1.80 km – 500 mm dia DI pipe	Jack well cum pump house will be built in the existing Kutni dam (reservoir). Raw water pipeline will be laid underground from the jack well intake to WTP site along an existing road
Water Treatment Plant	Treatment of raw water to meet the drinking water standards	10 MLD capacity water treatment plant with arrangements: <ul style="list-style-type: none"> • Alum coagulation & flocculation • Sedimentation, • Rapid gravity filtration, • Disinfection with chlorination • Wash water recovery • Sludge drying beds • Water quality testing laboratory • Miscellaneous infrastructure (compound wall, landscaping, lighting, 	WTP site is located adjacent to the Kutni Dam off-take canal. Total area required is 1.5 ha; site is owned by Water Resources Department, GoMP. Part of the site is under cultivation by neighboring farmers, and part is covered with shrubs and bushes.

Infrastructure	Function	Description	Location
		rest rooms etc).	
Booster pumping stations	To provide adequate pressure to transmit water to overhead tanks	Treated water pumping stations: 2 no,s 4mx8m size in RCC and brick masonry	1. Near SDM office in Rajnagar. Site is vacant and owned by GoMP 2. Near Khajuraho bypass road in Khajuraho. Site is vacant and owned by MPTDC
Pumping stations	To provide adequate pressure in the water supply system	Pumping stations at <ul style="list-style-type: none"> Jack well cum pump house in Kutni Reservoir (2 pumps) WTP (4 pumps) SDM Sump (8 pumps) MPTDC Sump (6 pumps) 	As above
OHTs and GLSR		RCC tanks <ul style="list-style-type: none"> 3 lakh liter treated water balancing sump 3 Lakh Liter Elevated Service Reservoir (ESR) 7 Lakh Liter ground level service reservoir (GLSR) 0.5 Lakh Liter Elevated Service Reservoir (ESR) 4 Lakh Liter ESR 10 Lakh Liter ESR 4 Lakh Liter ESR 2 Lakh Liter ESR 	(ii) <ul style="list-style-type: none"> At the SDM office booster station, Rajnagar; vacant site owned by GoMP Same as above On the hillock in Rajnagar town; site is vacant and owned by NPR Site is at foothill at Achnar village; site is vacant and owned by GoMP Site is vacant and owned by MPTDC, Khajuraho At children park, adjacent to existing OHT in the town centre in Khajuraho; site is vacant and owned by NPK at Lalguan; site is vacant & owned by GoMP at Kharohi; site is vacant & owned by GoMP
Transmission network	Water transmission to service reservoirs	Clear water feeder mains <ul style="list-style-type: none"> 7.9 km common (400 mm DI) 12.9 km in Khajuraho (80-350 mm dia DI) 3.1 km in Rajnagar (200-250 mm dia DI) 	Transmission pipelines will be mostly laid along the main roads. Pipes will be laid underground. The transmission main (150 mm dia) leading to Lalguan OHT traverses the land owned by ASI; this land is vacant, and pipeline will be laid with the permission of ASI. Water from this pipeline will also be provided to ASI premises.
Distribution network Improvement	To distribute water from service reservoirs to consumers	133 km pipes in Khajuraho <ul style="list-style-type: none"> 75 mm dia PE - 75 km 110 dia PE – 33 km 160 dia PE - 10.5 km 200 / 250 PE – 10.1km 	Pipes will be laid underground along the public roads; this work will cover entire area of the towns; in narrow roads, where there is no place, the pipeline will be laid within the tarmac; where the roads are very wide (15m or more), the pipelines

Infrastructure	Function	Description	Location
		<ul style="list-style-type: none"> 300-450 dia DI -4.4 km 44 km pipes in Rajnagar <ul style="list-style-type: none"> 75 mm dia PE - 27 km 110 dia PE – 10 km 160 dia PE - 6 km 200 / 250 PE – 1.2km 300 dia DI – 76 m 	<p>will be laid on both sides of the road</p> <p>Majority of the existing pipes are of AC; and therefore existing pipes will be left as it is in the ground untouched.</p>
Bulk Water Meters	Monitor water flow in the improved network	22 no,s Bulk flow Meters	Fixed at strategic locations at source, OHTs, GLSR, DMA inlets etc., bulk meters will be fixed with the pipe section
Consumer connection with flow meters	Provide water to consumers and measure water usage	<p>Consumer connection with meters</p> <ul style="list-style-type: none"> 5600 nos, in Khajuraho 3250 no,s in Rajnagar 	Water delivery pipe (MPDE of dia 20 - 25 mm) will be connected to distribution lines and meters will be attached to the delivery pipe at each house with a meter chamber

19. **Construction works.** Civil works in the project include linear excavation for laying pipes along the roads, placing pipes in the trench and refilling with the excavated soil. The trenches will be of 0.4 m – 0.7 m wide and 0.8 to 1 m depth. Subsequent to completion of works, road reinstatement will be undertaken by the contractor as part of the civil works. The roads in the core city area of both the towns are very narrow and congested with pedestrians and vehicles, while the roads in outer areas are wide. Other civil works in the subproject include construction of jack well in the reservoir, water treatment plant, water tanks, pumping stations, at the identified sites. These works will be confined to sites, and construction will include general activities like excavation for foundation, construction of foundations, columns, walls and roof in cement concrete and masonry, and fixing of mechanical and electrical fixtures, etc. Jack well cum pump house will involve construction within the water body. A temporary enclosed area (about 10 m dia) will be created using appropriate material and the water will be pumped out to make the area dry for construction. Once this is created, the rest of the construction will follow the general construction procedures to create a RCC well of size 6 m diameter. Once the work is over, the temporary structure will be removed.

20. **Project benefits.** The subproject aims to achieve safe and sustainable water services both in terms of services to customers, cost recovery and conservation of precious water resources. The subproject will provide continuous, pressurized and safe drinking water services to entire population of the towns (100% coverage). Besides achieving progressively increasing cost recovery by expanding the coverage and increasing operating efficiency, the subproject will improve the overall environmental quality of the town. It will reduce the reduced time and costs of households in accessing alternative sources of water, and will lead to better public health particularly reduction in waterborne and infectious diseases.

D. Implementation Schedule

21. After the approval of the detailed project report, bid will be prepared and tenders are likely to be invited by June 2016, and the contract will be awarded by December 2016. Construction is likely to start in January 2017, and will take about 24 months.

Figure 2: Schematic Diagram of Proposed Water Supply System

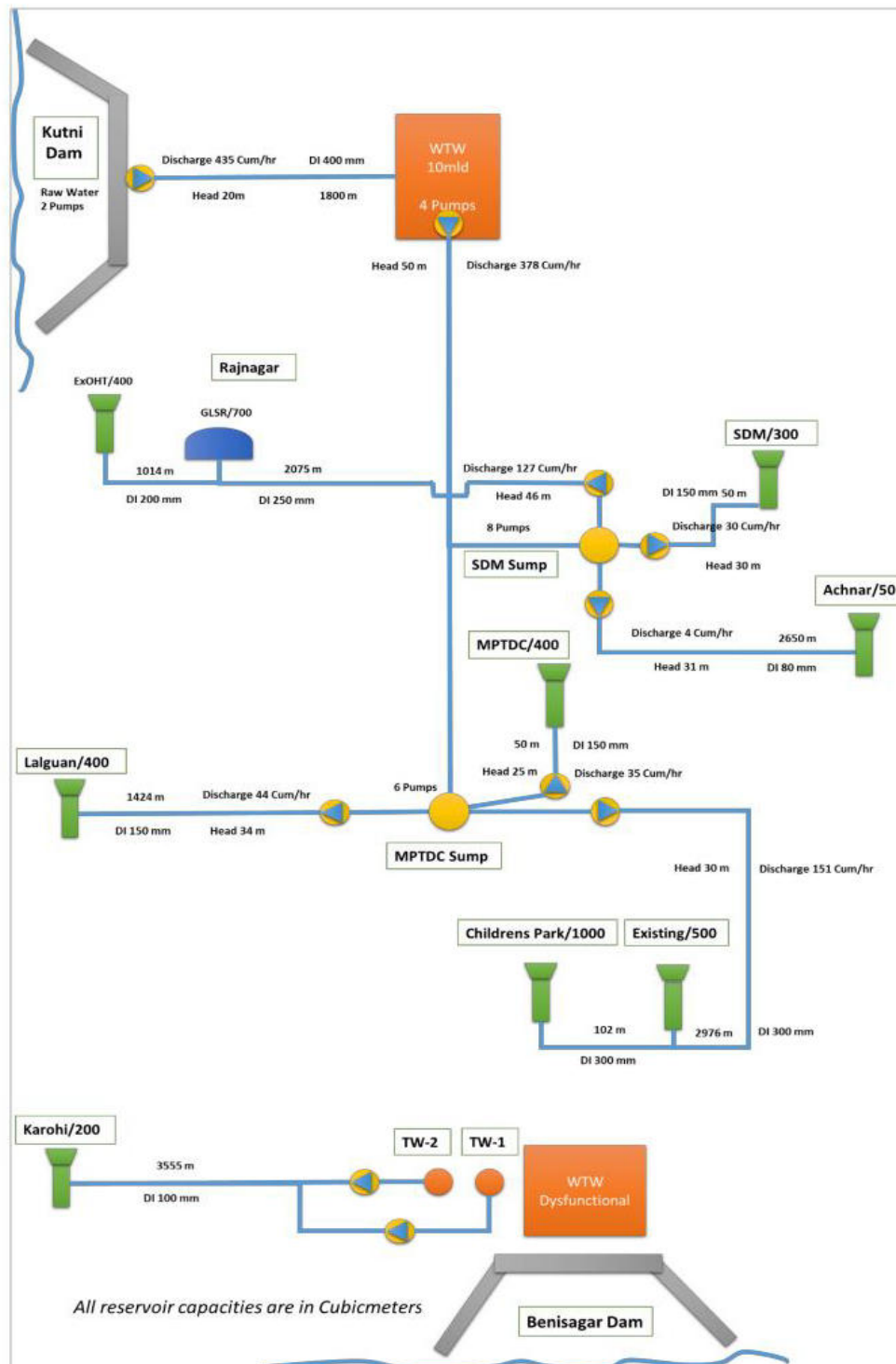


Figure 3: Conceptual Process Flow Diagram of 10 MLD WTP

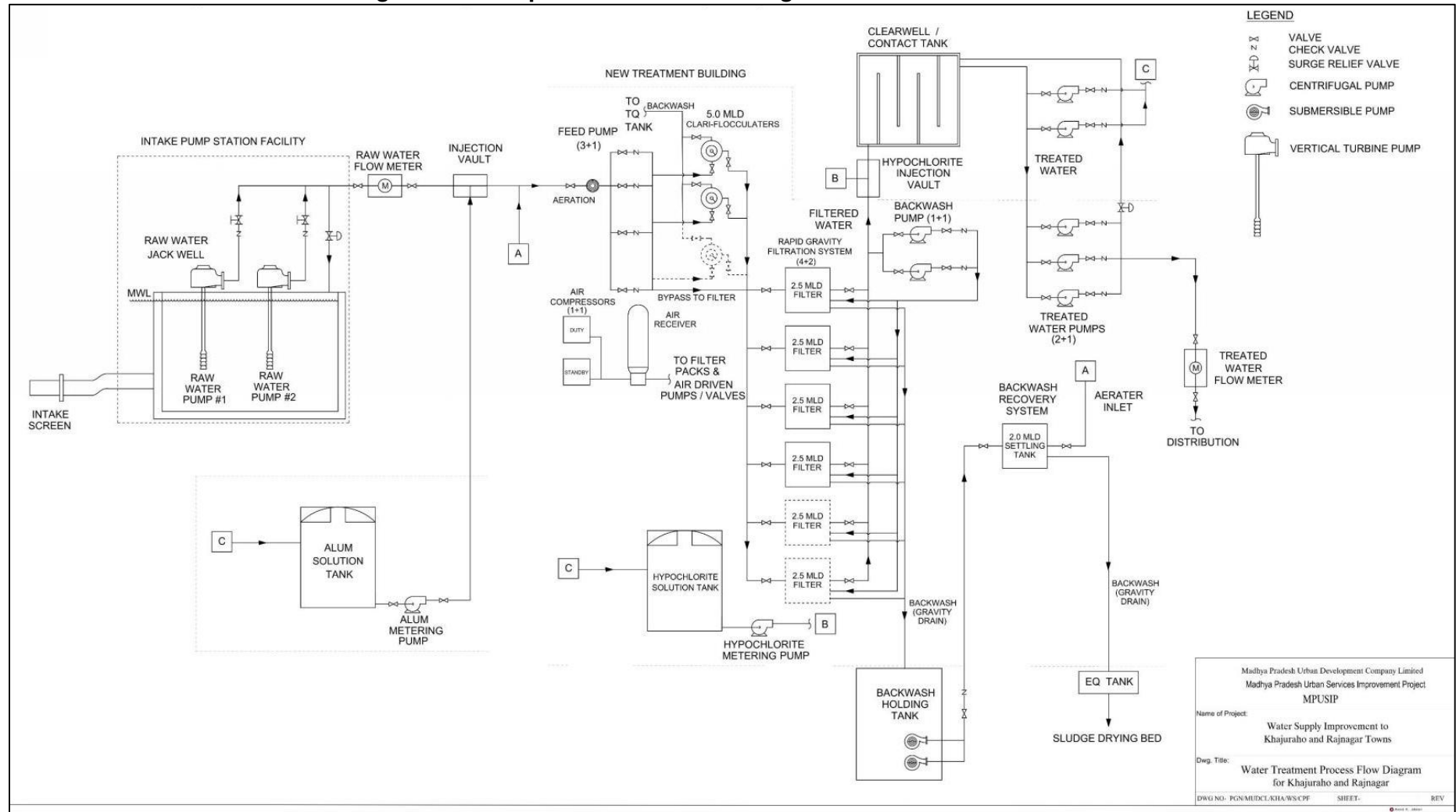


Figure 4: Proposed WTP Site At Kutni Dam



Figure 5: Proposed Transmission Network

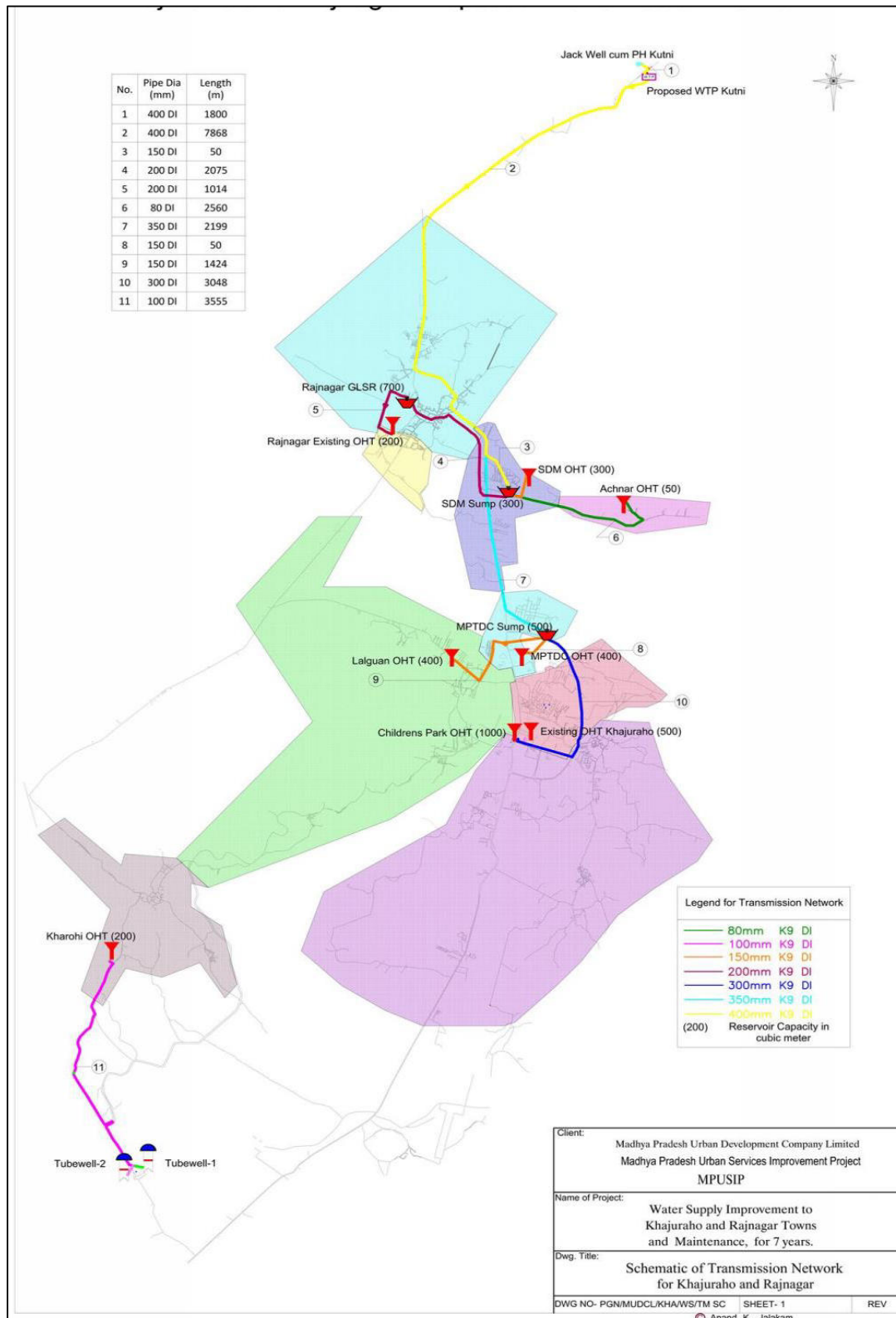
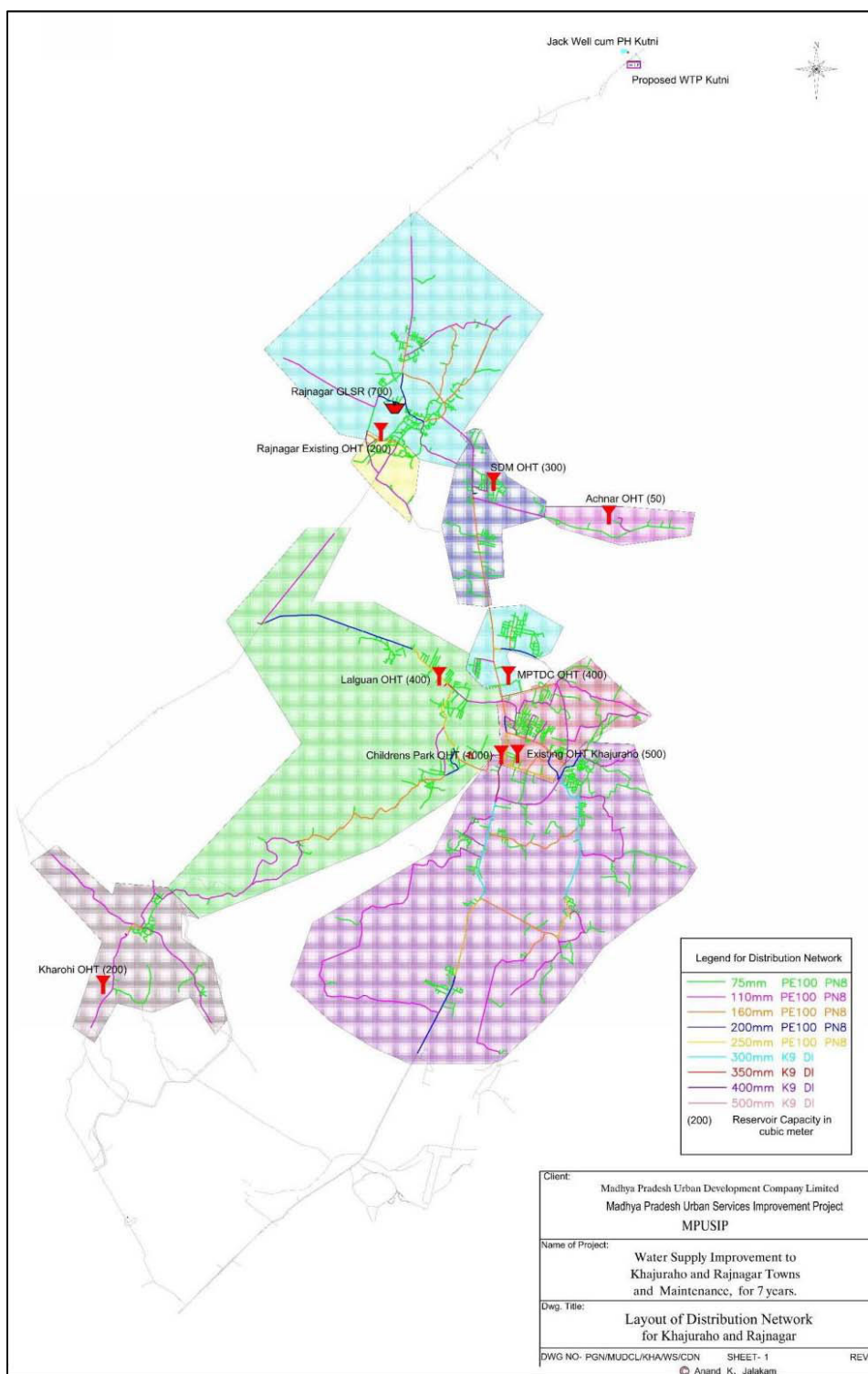


Figure 6: Proposed Transmission Network



III. POLICY, LEGAL AND ADMINISTRATIVE FRAMEWORK

A. ADB Policy

22. ADB requires the consideration of environmental issues in all aspects of ADB's operations, and the requirements for environmental assessment are described in ADB SPS, 2009. This states that ADB requires environmental assessment of all ADB investments.

23. **Screening and categorization.** The nature of the environmental assessment required for a project depends on the significance of its environmental impacts, which are related to the type and location of the project; the sensitivity, scale, nature, and magnitude of its potential impacts; and the availability of cost-effective mitigation measures. Projects are screened for their expected environmental impacts, and are assigned to one of the following four categories:

- (iii)
- (i) **Category A.** Projects could have significant adverse environmental impacts. An EIA is required to address significant impacts.
- (ii) **Category B.** Projects could have some adverse environmental impacts, but of lesser degree or significance than those in category A. An IEE is required to determine whether significant environmental impacts warranting an EIA are likely. If an EIA is not needed, the IEE is regarded as the final environmental assessment report.
- (iii) **Category C.** Projects are unlikely to have adverse environmental impacts. No EIA or IEE is required, although environmental implications are reviewed.
- (iv) **Category FI.** Projects involve a credit line through a financial intermediary or an equity investment in a financial intermediary. The financial intermediary must apply an environmental management system, unless all projects will result in insignificant impacts.

(iv)

24. **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.

(v)

25. **Public disclosure.** ADB will post the safeguard documents on its website as well as disclose relevant information in accessible manner in local communities:

- (vi)
- (i) for environmental category A projects, 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 implementing agency during project implementation upon receipt.

B. National Environmental Laws

26. **Environmental assessment.** The GoI 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.

27. Category A projects require EC from the central Ministry of Environment and Forests (MoEF). 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 MoEF prepares comprehensive Terms of Reference (ToR) for the EIA study. On completion of the study and review of the report by the EAC, MoEF considers the recommendation of the EAC and provides the EC if appropriate.

28. 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.

29. None of the components of this water supply subproject in Khajuraho-Rajnagar falls under the ambit of the EIA Notification 2006, and, therefore EC is thus not required for the subproject.

30. **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 2.

Table 2: Applicable Environmental Regulations

Law	Description	Requirement
Madhya Pradesh State Water Policy, 2003	Prepared in accordance with the National Water Policy, it states that “for environmental balance, skillful and planned management of all types of developmental activities, economic use on equitable basis and in view of the prime importance of water for all human and other living beings, an effective and sound water policy is necessary”. Policy is detailed in 17 sections dealing with different aspects of water resources. No. 7 deals with Water Allocation Priorities, and according to which drinking water supply shall have the highest priority followed by irrigation, power, tourism, etc. Water Resource Department is nodal department for permitting different uses of water resources. Policy also states that “clear provision for reservation of drinking water shall be made in irrigation projects”	Permission of WRD, GoMP: <ul style="list-style-type: none"> to abstract water from Kutni feeder reservoir for Khajuarho and Rajnagar water supply to construct jack well cum pump house in the reservoir
Water (Prevention and Control of Pollution) Act of 1974, Rules of 1975, and amendments	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 to this Act. These conditions	WTP requires CFE and CFO from MPPCB. Application has to be submitted online at http://www.mppcb.nic.in/xgn.html

Law	Description	Requirement
	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 For Establish (CFE) under Section 25 of the Act from Madhya Pradesh Pollution Control Board (MPPCB) before starting implementation and Consent For Operate (CFO) before commissioning.	
Environment (Protection) Act, 1986 and CPCB Environmental Standards.	Emissions and discharges from the facilities to be created or refurbished or augmented shall comply with the notified standards	(vii) Appendix 2 provides applicable standards for ambient air quality. Appendix 3 provides vehicular 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 4 provides applicable noise standards.
Municipal Solid Wastes Management Rules, 2016	Rules to manage municipal solid waste generated; provides rules for segregation, storage, collection, processing and disposal.	Solid waste generated at proposed facilities shall be managed and disposed in accordance with the MSWM Rules
Construction & Demolition Waste Management Rules, 2016	Rules to manage construction & to waste resulting from construction, remodeling, repair and demolition of any civil structure. Rules define C&D waste as waste comprising of building materials, debris resulting from construction, re-modeling, repair and demolition of any civil structure.	Construction & demolition waste generated from the project construction shall be managed and disposed as per the rules (Appendix 5)
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 National Monuments Authority (NMA).	<p>Khajuraho is a famous archeological place and there are several monuments of national and international importance.</p> <p>Works required for provision of public water supply are exempted from the regulated list of "construction works". However, works near the monuments (within 300 m) can only be conducted with prior permission of NMA.</p> <p>Khajuraho NP submitted application for permission to ASI; after scrutiny and site visit by Regional Director office Bhopal, application will be forwarded to NMA for grant of permission.</p>
Labor Laws	The contractor shall not make employment decisions based upon personal characteristics unrelated to job requirements. The contractor shall base the employment relationship upon equal opportunity and fair treatment, and shall not discriminate with respect to aspects of the employment relationship, including recruitment and hiring, compensation (including wages and benefits), working conditions and terms of	Appendix 6 provides applicable labor laws including amendments issued from time to time applicable to establishments engaged in construction of civil works.

Law	Description	Requirement
	employment or retirement, and discipline. The contractor shall provide equal wages and benefits to men and women for work of equal value or type.	

31. **ADB SPS Requirements.** During the design, construction, and operation of the project the PMU and PIUs will apply pollution prevention and control technologies and practices consistent with international good practice, as reflected in internationally recognized standards such as the World Bank Group's Environment, Health and Safety Guidelines. 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 proposed alternatives that are consistent with the requirements presented in ADB SPS.

Table 3: WHO Ambient Air Quality Guidelines

Table 1.1.1: WHO Ambient Air Quality Guidelines ^{7,8}		
	Averaging Period	Guideline value in $\mu\text{g}/\text{m}^3$
Sulfur dioxide (SO_2)	24-hour	125 (Interim target-1) 50 (Interim target-2) 20 (guideline)
	10 minute	500 (guideline)
Nitrogen dioxide (NO_2)	1-year	40 (guideline)
	1-hour	200 (guideline)
Particulate Matter PM_{10}	1-year	70 (Interim target-1) 50 (Interim target-2) 30 (Interim target-3) 20 (guideline)
	24-hour	150 (Interim target-1) 100 (Interim target-2) 75 (Interim target-3) 50 (guideline)
Particulate Matter $\text{PM}_{2.5}$	1-year	35 (Interim target-1) 25 (Interim target-2) 15 (Interim target-3) 10 (guideline)
	24-hour	75 (Interim target-1) 50 (Interim target-2) 37.5 (Interim target-3) 25 (guideline)
Ozone	8-hour daily maximum	160 (Interim target-1) 100 (guideline)

Table 4: World Bank Group's EHS Noise Level Guidelines

Table 1.7.1- Noise Level Guidelines⁵⁴		
	One Hour L_{Aeq} (dBA)	
Receptor	Daytime 07:00 - 22:00	Nighttime 22:00 - 07:00
Residential; institutional; educational ⁵⁵	55	45
Industrial; commercial	70	70

IV. DESCRIPTION OF THE ENVIRONMENT

A. Methodology Used for Baseline Study

32. **Data collection and stakeholder consultations.** Data for this study has been primarily collected through comprehensive literature survey, discussion with stakeholder agencies, and field visits to the proposed subproject sites.

33. The literature survey broadly covered the following:

- (i) Project details, reports, maps, and other documents prepared by technical experts of the ADB PPTA Team
- (ii) Discussions with Technical experts of the PPTA team, municipal authorities, relevant government agencies like ASI, MPPCB, etc.
- (iii) Secondary data from previous project reports and published articles, and
- (iv) Literature on land use, soil, geology, hydrology, climate, socioeconomic profiles, and other planning documents collected from Government agencies and websites.

34. **Ocular inspection.** Several visits to the project sites were made during IEE preparation period in 2015 to assess the existing environment (physical, biological, and socioeconomic) and gather information with regard to the proposed sites and scale of the proposed project. A separate socioeconomic study was conducted to determine the demographic information, existing service levels, stakeholder needs and priorities.

B. Physical Resources

1. Location, Area& Connectivity

35. Geographically, the project area is located at 24°50' N latitude and 79°55' E longitude in the Bundelkhand Region of Madhya Pradesh state. The project area comprises the two adjoining towns of Khajuraho and Rajnagar, administratively in Chhatarpur District of the state. It is located at about 300 km north of the state capital Bhopal, and 38 km east of the district headquarter, Chhatarpur. Chhatarpur district shares borders with Uttar Pradesh state in the north. Rajnagar and Khajuraho towns are located 4 km apart.

36. State highway 75 that passes near Khajuraho connects both Khajuraho and Rajnagar towns with Chhatarpur and from there to other major cities, and state capital Bhopal. Khajuaraho has a railway station, providing a better rail connectivity to national capital Delhi.

Khajuraho also has an airport, connecting it with Mumbai, Delhi and Varanasi, a famous religious place and tourist destination in Uttar Pradesh.

37. Khajuraho Nagar Parishad (Khajuraho Municipal Council) extends to an area of about 59 sq. km characterized by a mix of urban and few rural settlements. The town is divided into 15 municipal wards, which includes villages of Achnar, Karohi and Lalguan. The total geographical area under Rajnagar Nagar Parishad (Rajnagar Municipal Council) is 28 sq. km, and divided into 15 municipal wards.

2. Topography, Soils and Geology

38. The Bundelkhand region is mostly characterized by rugged, ravenous, undulating terrain with rocky outcrops, narrow valley and its hillocks are bound by Vindhyan Plateau. This plateau is also bound by River Yamuna in the north, River Ken in the east and rivers Betwa and Pahuj in the west. Bundelkhand region falls both in Madhya Pradesh and neighboring Uttar Pradesh state, and the project areas is almost is in centre of this region in Chhatarpur district.

39. Topography of the project area is mostly plan, except for few isolated small range hills in Rajnagar and near Achanar village in Khajuraho. Average elevation is 223 m, and the area predominantly slopes from southwest to northeast. Khajuraho is mostly drains into a small river Nandi towards northeast, and some southern parts of the town drains into River Kurar. These two streams are tributaries of River Kutni. Rajnagar mostly drains into River Kutni on northern side.

(viii)

40. About 65% of the district is occupied by Bundelkhand granite in northern & north central part (which included the project area) with a thin soil cover. The granite is pink in colour, medium to coarse grained porphyritic in texture. It is very hard & compact with well-developed joints. The soil in the region is mainly alluvial type occurring in the north eastern part of the district. Red and Yellow soil is prevalent in the north eastern part and red and black soil is prevalent in the central part. The town is under Granite Belt of Madhya Pradesh. Depth of soils is shallow. The region has various minerals of sedimentary origin: Sandstone, Shale and Limestone.

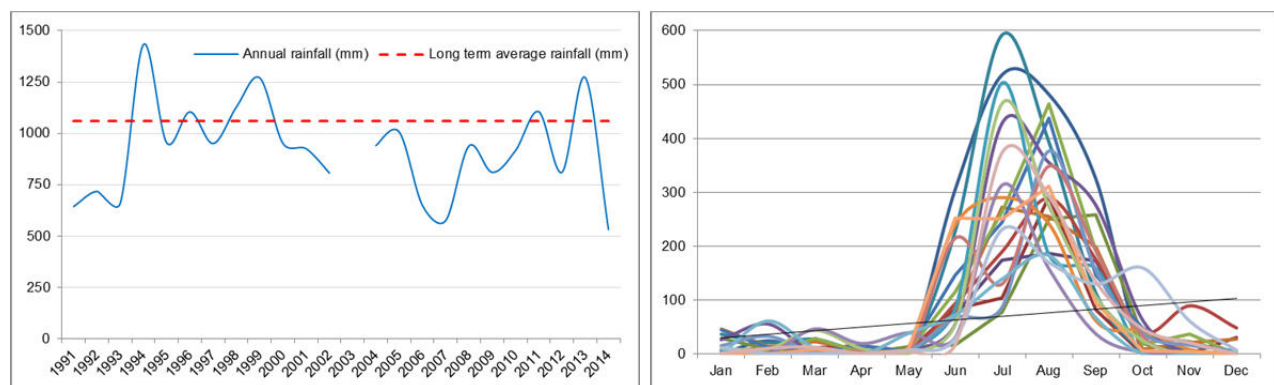
3. Seismology

41. As per the seismic zoning map of India, project area falls under Zone II, which is the lowest earthquake risk zone in India. This zone is termed as “low damage risk zone”.

4. Climatic Conditions

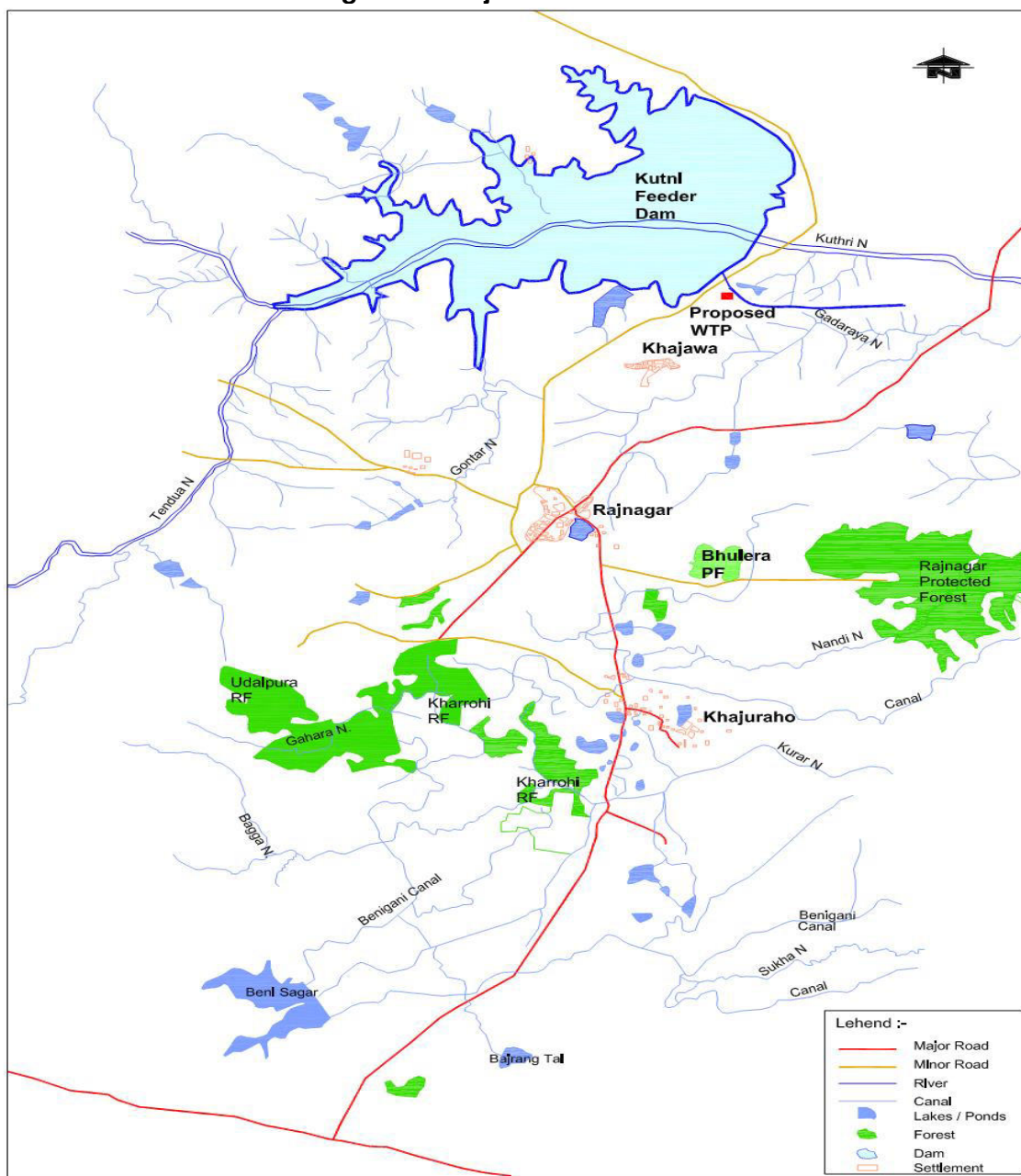
42. Entire Bundelkhand region is characterized by semi-arid extreme climate, with very hot summers, very cold winters and low rain monsoons. The region is prone to drought. The long term average annual rainfall is 1060 mm. Rainfall is mostly erratic and below average. 2014 was the lowest rainfall year in the 2 to 3 decades. Rainfall is mostly concentrated in the monsoon season of June/July to September/October – about 80-95% of annual rainfall is received during these months.

Figure 7: Annual and Monthly Rainfall Pattern – Chhatarpur District



43. There are significant seasonal and day-night temperature variations almost throughout the year. There are three predominant seasons: June to September is monsoon (southwest monsoon), October to March is winter, and April to till onset of monsoon in late June is summer. Summers are very hot. May is normally the hottest month with an average maximum temperature of 42.3°C . Minimum temperatures are recorded during the month of January. The average minimum temperature of January is 7.1°C .

Figure 8: Project Area Environs

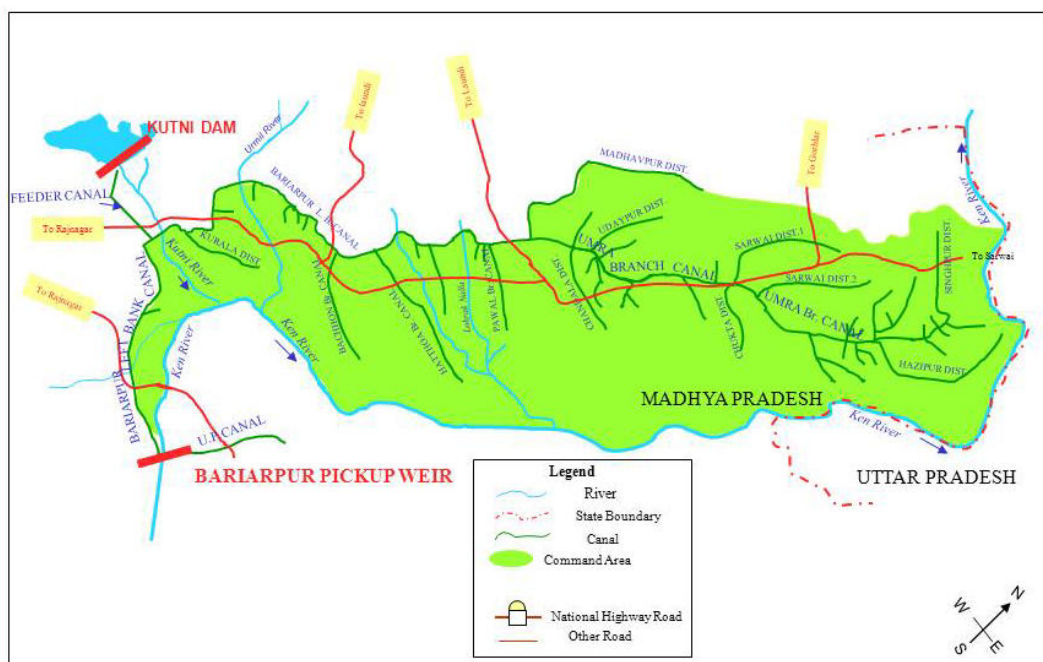


5. Surface Water

44. Ken River is an important river flowing through the drought prone semi-arid regions of Uttar Pradesh and Madhya Pradesh states. River Kutni, a tributary of Ken, flows near project town Rajnagar. Kutni is a small and seasonal river. There are several small rivers and stream in and around the project area like Kurar River, Gontar River, Tendua River. These rivers are mostly dry, and flow only for a short duration during monsoon. In below average rainfall years, the rivers completely run dry. Besides, rivers and streams, there are number of small lakes and ponds in and around the project area. There are small lakes and tanks in the project area. Benisagar dam is an important water body, located in the southwest side of Khajuraho town.

45. **Kutni Dam as Water Supply source.** A dam across Kutni was constructed at Khajawa village near Rajnagar by GoMP as part of the Bariyarpur Left Bank Canal Project, which takes off from Bariyarpur pick up weir across Ken on the border of Panna and Chhatarpur districts. As per the inter-state agreement between MP and Uttar Pradesh (UP), MP constructed Bariyarpur Left Bank Canal (LBC) to utilize surplus water from the weir to irrigate 43,850 hectares in Chhatarpur district. Since the share water available from River Ken is not sufficient to meet the irrigation demand, Kunti feeder dam/reservoir was constructed. A 5.25 km long canal feeds the Bariyarpur LBC from Kunti dam. The project is depicted in the below figure (source: <http://india-wris.nrsc.gov.in>). With a catchment area of over 500 sq. km, the dam is a good source of water supply, and therefore it is proposed to use as source for water supply in Khajuraho and Rajnagar.

Figure 9: Bariyarpur lbc and Kutni feeder dam command area



6. Groundwater

46. Khajuraho comes under Bhundelkhand region. This region is covered by Bhundelkhand granite in northern part with thin soil cover. This region is very hard and compact with well-developed joints. These joints were open at the surface and persist to about 20m below the surface. Ground water in this region also occurs in weathered mantle in joints and fracture under water table condition and can sustain well having up to 2lps discharge. Ground water in the alluvium also occurs under water table conditions.

47. Ground water level in this region ranges from 4.5 to 14.57 mbgl during pre-monsoon. Shallow water level in the district is less than 6m in north eastern and south eastern part of the district. Whereas in northern and southern parts the deepest water level recorded was 14.5mbgl. whereas in the post monsoon period the water level ranges from 2.5mbgl to 12.5mbgl with a shallow water level of less than 5m. The deepest water level is 12.5mbgl, recorded in the Maharajpur. The water level fluctuations in the pre and post monsoon in the district ranges from 0.10m to 9.45m.

48. **Groundwater quality.** Following table shows the groundwater quality in the study area. Some of the water quality parameters although exceed desirable level, are however within the permissible levels of drinking water standards. Bacteriological contamination is evident from the water quality results.

Table 5: Groundwater Quality (2015)

Parameter	Sevagram, Khajuraho	Benisagar water works	Ranipur, Rajnagar	Drinking water standards*
Temperature, oC	27.5	27.5	28	-
Turbidity, NTU	1.41	1.46	1.16	5-10
Color, Hazen units	Nil	Nil	Nil	5-25
pH	7.2	7.2	7.5	6.5-8.5
Electrical conductivity (μ s/cm)	1430	439	647	750 – 2000
Total dissolved solids (mg/l)	798	246	360	500-2000
Total alkalinity (mg/l)	324	146	228	-
Chlorides (mg/l)	123	26.8	31	250-1000
Total hardness (mg/l)	435	285	370	300-600
Calcium (mg/l)	86	46	74	75-200
Magnesium (mg/l)	52.8	40.8	44.4	30-100
Iron (mg/l)	0.05	0.1	0.05	0.3 – 1
Manganese (mg/l)	Nil	Nil	0.01	-
Fluoride (mg/l)	0.33	0.25	1.02	1-1.5
Nitrate (mg/l)	39.6	4	32.4	45-100
Sulphates (mg/l)	98.28	10.3	13.65	200-400
Total Coliform / 100ml	340	50	Nil	10
Thermo tolerant coliform / 100 ml	100	40	Nil	-

Source: Sampling survey 2015 by PPTA Team; samples collected from tube wells

* standards prescribe lower and higher values for parameters, except pH; lower value is the 'desirable limit' while higher value is the 'permissible limit in the absence of alternate source'; there is only lower value for parameters which have no relaxation.

7. Air Quality

49. There is no data on ambient air quality in Khajuraho and Rajnagar Towns, which are not subject to monitoring by the Madhya Pradesh Pollution Control Board (MPPCB) as there are no major industries. Located in the semiarid drought prone Bundelkhand region, particulate matter is likely to be high, particularly during summer months. Traffic is the only significant pollutant, so levels of oxides of sulphur and nitrogen are likely to be well within the National Ambient Air Quality Standards (NAAQS).

50. 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.

C. Ecological Resources

51. Project area mostly comprises urban areas, agricultural areas of Khajuraho and Rajnagar, which are converted to human use many years back. Extent of forest areas in the project area is very limited, and none of the project components are located in the forest areas. Bhulera protected forest (PF) near Achnar village and Kharrohi PF between Khajuraho and Kharrohi village are situated in the study area. These forest areas are characterized by low

range hills, rugged lands, rocky outcrops, open forests (10-40% tree canopy cover) and scrub lands (less than 10% tree canopy cover). Following type of tree species are found in these areas: babul (*Acacia Nilotica*), neem, khair (*Acacia catechu*), palas (*Butea monosperma*), ber (*Zizyphus varieties*), tendu (*Diospyros melanoxylon*), mahua (*Mahuca Indica*), semal (*Salmalia malabarica*) and kardhai (*Anogeissus pendula*).

52. Common wild animals like wild boar, monkey, jackal, etc., are found in these forests. Aquatic life in the project areas is not notable, given low rainfall semi-arid zone. Common fishes are found in water bodies like Kutnia dam, Prem sagar lake in Khajuraho.

53. The OHT locations in Achnar and Karrohi are adjacent to protected forests² (50 meters from the protected forest boundary) however construction activities will be confined to the identified sites, and will not encroach into the protected forests as these are clearly demarcated and separated by existing boundary fences.

D. Economic Development

1. Land use

54. Khajuraho Development Plan came into existence in 1978, which is replaced by Development Plan of 1991 that refers to the development vision to 2011. The main focus of the 2011 Plan is an integrated development of tourism as well as preservation of glorious temples of international recognition and of universal values. About 18.50 percent of land area (27.14 Ha) is allocated for residential use, 34.4 percent Transportation (50.54 Ha) and 19.70 percent Commercial (29.16 Ha) land-use are the other two major land use pattern. As per the existing land use pattern, the commercial activity is observed to be the second largest activity after the transportation activity may be mainly due to the tourist inflow. Present development shows a clustered settlement pattern spread over 59 sq.km area, comprising both urban and rural settlements. Most of the area is predominantly undeveloped and is under the agricultural use. The urbanized area is only about 15% of the total municipal areas.

55. Temple complexes form the centre of development. Most of the residential and commercial activities are located near temple complex. Thus density is higher near temple complex than other area. All the high end hospitality areas and Hotel industry is developed along the road to Bamitha, along which airport and railway station is located.

56. Spread over 28 sq. km area Rajnagar is comparatively a smaller town and is traditionally an agriculture based economy. It is a local center for agricultural marketing dealing in agriculture produce, inland fisheries and forest produce. Large part of the municipal area is still under agriculture.

2. Industry & Agriculture

57. There are no notable industries in Khajuraho and Rajnagar. The economy is mostly dependent on agriculture and agricultural based activities. There are few agro-based industries like rice and oil mills. Khajuraho has also significant tourism based economy.

² These forests are classified as open forests with very less tree cover and common wildlife.

58. Kharif and rabi are the main crop seasons in the project area. Main crops are wheat, pulses, sesame, vegetables, etc.

3. Infrastructure

59. **Sewerage.** There is no sewerage collection and treatment system in the towns. Households mainly depend on individual sanitation systems like pit latrines, septic tanks etc. Open defecation is also prevalent in the project area. Septage from septic tanks is collected by mobile tankers with suction arrangement. Sewerage and sanitation systems needs to be improved in the towns to meet the increased wastewater generation due to improvement in water supply.

60. **Solid Waste Management.** There is no proper solid waste management system in the towns. Respective municipal councils are responsible for SWM services their areas. Waste generated in the towns are collected and disposed by crude open dumping method in the outskirts of the towns.

61. **Storm Water Drainage.** Open drainage system is provided in towns for collection and conveyance of rain water from the town. Due to lack of sewerage system, the drains are presently carrying wastewater including sewage. Since rains are confined only to a short duration in monsoon, the drains mostly carry wastewater. Indiscriminate disposal of solid waste into drains is common, due to which drains are often choked, creating unhygienic conditions.

(ix)

62. **Power Supply.** Thermal power is the main source of energy in Madhya Pradesh, contributing nearly 90% of the electricity, compared to hydropower, which produces the remainder.

(x)

63. **Transport.** The old town areas of Khajuraho and Rajnagar are characterized by very narrow roads that are frequently congested with traffic and pedestrians. In contrast the remainder of the town has a relatively good road system, particularly in the outer areas, where streets are wide and not heavily used by traffic. Roads are surface either with bitumen or concrete, and roads in the outer areas are mostly unpaved. Most of the roads are maintained by respective municipal councils except the main roads connecting other towns and villages, which are maintained by the Public Works Department (PWD). Road the condition is generally poor, with many roads in need of repairs and resurfacing. Khajuraho Nagar Parishad is currently improving some of the important roads in the town.

(xi)

E. Socio Cultural Resources

1. Demography

64. **Khajuraho.** According to the census, the population of Khajuraho was 24,481 in 2011, increased from 19,286 in 2001, which shows an increase of 27 % over the decade. The previous decade of 1991-2001 experienced a very high growth of 195%, which is mainly due to inclusion of surrounding villages in the municipal limits. Overall literacy is 70.9% (which is slightly higher than the state average of 69.3%). The literacy figures are reported at 79.4% for males and 61.2% for females. The sex ratio is 908 females per 1000 males, less than the state average of 918. With an area of 59 sq. km under the municipal limits, gross population density is very low (409 persons/km), but this varies across the area, as most of this area is undeveloped, and in the core area of the town, population is dense. About 2% of the population are scheduled

tribes (ST), but these are part of the mainstream population, and about 16% belong to scheduled castes (SC). Main language spoken the project areas is Bundelkhandi and Hindi.

65. **Rajnagar.** According to the census, the population of Rajnagar was 14,253 in 2011, increased from 12,449 in 2001, which shows an increase of 15 % over the decade. The previous decade of 1991-2001 experienced comparatively higher growth of 21%. Overall literacy is 73.71%, reported at 79.93% for males and 66.60% for females, which is better than literacy in the state as a whole, which is 69.3% overall, and 78.7% for males and 59.3% for females. The sex ratio is however significantly below the natural 1:1 ratio, being 882 females per 1000 males, lower than the state average.

2. History, Culture and Tourism

66. Khajuraho is a historical, culture and tourism centre in central India, which is world famous for its beautifully carved temples. This is notified as World Heritage Site by UNESCO in the year 1986. Rajnagar, on the other hand, has no places of significant historical or tourism importance.

67. The name Khajuraho is said to be derived from Sanskrit words 'kharjura' meaning date palm. Khajuraho was the cultural capital of the Hindu Rajput kingdom of the Chandelas, who undertook massive construction in the city of about 85 temples of which 22 remained till today. The city was built to showcase the wonderful architectural and engineering capabilities of the Chandelas, who ruled central india. The temples of Khajuraho were built between 950 - 1050 A.D. As per the legend, the Chandelas claimed descent from the moon, hence the name Chandela. Chandela kings have chosen Khajuraho, about 35 miles, from Mahoba, the capital of the Chandela dynasty.

68. Subsequent to fall of Chandela kingdom to Delhi Sulthanate in 13th Century, some temples were destroyed, others were left in neglect, and Khajuraho lost its prominence. In late 18th century, the temples were rediscovered. Following are the nationally protected monuments of ASI.

69. The temples in Khajuraho are broadly divided in to three groups: eastern group, western group and southern group of temples. Following are the protected monuments in Khajuraho listed by Archeological Survey of India.

- (i) Chausath Yogini Temple
- (ii) Chitragupta or Bharatji's Temple
- (iii) Chopra or Square Tank
- (iv) Devi Jagadambi Temple
- (v) Kandariya Temple
- (vi) Lakshman Temple
- (vii) Lalguan Mahadeva Temple
- (viii) Mahadeva Temple
- (ix) Matangesvara Temple
- (x) Nandi Temple
- (xi) Parvati Temple
- (xii) Varaha Temple
- (xiii) Visvanath Temple
- (xiv) Adinath Temple
- (xv) Brahma Temple

- (xvi) Colossal Statue of Shri Hanuman
- (xvii) Ghantai Temple
- (xviii) Parasvanath Temple
- (xix) Kakra Math
- (xx) Santinatha Temple
- (xxi) Vamana Temple
- (xxii) Javari Temple
- (xxiii) Duladeo Temple
- (xxiv) Jatakari or Chaturbhuj Temple



70. **Tourism.** Khajuraho is one of the prominent tourist destinations in India attracting tourists from all over India and abroad. Main tourist season starts in the month of August and continues up March. December-January is considered as peak tourist season, during which most of the international tourist visits Khajuraho. As per the available records, about 400,000 tourists visit Khajuraho every year, of which about 25% are foreign tourists.






71. Khajuraho dance festival, celebrated every year 1 to 7 February, is an internationally recognized dance festival attracts large number of dancers from several countries. Large number of devotees visit Khajuraho temples during the festivals of Shivratri and Basant Panchami, which usually fall during the months of January-March.







F. Subproject Site Environmental Features


72. Features of the selected subproject sites are presented in the following table.

Table 6: Site Environmental Features

Infrastructure	Location & Environmental Features	Site Photograph
Water intake facilities	<p>Jack well cum pump house will be built in Kutni reservoir, under the control of Water Resources Department, GoMP.</p> <p>Impoundment of water in the dam started in the year 2010-11. Dam is used as feeder reservoir to an irrigation canal. Water level in the dam is usually high in the post monsoon season, and recedes with release of water in the period of October /November to January / February. Aquatic life in the reservoir is limited to local species of fishes, and aquatic plants. There are no notable sensitive features. Raw water pipeline will be laid underground from the jack well intake to WTP site along an existing road</p>	
Water Treatment Plant	<p>WTP site is located adjacent to the Kutni Dam off-take canal.</p> <p>Total area required is 1.5 ha; site is owned by Water Resources Department, GoMP. Part of the site is under cultivation by neighboring farmers, and part is covered with shrubs and bushes. Forest department has developed plantations in the strip of land along the canal. However, none of the activities are planned in this strip of land.</p>	

Infrastructure	Location & Environmental Features	Site Photograph
Booster pumping stations	1. Near SDM office in Rajnagar. Site is vacant and owned by GoMP. Site is located within the town along the Rajnagar-Khajuraho Road. Site is covered with rock out crops. There are no trees in the site. A graveyard is adjacent to the site.	
	2. Near Khajuraho bypass road in Khajuraho. Site is owned by MPTDC. Site is situated along Khajuraho-Rajnagar bypass road. Site is currently vacant, and there are no trees in the site. Rock outcrops are visible on the site	
OHTs and GLSR	Water balancing sump & OHT at Rajnagar. These two reservoirs will constructed at the booster station site at Rajnagar, details of which are provided above	
	GLSR at Rajnagar Site is located on a hillock within the town. Site is currently vacant, with bushes and shrubs scarcely. Site is owned by NPR and located adjacent to an existing road.	 (xii)
	ESR at Achnar Village Selected site is located in the northern side of the village adjoining a hilly forest area (Bhulera protected forest). Forest area is protected with a fence, and project activities will not encroach into the forest land. Bhulera PF is open forest with minimal tree cover, and common wild animals. Selected site is current vacant and owned by GoMP.	 (xiii)

Infrastructure	Location & Environmental Features	Site Photograph
	ESR at Khajuraho ESR will be located at the booster pumping station site at Rajnagar, details of which are provided above	 (xiv)
	ESR at Khajuraho Selected site is adjacent to the existing water tank facility in the town. Site is currently vacant and owned by NPK	 (xv)
	ESR at Lalguan Site is located within the village along the Lalguan Road. Site is vacant with no tree cover and owned by GoMP	
	ESR at Kharrohi Site is located in the outskirts of the village, and adjacent to a social forest plantation area. Site is owned by GoMP. Site is located adjacent to Karrohi protected forest. Site is currently vacant.	
Transmission & distribution network	<p>Transmission pipelines will be mostly laid along the main roads. Pipes will be laid underground.</p> <p>The transmission main (150 mm dia) leading to Lalguan OHT traverses the land owned by ASI; this land is vacant, and pipeline will be laid with the permission of ASI. Water from this pipeline will also be provided to ASI premises.</p> <p>Pipes will be laid along the roads/streets in the towns within the road right of way (ROW). In wider roads pipes/sewers will be laid in the road shoulder, and in narrow roads, where there is no space, pipes/sewers will be laid in the road carriage. Roads in the old part of the town are quite narrow (~3m), and in the rest of the town roads are wider. Roads</p>	 

Infrastructure	Location & Environmental Features	Site Photograph
	<p>are lines both sides with open drains. There are no trees along the roads, except in some new colonies in the outer areas. In old town areas pipes will be laid in the middle of the road, which may affect the traffic. There are residential areas around several monuments in Khajuraho, and provision of distribution network will require working within the regulated areas (300 m). No works however will traverse protected monument areas. ASI permission will be obtained. Given the small diameter (about 100 mm) pipes, the trench excavation will be very minimal (0.4 x 0.7m)</p>	

V. ANTICIPATED ENVIRONMENTAL IMPACTS AND MITIGATION MEASURES

73. 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.

74. 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) **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.
- (iv) **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.

75. 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).

76. 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.

77. The ADB Rapid Environmental Assessment Checklist in http://www.adb.org/documents/guidelines/environmental_assessment/eaguidelines002.asphas

been used to screen the project for environmental impacts and to determine the scope of the IEE.

78. In the case of this project (i) most of the individual elements are relatively small and involve straightforward 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 some works are located in the reservoir and (iii) being mostly located in an urban area, will not cause direct impact on biodiversity values. 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.

A. Pre-Construction Impacts – Design & Location

79. **Design of the Proposed Components.** Technical design of the (i) intake facilities at Kutni Dam; (ii) water treatment plant; (iii) raw water and clear water mains, (iv) storage reservoirs, (v) distribution network, connections and other items like flow meters, follows the relevant national planning and design guidelines, focusing on providing a robust system which is easy to operate, sustainable, efficient and economically viable. Following environmental considerations are included in the project:

- (i) Discontinuation of current unsustainable groundwater source and creating a new comprehensive water supply system based on a nearest surface water source
- (ii) Recovering wash water from treatment process
- (iii) Treatment and reuse of sludge from treatment process
- (iv) Minimizing water losses from pipelines by perfect jointing and alignments using appropriate techniques (HDPE pipes up to 150 mm dia joined by electro fusion couplers using on-site electro fusion welding, and all higher dia pipes by on site butt welding)
- (v) Minimizing overall resource use by combining bulk water facilities for Rajnagar and Khajuraho towns
- (vi) Designing the entire system to maintain optimal flow and terminal pressure, and optimising the overall energy usage
- (vii) Reducing the incidence of water borne diseases by providing 100% population including urban poor with potable water supplies
- (viii) Preparation and implementation of a water quality surveillance program including development of a laboratory as part of the project by DBO contractor to ensure that supplied water meets the drinking water standards
- (ix)
- (x) Development of laboratory with all necessary environment, health and safety measures and adopting international standard procedures for water quality testing Improve water use efficiency and reduce water wastage at household level by recording and monitoring the water usage, and charging the consumers as per usage; due consideration to urban poor
- (xi) Minimize unaccounted for water (UFW) losses using district metered area approach with flow meter and pressure logging arrangements to identify and rectify the leaks, and unauthorized connections
- (xii) Using low-noise and energy efficient pumping systems

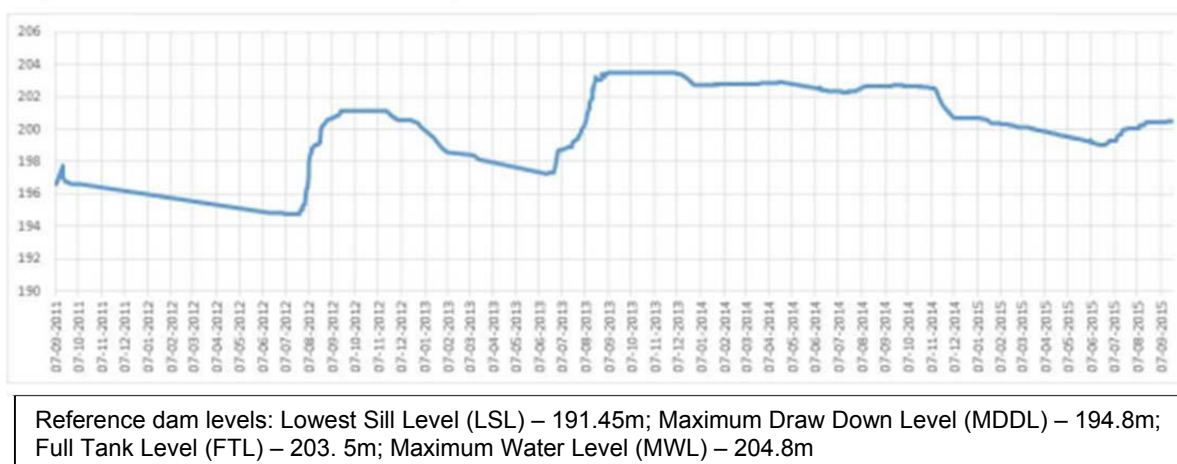
80. **Selection of water source.** An alternative source analysis has been conducted to select a feasible and sustainable source of water supply to meet the ultimate design demand of Khajuraho and Rajnagar. Three alternatives: (i) ground water; (ii) Benisagar reservoir; and (iii)

Kutni feeder dam, have been studied, and Kutni feeder dam is selected based on the techno-economic and environment considerations as elucidated below.

- (i) Groundwater source: Since the towns are currently depending on the groundwater, the continuation of same source with augmented supply was examined. As per the Central Ground Water Board (CGWB), groundwater utilization in Chhatarpur District is about 82% (of total utilizable resources), and the usage has been increasing rapidly in the recent past. Drying up of existing tube wells, in the summer months is a common feature in both the towns, exception being the tube wells at Benisagar WTP, which is at immediate downstream of Benisagar reservoir. Groundwater therefore is not considered a sustainable source for meeting total projected demand.
- (ii) Benisagar Reservoir: This is a minor irrigation reservoir and no flow, level or discharge data is available to study the water availability. Though the capacity is adequate to meet the demand, due to the fact that it almost dries up for about 4 months a year, due to which the existing system is defunct is taken into consideration and this source was not selected.
- (iii) Kutni Feeder Reservoir: Kutni Dam across River Kutni, a tributary of Ken River, was constructed near Rajnagar as part of Bariyapur Left Bank Canal (LBC) Project. Started in 1980, the construction of dam was completed recently in 2010-11. Kunti dam feeds water into the Bariyapur LBC. LBC originates from the Bariyapur pick up weir, while Kutni dam supplements it with additional water. As per the NPK and NPR, the District Water Use Committee of Chhatarpur headed by the District Collector has earlier granted permission to use Kutni water for drinking water. Given the dependability, sustainability and government permissions, the Kutni Feeder Reservoir is selected as water source for both the towns.

81. **Dam water sustainability and environmental considerations.** The gross storage capacity of Kutni feeder reservoir is 138.45 mcm, while the water requirement for the project is 14.6 MLD or 5.33 mcm per year, which is about 3.8%. Since it is only a feeder reservoir, there is no direct irrigation command area under the Kutni reservoir. Kutni acts a feeder reservoir to Bariyapur LBC to supplement the water availability from its principle source, i.e. Bariyapur pick up weir across River Ken for Rabi crop season. The total command area under Bariyapur 43,850 ha.

82. The impoundment of water in Kutni dam was started in the year 2010, and water level records are available from 2011. Maximum water level was recorded in the monsoon period of 2013, during which, as per the local information, the dam was overflowed for about 15 days. Lowest water levels are recorded in summer-pre-monsoon of 2012 followed by 2013. It is also observed that from the period of September 2013 to October 2014, the water level in the dam recorded no major changes indicating that there are no water releases during this period into the feeder canal. This may be due to the reason that 2013 was a good monsoon year, and the water availability from Bariyapur pick up weir was adequate to meet the irrigation demand of Bariyapur LBC. Therefore the dependence on Kutni dam for irrigation needs is limited, and moreover, the abstraction of 3.8% of gross storage may not anyway effect the irrigation.

Figure 10: Kutni Dam Water Level (2011-15)

83. Except the pre-monsoon season of 2012, during which the lowest water level was recorded confining the water impoundment to dam's dead storage, dam maintained a reasonably good water level in the entire period of 2011-15. Since it is drinking water project, the design ensures the supply of water from dead storage as well. Even at the dead storage level, the water availability in the dam (7.37 mcm) is adequate to meet the demand of full year. Given the vast catchment area of 511 sq. km, minimum flows are always expected into the dam even during a poor monsoon year. Except local fish species like *Jal*, *Kapla*, *Rohu*, etc, there is no notable aquatic life in the reservoir. Flora also limited to local aquatic plants, shrubs and bushes.

84. **Kutni Dam Water quality.** Catchment area of the dam is spread over 511 sq. km. The catchment area is mostly characterized by agricultural and barren lands, and forest areas. There are no polluting sources like industries or mining in the catchment areas. Habitations are limited to small villages, there is no major town located in the catchment. As presented in the table below, all the parameters of water quality in comparison with drinking water standards are well within the limits, except for turbidity and bacteriological contamination. Conventional water treatment and disinfection which is proposed in the project is adequate to make the water usable for drinking purposes. A regular water quality regime needs to be established for checking the raw water quality. The water supplied to the consumers at all time must meet the drinking water standards (**Appendix 7**)

Table 7: Kutni Dam Water Quality (2015)

Parameter	Kutni Dam	Drinking water standards*
Temperature, oC	28	-
Turbidity, NTU	48.2	5-10
Color, Hazen units	12	5-25
pH	8.1	6.5-8.5
Electrical conductivity (μ S/cm)	318	750 – 2000
Total dissolved solids (mg/l)	177	500-2000
Total alkalinity (mg/l)	100	-
Total hardness (mg/l)	205	300-600
Calcium (mg/l)	68	75-200
Magnesium (mg/l)	8.4	30-100
Chlorides (mg/l)	22.5	250-1000
Iron (mg/l)	0.54	0.3 – 1
Manganese (mg/l)	0.04	-

Parameter	Kutni Dam	Drinking water standards*
Sulphates (mg/l)	5.53	200-400
Fluoride (mg/l)	0.6	1-1.5
Nitrate (mg/l)	0.4	45-100
Total Coliform	3240	10
Thermo tolerant coliform	2280	-

Source: Sampling survey 2015 by PPTA Team.

* standards prescribe lower and higher values for parameters, except pH; lower value is the 'desirable limit' while higher value is the 'permissible limit in the absence of alternate source'; there is only lower value for parameters which have no relaxation.

85. Use of Chlorine as disinfectant. It is proposed to use chlorine at WTP and also at the elevated reservoir of Karrohi to disinfect the water prior to supply to consumers. Karrohi village will be supplied with water from existing tube wells at Beni Sagar water works, and so disinfection will be performed at the ESR prior to supply. There is invariably a safety risk when chlorine is handled. Although facilities are not located close to habitations, safety precautions are necessary to ensure the safety of workers and citizens. To avoid any risk, the chlorination facility will be provided with the following:

- (i) Chlorine neutralization pit with a lime slurry feeder
- (ii) Proper ventilation, lighting, entry and exit facilities
- (iii) Facility for isolation in the event of major chlorine leakage
- (iv) Personal protection and safety equipment for the operators in the chlorine plant
- (v) Provide training to the staff in safe handling and application of chlorine; this shall be included in the contract of Chlorinator supplier
- (vi) Supplier of Chlorinator equipment shall provide standard operating manual for safe operation and as well as maintenance and repairs; preferably these shall be provided both in English and Hindi Languages

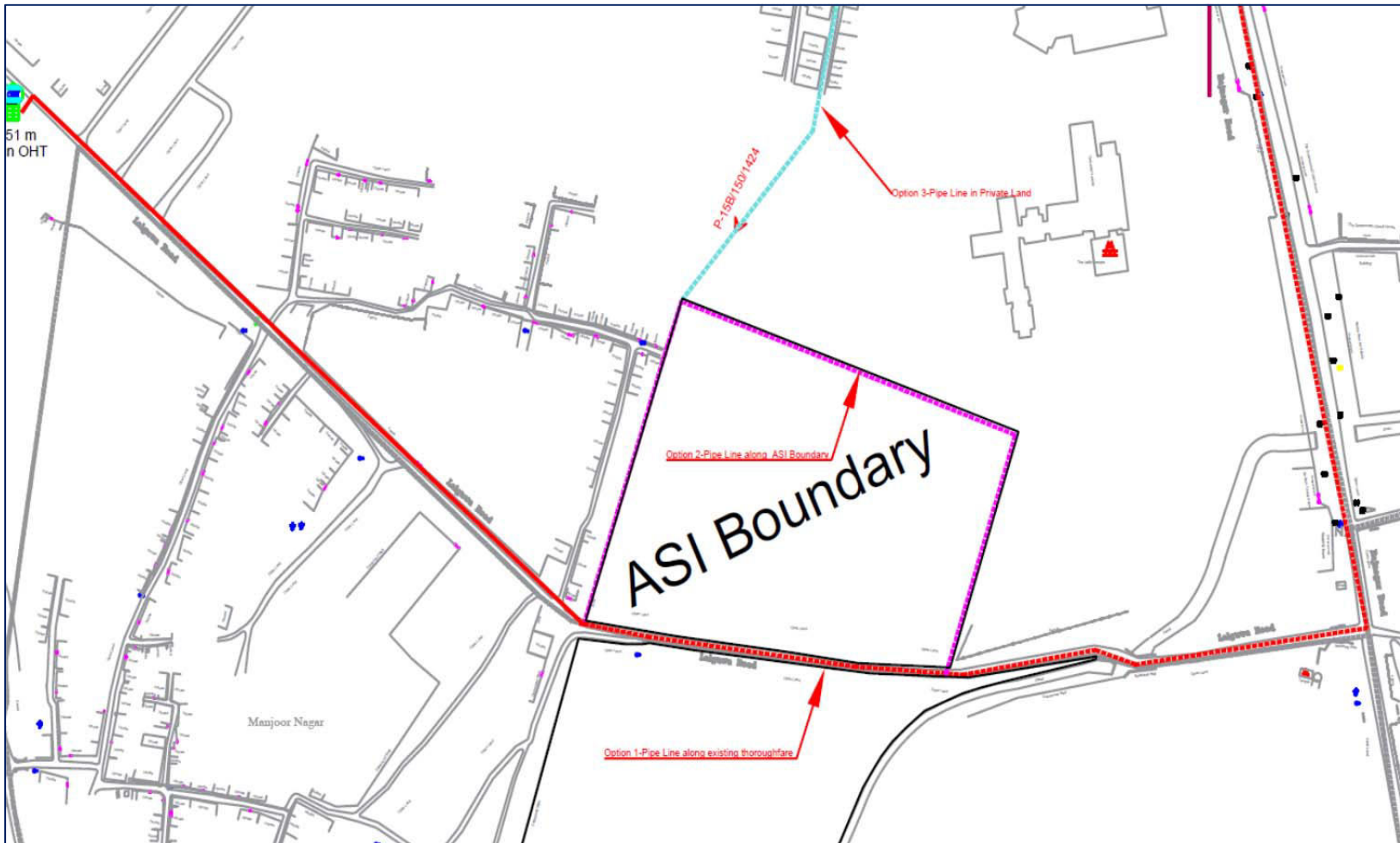
86. Utilities. Telephone lines, electric poles and wires, water lines within the proposed project locations may require to be shifted in few cases. To mitigate the adverse impacts due to relocation of the utilities, the contractor, in collaboration with ULB will (i) identify the locations and operators 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.

87. Social and Cultural Resources. Khajuraho is an historical town, and any work involving ground disturbance can uncover and damage archaeological and historical remains. For this project, excavation will occur in project sites, which are spread over entire town, so it could make high risk of such impacts if the sites contain any archeological and historical remains. Some proposed project sites (of transmission and distribution lines) are located within 300 m, which require prior permission of ASI. Besides this, the entire town is archeologically rich and the local enquiries indicate that there are instances of unearthing archeological remains especially in old town area during excavation for foundations of houses constructed by local people. Appropriate steps should be taken according to the nature of the risk. This should involve:

- (i) Obtain permission for laying of water pipelines within 300 m of protected monuments
- (ii) Include ASI as project stakeholder, Khajuraho local representative of ASI should be included in the town level committee

- (iii) Develop a protocol for use by the construction contractors in conducting any excavation work, to ensure that any chance finds are recognised and measures are taken to ensure they are protected and conserved. This should involve:
- Having excavation observed by a person with archaeological field training; contractor should employ a person with a formal certification course in archaeology from recognized (such as Institute of Archaeology, ASI, Delhi) during the ground excavation activities
 - Conduct awareness training to contractor & supervision staff prior to start of excavation
 - Stopping work immediately to allow further investigation if any finds are suspected;
 - Calling in the ASI if a find is suspected, and taking any action they require to ensure its removal or protection in situ

Figure 11: Location of Pipeline With Respect to Protected Monument



88. **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, or in areas which will

89. **Site selection of sources of materials.** Significant quantities of coarse aggregate and fine aggregate will be required for construction works. Requirement of gravel is limited. Contractor should procure these materials only from the quarries permitted/licensed by Mines and Geology Department. Contractor should, to the maximum extent possible, procure material from existing quarries, and creation of new quarry areas should be avoided as far as possible. 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.

B. Construction Impacts

90. **Pipeline laying works.** Civil works in the project include linear excavation for laying pipes along the roads, placing pipes in the trench and refilling with the excavated soil. The trenches will be of 0.4 m – 0.7 m wide and 0.8 to 1.2 m depth. Subsequent to completion of works, road reinstatement will be undertaken by the contractor as part of the civil works. The roads in the core city area of both the towns are very narrow and congested with pedestrians and vehicles, while the roads in outer areas are wide.

91. Earth work excavation will be undertaken by machine (backhoe excavator) and include danger lighting and using sight rails and barricades at every 100 m., while pipe laying works will include laying pipes at required gradient, fixing collars, elbows, tees, bends and other fittings including conveying the material to work spot and testing for water tightness. 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. As trenches are a maximum of 1.2 m, there is no risk of collapse of trenches or 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. About 95% of the excavated soil will be used for refilling the trench after placing the pipe and therefore residual soil after pipe laying and refilling is not significant. This soil shall be used for construction of WTP in ground leveling.

92. 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. These anticipated impacts are temporary and for short duration. Water and sewer lines will be laid on either side of the roads/streets.

93. **Other construction works.** Other civil works in the subproject include construction of jack well in Kutni reservoir, water treatment plant, water tanks, pumping stations, at the identified sites. These works will be confined to sites, and construction will include general activities like excavation for foundation, construction of foundations, columns, walls and roof in

cement concrete and masonry, and fixing of mechanical and electrical fixtures, etc. Jack well cum pump house will involve construction within the water body. An enclosed area (about 10 m dia) will be created at the selected site using temporary barriers like sand bags or sheet piles and the water will be pumped out to make the area dry for construction. Once this is created, the rest of the construction will follow the general construction procedures to create a RCC well of size 6 m diameter. Once the work is over, the temporary barriers will be removed.

94. **Sources of Materials.** Significant amount of sand and coarse aggregate will be required for this project. The construction contractor will be required to:

- (i) Use material sources permitted by government;
- (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.

95. **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) Damp down exposed soil and any stockpiled material on site by water sprinkling;
- (ii) Use tarpaulins to cover sand and other loose material when transported by trucks;
- (iii) Clean wheels and undercarriage of haul trucks prior to leaving construction site
- (iv) Disallow access in the work area except workers to limit soil disturbance and prevent access by barricading and security personnel
- (v) Fit all heavy equipment and machinery with air pollution control devices which are operating correctly

96. **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. As the rainfall in the project areas is mostly confined to monsoon, these potential impacts are short-term and temporary. However, to ensure that these are mitigated, construction contractor will be required to:

- (i) All earthworks be conducted during the dry season to prevent the problem of soil run-off during monsoon season;
- (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, only designated disposal areas shall be used;
- (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 inspection according to the Environmental Management Plan (EMP).

97. Construction of jack well in the reservoir may lead degradation of water quality due to increase in turbidity and chemical contamination from fuels and lubricant used in construction

work. Increase in silt content and water turbidity, chemical quality can affect the aquatic life, silting/chocking of spill ways/ canals etc., Though there are no notable aquatic life, to ensure that any negative impacts are mitigation, the contractor will be required to:

- (i) Select a construction methodology that is least disturbing, and appropriate for the in-situ soil condition, and able to complete the construction work prior to onset of monsoon
- (ii) Schedule the construction works during low water level period – late winter months to pre monsoon (February – June/July); ensure that works are completed during the same period to prior to onset of monsoon; confirm with dam authorities on release of water; avoid scheduling the works during water release period.
- (iii) Erect temporary barriers to form enclosed construction area with least disturbance
- (iv) Allow adequate time settle the distributed solids to prior to pumping out water; only clear/clarified water shall be pumped back into the reservoir; any silt laden water should be pumped to a silt pond
- (v) Avoid/minimize use of fuels, chemicals and lubricants; ensure no spillage

98. **Generation of Construction Wastes.** Solid wastes generated from the construction activities are excess excavated earth (spoils), discarded construction materials, cement bags, wood, steel, oils, fuels and other similar items. Domestic solid wastes may also be generated from the workers' camp. Improper waste management could cause odor and vermin problems, pollution and flow obstruction of nearby watercourses and could negatively impact the landscape. The following mitigation measures to minimize impacts from waste generation shall be implemented by the contractor:

- (i) Prepare and implement a Construction Waste Management Plan
- (ii) Stockpiles, lubricants, fuels, and other materials should be located away from steep slopes and water bodies;
- (iii) Avoid stockpiling any excess spoils. Excess excavated soils should be dispose to approved designated areas;
- (iv) Domestic solid wastes should be properly segregated in biodegradable and non-biodegradable for collection and disposal to designated solid waste disposal site;
- (v) Residual and hazardous wastes such as oils, fuels, and lubricants shall be disposed in disposal sites approved by local authorities;
- (vi) Prohibit burning of construction and domestic waste;
- (vii) Ensure that wastes are not haphazardly dumped within the project site and adjacent areas.
- (viii) Get approval of PIU in writing that the necessary environmental restoration work has been adequately performed before acceptance of work.

99. **Noise and Vibration Levels.** Except water intake and WTP, all the construction works will be conducted at selected sites and along the roads in Khajuraho and Rajnagar urban areas, where there are houses, schools and hospitals, religious & historical 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 and monuments. 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) 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 use portable street barriers to minimise 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) Identify any buildings at risk from vibration damage and avoiding any use of pneumatic drills or heavy vehicles in the vicinity;
- (vi) Consult the ASI 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.
- (vii) Excavation and construction methodology to be used near the monuments (within the regulated area of 300 m of any monument) shall be finalized in consultation with ASI office in Khajuraho; no equipment causing vibration and heavy noise should be used

100. **Surface and 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. In Khajuraho and Rajnagar groundwater is deeper than the proposed excavation depths, and rains are limited to short duration during monsoon. However, 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.

101. **Accessibility.** Excavation along the roads, hauling of construction materials and operation of equipment on-site can cause traffic problems. Roads in the core/old town areas of Rajnagar and Khajuraho are very narrow. However, most of the roads are used by pedestrians and two wheelers, and four wheelers vehicles are very limited. Potential impact is negative but short term and reversible by mitigation measures. The construction contractor will be required to:

- (i) Confine work areas along the roads to the minimum possible extent; all the activities, including material & waste/surplus soil stocking should be confined to this area. Proper barricading should be provided; avoid material/surplus soil stocking in congested areas – immediately removed from site/ or brought to the as and when required
- (ii) Leave spaces for access between mounds of soil;
- (iii) Provide walkways and metal sheets where required to maintain access across for people and vehicles;
- (iv) Plan transportation routes so that heavy vehicles do not use narrow local roads, except in the immediate vicinity of delivery sites;
- (v) Schedule transport and hauling activities during non-peak hours;
- (vi) Locate entry and exit points in areas where there is low potential for traffic congestion;
- (vii) Keep the site free from all unnecessary obstructions;
- (viii) Drive vehicles in a considerate manner;
- (ix) Coordinate with Traffic Police for temporary road diversions, where necessary, and for provision of traffic aids if transportation activities cannot be avoided during peak hours
- (x) Notify affected public by public information notices, providing sign boards informing nature and duration of construction works and contact numbers for concerns/complaints.

102. 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 is 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.

103. **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) Leave spaces for access between mounds of soil;
- (ii) Provide walkways and metal sheets where required to maintain access across for people and vehicles;
- (iii) Increase workforce in the areas with predominantly 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.

104. **Socio-Economic – Employment.** Manpower will be required during the 24-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) Employ at least 50% of the labour force, or to the maximum extent; and

105. **Occupational Health and Safety.** Workers need to be mindful 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 be required to:

- (i) Comply with all national, state and local labour laws (see **Appendix 6**);
- (ii) Develop and implement site-specific occupational health and safety (OH&S) 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) OH&S Training³ for all site

³ 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.

- personnel; (d) documented procedures to be followed for all site activities; and (e) documentation of work-related accidents;
- (iii) Ensure that qualified first-aid is provided at all times. Equipped first-aid stations shall be easily accessible throughout the site;
- (iv) Provide medical insurance coverage for workers;
- (v) Secure all installations from unauthorized intrusion and accident risks;
- (vi) Provide supplies of potable drinking water;
- (vii) Provide clean eating areas where workers are not exposed to hazardous or noxious substances;
- (viii) 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;
- (ix) 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;
- (x) Ensure the visibility of workers through their use of high visibility vests when working in or walking through heavy equipment operating areas;
- (xi) Ensure moving equipment is outfitted with audible back-up alarms;
- (xii) 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
- (xiii) 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.

106. **Asbestos Materials.** Existing water distribution network is mostly asbestos cement (AC) pipes, and because of the health risks these will be left in situ and replaced by new pipes. Plan pipeline alignments carefully to avoid any conflict or damage.

107. **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.

108. Central parts of the towns are characterized by narrow roads and some of which are accessible only by foot/two wheelers. 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 (~400 mm) and depth (~700 mm) of trench is minimal, it will pose safety risk, especially for children and elders. The construction contractor will be required to:

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.

- (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

109. **Work Camps.** Operation of work 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) Ensure conditions of liveability at work camps are maintained at the highest standards possible at all times;
- (v) Prohibit employees from poaching wildlife and cutting of trees for firewood;
- (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) Confirm to PMU report in writing that the camp has been vacated and restored to pre-project conditions before acceptance of work.

110. **Debris disposal.** Prior to the commencement of works, contractor shall identify a debris disposal site in consultation with the PIU 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 surface water bodies.⁴
- (iii) No residential areas shall be located within 100 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.

C. Operation and Maintenance Impacts

111. Operation and Maintenance of the water supply system will be carried out by Khajuraho & Nagar Parishad urban local bodies (ULB) directly or through an external operator. During the system design life (15/30 years for mechanical/civil components) it shall not require major repairs or refurbishments and should operate with little maintenance beyond routine actions

⁴ 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.

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.

112. Recurrence of pipe bursting and leakage problems can be managed by the leak detection and water auditing surveys. The ULB will be required to ensure that the leak detection and rectification time is minimized.

113. Since back water is recovered and recirculated in the WTP, no wastewater will be generated from water treatment process. The sludge generated from the wash water storage tank, and sedimentation tanks

(xviii)

114. Water treatment process will generate sludge from sedimentation of particulate matter in raw water, flocculated and precipitated material resulting from chemical coagulation, residuals of excess chemical dosage, plankton etc; and waste from rinsing and back washing of filter media containing debris, chemical precipitates, straining of organic debris and plankton. . Following are included in the subproject design to dispose the sludge and back wash:

- (i) Provision for recirculation system for filter backwash – backwash water from filter beds will be sent to a storage tank, and after allowing adequate time for settlement of solids, clarified water will be pumped to WTP inlet. This arrangement will avoid pollution and also minimize wastage of water.
- (ii) Accumulated sludge from clariflocculators, filter backwash etc., will be disposed-off at sludge drying beds for natural drying. Dried sludge will be disposed off in a land fill or used as soil conditioner if it is suitable.
- (iii) The citizens of the Khajuraho and Rajnagar Nagar Parishads will be the major beneficiaries of the improved water supply system, as they will be provided with a constant supply of better quality water, piped into their homes at an appropriate pressure. The project will improve the over-all health condition of the town as water borne diseases will 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. This should also improve the environment of these areas, should deliver major improvements in individual and community health and well-being.

VI. PUBLIC CONSULTATION AND INFORMATION DISCLOSURE

A. Overview

115. 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 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.

116. Most of the main stakeholders have already been identified and consulted during preparation of 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 near sites where facilities will be built (WTP and water tanks), and government and utility agencies responsible for provision of services in Khajuraho and Rajnagar, Archeological Survey of India, Forest Department, and Madhya Pradesh 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 (MPUDC, PMU and PIUs), Government of India and the ADB.

B. Public Consultation

117. The public consultation and disclosure program is a continuous process throughout the project implementation, including project planning, design and construction.

1. Consultation during Project Preparation

118. Institutional consultations were conducted with the Governmental Departments such as PMU, Pollution Control Board, Public Health Engineering Department, Water Resourced Department, ASI and Forest Department etc. The subproject proposal is formulated in consultation with Khajuraho and Rajnagar Nagar Parishad and suit the requirements of the ULBs.

119. Detailed discussions were held with the ASI Regional Director, Central Zone, at Bhopal regarding the process and time required to obtain permission for lying the transmission line in ASI land. It is transpired that the permission will be issued by National Monument Authority (NMA) Delhi based on the site inspection and recommendation by the Regional Office in Bhopal. The process will take about a month.

120. Focus-group discussions with affected persons and other stakeholders were conducted to learn their views and concerns. A socio economic household survey has been conducted in the town, covering sample households, to understand the household characteristics, health status, and the infrastructure service levels, and also the demand for infrastructure services. General public and the people residing along the project activity areas were also consulted during visits to the project sites. A consultation meeting was conducted in December 2015 with NGOs actively working in Chhatarpur district. Details of the public consultations are provided in **Appendix 8.**

(xix)

121. 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), which may affect the tourist season. Project team explained that works will be appropriately scheduled to avoid work near tourist places during peak tourist season of December – February.

2. Consultation during construction

122. Prior to start of construction, ULB and PIU with the assistance of PMC will conduct information dissemination sessions at various places and solicit the help of the local community, leaders/prominent for the project work. 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.

123. A constant communication will be established with the affected communities to redress the environmental issues likely to surface during construction phases and also regarding the grievance redress mechanism. ULB/PIU and PMC 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

124. Executive summary of the IEE will be translated in Hindi and made available at the offices of PMU, PIU, Nagar Parishad offices, and also displayed on their notice boards. 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 MPUDC, PMU after approval of the IEE by Government and ADB. Stakeholders will also be made aware of grievance register and redress mechanism.

125. Public information campaigns 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 of progress and future plans. Prior to start of construction, the PMU/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.

126. 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 advertising, pamphlets, radio broadcasts, road signage, etc.

VII. GRIEVANCE REDRESS MECHANISM

A. Project Specific Grievance Redress Mechanism

127. A program-specific grievance redress mechanism (GRM) shall be established to receive, evaluate, and facilitate the resolution of AP's concerns, complaints, and grievances about the social and environmental performance at the level of the project. The following GRM provides a time-bound and transparent mechanism to voice and resolve social and environmental concerns linked to the project.

128. A common GRM will be in place for social, environmental, or any other grievances related to the project. The GRM will provide an accessible and trusted platform for receiving and facilitating resolution of affected persons' grievances related to the program. The multi-tier GRM for the project is outlined below, each tier having time-bound schedules and with responsible persons identified to address grievances and seek appropriate persons' advice at each stage, as required. ULB-wide public awareness campaigns will ensure that awareness on grievance redress procedures is generated through the campaign.

129. **Who can complain:** A complaint may be brought by persons who are, or could be, "directly, indirectly, materially, and adversely" affected by the project. A complaint can be submitted on behalf of the affected person/people by a representative, provided that he or she identifies the affected person/people and includes evidence of the authority to act on their behalf.

130. **What the Grievance/Complain should contain:** Any concerns pertaining to safeguard compliance - environment, involuntary resettlement, indigenous people, design related issues, compensation, service delivery or any other issues or concerns related to the project. The complaint must contain name, date, address/contact details of the complainant, location of the problem area, along with the problem. In addition, online filing using the state's existing grievance redress mechanism or telephone helpline will also be open to use by affected persons.⁵

131. **Where to file a Complaint:** Complainants will have the flexibility of conveying grievances/suggestions by dropping or reporting grievance redress/suggestion forms in complaints/suggestion boxes to be installed by project at Khajuraho and Rajnagar Nagar Parishad offices, PIU offices, CM (Chief Minister) Helpline or by e-mail or by writing in a complaints register in the PIU offices or at construction site offices.

132. **How to file a Complaint:** The application should be precise and specific. The application can be sent either by post or through electronic means or deliver personally. A sample grievance form is at **Appendix 9**.

- (i) Offline System - The application can be made on the application form available at all accessible places (NPs/ Office of PIUs/ construction site offices). The application should have the name and complete postal address of the applicant.
- (ii) Online System - Grievances pertaining to the implementation of the project can also be filed online at the website of MPUDC/PMU or by e-mails.

133. **Documentation:** Documentation of the complaints is important and must contain 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. PMU with the support of PIU will have the overall responsibility for timely grievance redress, and for registration of grievances, related disclosure, and communication with the aggrieved party. All the documents made available to the public at the community level (at ward offices) and will include information on the contact number, address and contact person for registering grievances, and will be disseminated throughout the project area by the PIU.

134. **Grievance/Problem Redress through Participatory Process:** Efforts must be made by the PIU with the support of safeguard consultants to resolve problems amicably, conflicts through participatory process with the community and the Nagar Parishads. In case of grievances that are immediate and urgent in the perception of the complainant, the Contractor, and supervision personnel from the PIU will provide the most easily accessible or first level of contact for the quick resolution of grievances. Contact phone numbers and names of the concerned staff and contractors, will be posted at all construction sites at visible locations.

135. Following process will be followed:

⁵ Government of Madhya Pradesh has a special program called Chief Minister's Monitoring Programme, which monitors development programs in the state and provides for online registration of complaints. The Public Grievance Redressal Department of GoMP clearly displays the Chief Minister's Helpline Number, through which persons may lodge complaints directly to the highest authority in the state. The website of the Public Grievance Redressal Department also provides a kiosk locator for district level grievance redress kiosks. <http://www.mp.gov.in/web/guest/home>.

- (i) **1st level grievance.** In case of grievances that are immediate and urgent in the perception of the complainant, PMC supervising staff will direct the contractor to and ensures that it is resolved. If the grievance is not under the contractor scope, but under the program, PMC (field office) will resolve this issue. All the grievances should be resolved within 3 days of receipt of a complaint/grievance. The complaints/grievances received in the CM helpline that are related to MPUSIP will be referred to project GRM at this first level. CM helpline staff will be included in the GRM training so that they can identify the related grievances and forward to this project GRM.
- (ii) **2nd level grievance.** All grievances that cannot be redressed at first level within 3 days will be brought to the notice of PIU and PMC Assistant Environmental Specialist. PIU will review the grievance and act appropriately to resolve it within 10 days of receipt.
- (iii) **3rd level grievance.** All the grievances that are not addressed at 2nd level by PIU within in 10 days of receipt will be brought to the notice of notice of the Grievance Redressal Committee (GRC).⁶ GRC will meet twice a month and determine the merit of each grievance brought to the committee. The GRC will resolve the grievance within 1 month of receiving the complaint. All decisions taken by the GRC will be communicated to complainant by the Nodal Officer.

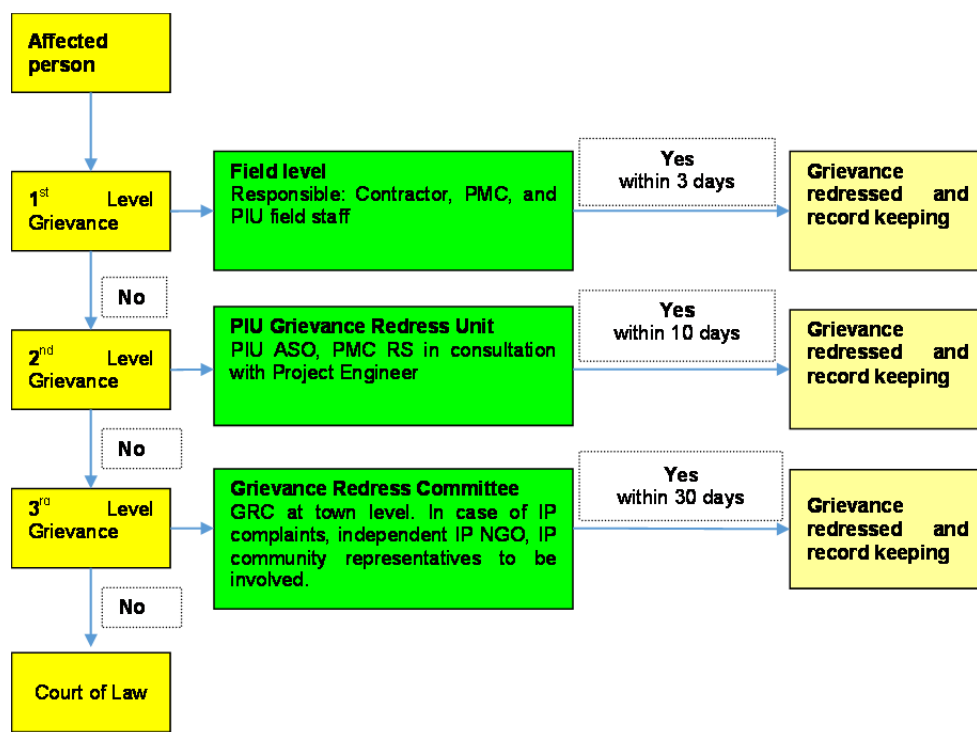
136. In case of any inter-departmental or inter-jurisdictional coordination required for resolution of specific grievances, the PIU will refer the matter directly to the PMU for state-level or inter-departmental coordination and resolution, instead of the town-level GRC. The project GRM notwithstanding, 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. Alternatively, if the grievance is related to land acquisition, resettlement & rehabilitation,⁷ the APs can approach the Land Acquisition, Rehabilitation and Resettlement Authority (LARRA) of Madhya Pradesh, established under the Right to Fair Compensation and Transparency in Land Acquisition, Rehabilitation, and Resettlement Act, 2013.

137. **Record-keeping.** PIU will keep records of grievances received, corrective actions taken and the final outcome. The number of grievances recorded and resolved and the outcomes will be displayed/disclosed in the PIU office, ULB offices, and on the web.

⁶ Grievance redress committee (GRC) will be formed at town-level with members composed of: ULB Chairperson, ULB CMO, Environmental Specialist of PMC, PIU Dy.PM and PIU Community Development Officer. In case of any complaints by IP or members of scheduled tribes, the PIU will include as special member, a representative of an independent local NGO involved in tribal welfare. Special invitees to hearing of IP complaints will include two representatives from affected IP community and the project IP NGO, if appointed for IPP implementation.

⁷ the Authority admits grievance only with reference to the LA and R&R issues under the new Act

Figure 12: MPUSIP Grievance Redress Mechanism



Note: ASO=Assistant Safeguard Officer, GRC = Grievance Redressal Committee; PMC = Project Management Consultants, PMU = Project Management Unit

VIII. ENVIRONMENTAL MANAGEMENT PLAN

A. Environmental Management Plan

138. An environmental management plan (EMP) has been developed to provide mitigation measures to reduce all negative impacts to acceptable levels.

139. The EMP will guide the environmentally-sound construction of the subproject and ensure efficient lines of communication between MPUDC, project management unit (PMU), project implementing unit (PIU), consultants and contractors. The EMP will (i) ensure that the activities are undertaken in a responsible non-detrimental manner; (ii) provide a pro-active, feasible and practical working tool to enable the measurement and monitoring of environmental performance on site; (iii) guide and control the implementation of findings and recommendations of the environmental assessment conducted for the subproject; (iv) detail specific actions deemed necessary to assist in mitigating the environmental impact of the subproject; and (v) ensure that safety recommendations are complied with. The EMP includes a monitoring program to measure the environmental condition and effectiveness of implementation of the mitigation measures. It will include observations on- and off-site, document checks, and interviews with workers and beneficiaries.

140. The contractor will be required to submit to PIU, for review and approval, a site environmental plan (SEP) 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; (iii) monitoring program as per

SEP; and (iv) budget for SEP implementation. No works are allowed to commence prior to approval of SEP.

141. A copy of the EMP/approved SEP will be kept on site during the construction period at all times. The EMP included in the bid and contract documents. Non-compliance with, or any deviation from, the conditions set out in this document constitutes a failure in compliance.

142. For civil works, the contractor will be required to (i) carry out all of the mitigation and monitoring measures set forth in the approved SEP; and (ii) 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 SEP. The contractor shall allocate budget for compliance with these SEP measures, requirements and actions.

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

Table 8: Design Stage Environmental Management Plan

Field	Anticipated Impact	Mitigation Measures	Responsible for Implementation/ Monitoring	Cost and Source of Funds
Design of water supply system	Unsustainable source; resource & energy use	<ul style="list-style-type: none"> (i) Discontinuation of current unsustainable groundwater source and creating a new comprehensive water supply system based on a nearest surface water source (ii) Recovering wash water from treatment process (iii) Treatment and reuse of sludge from treatment process (iv) Minimizing water losses from pipelines by perfect jointing and alignments using appropriate techniques (HDPE pipes up to 150 mm dia joined by electro fusion couplers using on-site electro fusion welding, and all higher dia pipes by on site butt welding) (v) Minimizing overall resource use by combining bulk water facilities for Rajnagar and Khajuraho towns (vi) Designing the entire system to maintain optimal flow and terminal pressure, and optimising the overall energy usage vii Reducing the incidence of water borne diseases by providing 100% population including urban poor with potable water supplies (viii) Preparation and implementation of a water quality surveillance program including development of a laboratory as part of the project by DBO contractor to ensure that supplied water meets the drinking water standards (ix) Development of laboratory with all necessary environment, health and safety measures and adopting international standard procedures for water quality testing (x) Improve water use efficiency and reduce water wastage at household level by recording and monitoring the water usage, and charging the consumers as per usage; due consideration to urban poor (xi) Minimize unaccounted for water (UFW) losses using district metered area approach with flow meter and pressure logging arrangements to identify and rectify the leaks, and unauthorized connections (xii) Using low-noise and energy efficient pumping systems 	DBO Contractor / PMU	Project Costs
Water abstraction from Kutni dam	Project sustainability & water use conflicts	<ul style="list-style-type: none"> (i) Obtain permission from Water resources department, GoMP, prior to bid process 	PMU & Khajuraho & Rajnagar Nagar Parishads	Project Costs
Chlorine usage as disinfectant at WTP and Karrohi ESR	Chlorine handling & application risk – health & safety risk to workers and general public	<p>Provide the following measure at the chlorine application unit:</p> <ul style="list-style-type: none"> (i) Chlorine neutralization pit with a lime slurry feeder (ii) Proper ventilation, lighting, entry and exit facilities (iii) Facility for isolation in the event of major chlorine leakage (iv) Personal protection and safety equipment for the operators in the chlorine plant (v) Provide training to the staff in safe handling and application of chlorine; this shall be included in the contract of Chlorinator supplier (vi) Supplier of Chlorinator equipment shall provide standard operating manual for safe operation and as well as maintenance and repairs; preferably these shall be provided both 	DBO Contractor / PMU	Project Costs

Field	Anticipated Impact	Mitigation Measures	Responsible for Implementation/ Monitoring	Cost and Source of Funds
		in English and Hindi Languages		
Socio cultural resource	Encroachment / damage to protected monuments and chance finds	(i) Obtain ASI permission for laying of water pipelines within 300 m of protected monuments prior to start of bidding (ii) Include ASI as project stakeholder, Khajuraho local representative of ASI should be included in the town level committee (iii) Proper procedures (protocol) shall be used by the construction contractors in conducting any excavation work, to ensure that any chance finds are recognised and measures are taken to ensure they are protected and conserved. This should involve: <ul style="list-style-type: none"> • Having excavation observed by a person with archaeological field training; contractor should employ a person with a formal certification course in archaeology from recognized (such as Institute of Archaeology, ASI, Delhi) during the ground excavation activities • Conduct awareness training to contractor & supervision staff prior to start of excavation • Stopping work immediately to allow further investigation if any finds are suspected; • Calling in the ASI if a find is suspected, and taking any action they require to ensure its removal or protection in site. 	PIU & Khajuraho & Rajnagar Nagar Parishads	Project Costs

Table 9: 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
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	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), waste management	-

Field	Anticipated Impact	Mitigation Measures	Responsible for Implementation	Monitoring of Mitigation	Cost and Source of Funds
		<p>contractors to prepare a contingency plan to include actions to be taken in case of unintentional interruption of services.</p> <p>(iii) Require contractors to prepare spoils (waste) management plan (Appendix 10) and traffic management plan (Appendix 11)</p>		plan and traffic management plan	
Construction work camps, stockpile areas, storage areas, and disposal areas.	Conflicts with local community; disruption to traffic flow and sensitive receptors	<p>(i) Prioritize areas within or nearest possible vacant space in the project location;</p> <p>(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;</p> <p>(iii) Do not consider residential areas;</p> <p>(iv) Take extreme care in selecting sites to avoid direct disposal to water body which will inconvenience the community.</p> <p>(v) For excess spoil disposal, ensure (a) site shall be selected preferably from barren, infertile</p>	DBO Contractor to finalize locations in consultation and approval of PIU	<p>(i) List of selected sites for construction work camps, hot mix plants, stockpile areas, storage areas, and disposal areas.</p> <p>(ii) Written consent of landowner/s (not lessee/s)</p>	-

Field	Anticipated Impact	Mitigation Measures	Responsible for Implementation	Monitoring of Mitigation	Cost and Source of Funds
		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.			
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.	<ul style="list-style-type: none"> (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;	-

Field	Anticipated Impact	Mitigation Measures	Responsible for Implementation	Monitoring of Mitigation	Cost and Source of Funds
Consents, permits, clearances, NOCs, etc.	Failure to obtain necessary consents, permits, NOCs, etc. can result to design revisions and/or stoppage of works	<ul style="list-style-type: none"> (i) Obtain all necessary consents, permits, clearance, NOCs, etc. prior to award of civil works. (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 	PIU and PMC	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.
Asbestos Cement Pipes	Health risk due to exposure to asbestos materials	<ul style="list-style-type: none"> (i) Obtain details from PHED/NPs on location of underground AC pipes (ii) Locate the new pipe/sewer carefully to avoid encountering AC pipes (ii) Leave the AC pipes undisturbed in the ground. 	DBO Contractor in coordination with PIU and PMC	(i) Detailed construction drawings showing alignment of AC pipes	No cost required. Mitigation measures are part of TOR of PIU and PMDSC

Table 10: 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) Project manager and all key workers will be required to undergo training on EMP implementation including spoils/waste management, Standard operating procedures (SOP) for construction works; occupational health and safety (OH&S), core labor laws, applicable environmental laws, etc.	DBO Contractor	(i) Certificate of Completion (Safeguards Compliance Orientation) (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 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.	(i) Damp down exposed soil and any stockpiled material on site by water sprinkling; (ii) Use tarpaulins to cover sand and other loose material when transported by trucks; (iii) Clean wheels and undercarriage of haul trucks prior to leaving construction site (iv) Disallow access in the work area except workers to limit soil disturbance and prevent access by barricading and security personnel (v) Fit all heavy equipment, and machinery with air pollution control devices which are operating correctly; all the vehicle shall meet the emission norms and shall have valid pollution under control (PUC) certificate (Appendix 3)	DBO Contractor	(i) Location of stockpiles; (ii) Complaints from sensitive receptors; (iii) Heavy equipment and machinery with air pollution control devices; (iv) Pollution under control certificate	Cost for implementation of mitigation measures responsibility of contractor.
Surface water quality	Mobilization of settled silt materials, and chemical contamination from fuels and lubricants during installation of pipelines can contaminate nearby surface water quality.	(i) All earthworks be conducted during the dry season to prevent the problem of soil run-off during monsoon season; (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	DBO Contractor	(i) Areas for stockpiles, storage of fuels and lubricants and waste materials; (iii) Records of surface water quality inspection; (iv) Effectiveness of water management	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
		<p>and materials in the construction works. If spoils will be disposed, only designated disposal areas shall be used;</p> <p>(iv) Install temporary silt traps or sedimentation basins along the drainage leading to the water bodies;</p> <p>(v) Place storage areas for fuels and lubricants away from any drainage leading to water bodies;</p> <p>(vi) Dispose any wastes generated by construction activities in designated sites; and</p> <p>(vii) Conduct surface quality inspection according to the Environmental Management Plan (EMP).</p>		<p>measures;</p> <p>(v) No visible degradation to nearby drainages, nallahs or water bodies due to civil works</p>	
	Pollution of Kutni dam due to jack well construction	<p>(i) Select a construction methodology that is least disturbing, and appropriate for the in-situ soil condition, and able to complete the construction work prior to onset of monsoon</p> <p>(ii) Schedule the construction works during low water level period – late winter months to pre monsoon (February – June/July); ensure that works are completed during the same period to prior to onset of monsoon; confirm with dam authorities on release of water; avoid scheduling the works during water release period.</p> <p>(iii) Erect temporary barriers to form enclosed construction area with least disturbance</p> <p>(iv) Allow adequate time settle the distributed solids to prior to pumping out water; only clear/clarified water shall be pumped back into the reservoir; any silt laden water should be</p>	DBO contractor	<p>(i) No visible degradation to nearby drainages, nallahs or water bodies due to civil works</p> <p>(ii) water quality monitoring results</p>	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
		pumped to a silt pond (v) Avoid/minimize use of fuels, chemicals and lubricants; ensure no spillage			
Noise Levels	Increase in noise level due to earth-moving and excavation equipment, and the transportation of equipment, materials, and people	<ul style="list-style-type: none"> (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) 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 use portable street barriers to minimise 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) Identify any buildings at risk from vibration damage and avoiding any use of pneumatic drills or heavy vehicles in the vicinity; (vi) Consult the ASI 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. (vii) Excavation and construction methodology to be used near the monuments (within the regulated area of 300 m of any monument) shall be finalized in consultation with ASI office in Khajuraho; no equipment causing vibration and heavy noise should be used 	DBO Contractor	<ul style="list-style-type: none"> (i) Complaints from sensitive receptors; (ii) Use of silencers in noise-producing equipment and sound barriers; (iii) Equivalent day and night time noise levels 	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
Landscape and aesthetics	Impacts due to 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.	<ul style="list-style-type: none"> (i) Prepare and implement a Construction Waste Management Plan (ii) Stockpiles, lubricants, fuels, and other materials should be located away from steep slopes and water bodies; (iii) Avoid stockpiling any excess spoils. Excess excavated soils should be disposed to approved designated areas; (iv) Domestic solid wastes should be properly segregated in biodegradable and non-biodegradable for collection and disposal to designated solid waste disposal site; (v) Residual and hazardous wastes such as oils, fuels, and lubricants shall be disposed in disposal sites approved by local authorities; (vi) Prohibit burning of construction and domestic waste; (vii) Ensure that wastes are not haphazardly dumped within the project site and adjacent areas. (viii) Get approval of PIU in writing that the necessary environmental restoration work has been adequately performed before acceptance of work. 	DBO Contractor	<ul style="list-style-type: none"> (i) Complaints from sensitive receptors; (ii) Worksite clear of hazardous wastes such as oil/fuel (iv) Worksite clear of any excess excavated earth, excess construction materials, and solid waste such as removed concrete, wood, packaging materials, empty containers 	Cost for implementation of mitigation measures responsibility of contractor.
Existing Infrastructure and Facilities	Disruption of service and damage to existing infrastructure at specified project location	<ul style="list-style-type: none"> (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 	DBO Contractor	Existing Utilities Contingency Plan	Cost for implementation of mitigation measures responsibility of contractor.
Ecological Resources – Terrestrial	Loss of vegetation and tree cover	<ul style="list-style-type: none"> (i) Minimize removal of vegetation and disallow cutting of trees; (ii) If tree-removal will be required, obtain tree-cutting permit and (iii) Plant 5 native trees for every one 	DBO Contractor	PIU to report in writing the no of trees cut and planted.	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
		that is removed.			
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 problems and conflicts near project locations and haul road	<ul style="list-style-type: none"> (i) Confine work areas along the roads to the minimum possible extent; all the activities, including material & waste/surplus soil stocking should be confined to this area. Proper barricading should be provided; avoid material/surplus soil stocking in congested areas – immediately removed from site/ or brought to the as and when required (ii) Leave spaces for access between mounds of soil; (iii) Provide walkways and metal sheets where required to maintain access across for people and vehicles; (iv) Plan transportation routes so that heavy vehicles do not use narrow local roads, except in the immediate vicinity of delivery sites; (v) Schedule transport and hauling activities during non-peak hours; (vi) Locate entry and exit points in areas where there is low potential for traffic congestion; (vii) Keep the site free from all unnecessary obstructions; (viii) Drive vehicles in a considerate manner; (ix) Coordinate with Traffic Police for temporary road diversions, where necessary, and for provision of traffic aids if transportation activities cannot be avoided during peak hours (x) Notify affected public by public information notices, providing sign 	Construction Contractor	<ul style="list-style-type: none"> (i) Traffic route during construction works including number of permanent signages, barricades and flagmen on worksite (Appendix 11); (ii) Complaints from sensitive receptors; (iii) Number of signages placed at project location. 	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
		<p>boards informing nature and duration of construction works and contact numbers for concerns/complaints.</p> <p>For works in very narrow roads</p> <p>(i) Inform the affected local population 1-week in advance about the work schedule</p> <p>(ii) Plan and execute the work in such a way that the period of disturbance/ loss of access is minimum.</p> <p>(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.</p>			
Socio-Economic – Income.	Impede the access of residents and customers to nearby shops	<p>(i) Leave spaces for access between mounds of soil;</p> <p>(ii) Provide walkways and metal sheets where required to maintain access across for people and vehicles;</p> <p>(iii) Increase workforce in the areas with predominantly institutions, place of worship, business establishment, hospitals, and schools;</p> <p>(iv) Consult businesses and institutions regarding operating hours and factoring this in work schedules; and</p> <p>(v) Provide sign boards for pedestrians to inform nature and duration of construction works and contact numbers for concerns/complaints.</p> <p>(vi) Notify community/ water users in advance about likely interruptions in water supply.</p> <p>(vii) Provide alternate sources of</p>	DBO Contractor	<p>(i) Complaints from sensitive receptors;</p> <p>(ii) Spoils management plan</p> <p>(iii) Number of walkways, signages, and metal sheets placed at project location.</p>	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
		clean water until water supply is restored.			
Socio-Economic - Employment	Generation of temporary employment and increase in local revenue	(i) Employ at least 50% of the labour force, or to the maximum extent, local persons within the 2-km immediate area if manpower is available; (iii) Comply with labor laws	DBO Contractor	(i) Employment records; (ii) Compliance to labor laws (see Appendix 6 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 6 of this IEE) (ii) Develop and implement site-specific occupational health and safety (OH&S) 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 like helmet, gumboot, safety belt, gloves, nose musk and ear plugs; (c) OH&S Training for all site personnel; (d) documented procedures to be followed for all site activities; and (e) documentation of work-related accidents; (ii) Ensure that qualified first-aid can be provided at all times. Equipped first-aid stations shall be easily accessible throughout the site; (iii) Provide medical insurance coverage for workers; (iv) Secure all installations from unauthorized intrusion and accident risks; (v) Provide supplies of potable drinking water; (vi) Provide clean eating areas where workers are not exposed to hazardous or noxious	DBO Contractor	(i) Site-specific OH&S Plan; (ii) Equipped first-aid stations; (iii) Medical insurance coverage for workers; (iv) Number of 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&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 (see	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
		<p>substances;</p> <p>(vii) 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;</p> <p>(viii) 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;</p> <p>(ix) Ensure the visibility of workers through their use of high visibility vests when working in or walking through heavy equipment operating areas;</p> <p>(x) Ensure moving equipment is outfitted with audible back-up alarms;</p> <p>(xi) 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</p> <p>(xii) 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.</p>		Appendix 6 of this IEE)	

Field	Anticipated Impact	Mitigation Measures	Responsible for Mitigation	Monitoring of Mitigation	Cost and Source of Funds
Asbestos Cement (AC) Materials	Health risks associated with AC pipes	(i) leave AC pipes in-situ untouched	DBO Contractor	(i) on site observations & records	Cost for implementation of mitigation measures responsibility of contractor.
Community Health and Safety.	Traffic accidents and vehicle collision with pedestrians during material and waste transportation	(i) Plan routes to avoid times of peak-pedestrian activities. (ii) Liaise with PIU/ULB in identifying high-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.	DBO Contractor	(i) Traffic Management Plan; (ii) Complaints from sensitive receptors	Cost for implementation of mitigation measures responsibility of contractor.
Safety of sensitive groups (children, elders etc.) and others 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	DBO Contractor	Complaints from neighborhood and monitoring of accidents	Cost for implementation of mitigation measures responsibility of contractor.
Work Camps and worksites	Temporary air and noise pollution from machine operation, water pollution from storage and use of fuels, oils, solvents, and lubricants	(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;	DBO 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
	Unsanitary and poor living conditions for workers	(iv) Ensure conditions of livability at work camps are maintained at the highest standards possible at all times; Prohibit employees from poaching wildlife and cutting of trees for firewood; (v) Train employees in the storage and handling of materials which can potentially cause soil contamination; (vi) Recover used oil and lubricants and reuse or remove from the site; (vii) Manage solid waste according to the preference hierarchy: reuse, recycling and disposal to designated areas; (viii) 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) Excavation work shall be supervised by a person with archaeological training (i) Stop work immediately to allow further investigation if any finds are suspected; (iii) Call the ASI if a find is suspected, and taking any action they require to ensure its removal or protection in situ	DBO Contractor	(i) mobilization of archeologist (ii) Records of chance finds	Cost for implementation of mitigation measures responsibility of contractor.
Submission of EMP implementation report	Unsatisfactory compliance to EMP	(i) Appointment of (I) EHS Supervisor and Archeological supervisor to ensure EMP implementation (ii) Timely submission of monitoring reports including pictures	DBO contractor	Availability and competency of appointed supervisor Monthly report	Cost for implementation of mitigation measures responsibility of contractor.
Post-construction clean-up	Damage due to debris, spoils, excess construction materials	(i) Remove all spoils wreckage, rubbish, or temporary structures (such as buildings, shelters, and latrines) which are no longer required; and (ii) All excavated roads shall be	DBO Contractor	PIU/PMC report in writing that (i) worksite is restored to original conditions; (ii) camp has been vacated and restored to pre-project	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
		<p>reinstated to original condition.</p> <p>(iii) All disrupted utilities restored</p> <p>(iv) All affected structures rehabilitated/compensated</p> <p>(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.</p> <p>(vi) All hardened surfaces within the construction camp area shall be ripped, all imported materials removed, and the area shall be top soiled and regrassed using the guidelines set out in the revegetation specification that forms part of this document.</p> <p>(vii) The contractor must arrange the cancellation of all temporary services.</p> <p>(viii) Request PIU to report in writing that worksites and camps have been vacated and restored to pre-project conditions before acceptance of work.</p>		<p>conditions; (iii) all construction related structures not relevant to O&M are removed; and (iv) worksite clean-up is satisfactory.</p>	

Table 11: Environmental Management Plan of Anticipated Impacts during Operation

Field	Anticipated Impact	Mitigation Measures	Responsible for Mitigation	Monitoring of Mitigation	Cost and Source of Funds
Check for blockage and leakage problems reducing the water losses	Loss of water, increased demand and inconvenience to consumers & general public	Effectiveness of leak detection and water auditing to reduce the water losses	DBO Contractor	Khajuraho & Rajnagar Nagar Parishad/	Operating costs
Water contamination – raw water contamination at source and treated	Impacts on public health	<p>Ensure protection of water source quality (Kutni Dam), any entry of wastewater into the dam in future should be prevented.</p> <p>Contamination of treated water during transmission</p>	Khajuraho & Rajnagar Nagar Parishad	-	Operating costs

Field	Anticipated Impact	Mitigation Measures	Responsible for Mitigation	Monitoring of Mitigation	Cost and Source of Funds
water during transmission		<p>and distribution should be prevented by quickly identifying, isolating and repairing the leak section. Develop a system of leak detection and rectification.</p> <p>Prepare and implement a water quality surveillance program including development of a water quality laboratory.</p> <p>Conduct regular monitoring of raw & treated water and ensure that water supplied at all times meets the drinking water standards (Appendix 7)</p>	DBO Contractor	Khajuraho & Rajnagar Nagar Parishad/	
Discharge the impurities and other solids collected due to filtration and back wash	Pollution of streams /drains	Maintain the mechanical parts as per the maintenance plan to avoid any hazards	DBO Contractor	Khajuraho & Rajnagar Nagar Parishad/	Operating costs
Sludge generation	Land and water pollution, impacts on health & environment	Collect in an underground chamber and allow for settling and remove the solid sludge to abandoned areas	DBO Contractor	Khajuraho & Rajnagar Nagar Parishad/	Operating costs
Increased in sewage generation	Water pollution, and impacts on public health and environment	Sanitation facilities needs to be improved at community level and at the town level to suit the increased sewage generation	Khajuraho & Rajnagar Nagar Parishad/	PMU	To be identified by respective NPs
Generation of waste materials	Impacts on public health and environment	Collect solid wastes and dispose to approved disposal yards	DBO Contractor	Khajuraho & Rajnagar Nagar Parishad/	Operating costs
Occupational health and safety	Health, social and economic impacts on the workers	<p>Provide appropriate PPE and training on its proper use and maintenance.</p> <p>Use fall protection equipment when working at heights.</p> <p>Maintain work areas to minimize slipping and tripping hazards.</p> <p>Implement a training program for operators who work with chlorine regarding safe handling practices and emergency response procedures.</p> <p>Prepare escape plans from areas where there might be a chlorine emission.</p> <p>Install safety showers and eye wash stations near the chlorine equipment and other areas where hazardous chemicals are stored or used.</p>	DBO Contractor	Khajuraho & Rajnagar Nagar Parishad/	Operating costs

Field	Anticipated Impact	Mitigation Measures	Responsible for Mitigation	Monitoring of Mitigation	Cost and Source of Funds
		Prohibit eating, smoking, and drinking except in designated areas.			

Table 12: 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 12	Weekly during construction	Supervising staff and safeguards specialists	No costs required
Ambient air quality	5 locations (WTP site, two worksites each in Khajuraho & Rajnagar)	<ul style="list-style-type: none"> PM10, PM2.5 NO2, SO2, CO 	Once before start of construction Quarterly (yearly 4-times) during construction (2 year period considered)	DBO Contractor	Cost for implementation of monitoring measures responsibility of contractor (45 samples x 5000 per sample = 225,000)
Ambient noise	5 locations (WTP site, two worksites each in Khajuraho & Rajnagar)	<ul style="list-style-type: none"> Day time and night time noise levels 	Once before start of construction Quarterly (yearly 4-times) during construction (2 year period considered)	DBO Contractor	Cost for implementation of monitoring measures responsibility of contractor (45 samples x 1500 per sample = 67,500)
Surface water quality	1 location (near jack well construction site)	<ul style="list-style-type: none"> pH, Oil & grease, Cl, F, NO3, TC, FC, Hardness, Turbidity BOD, COD, DO, Total Alkalinity 	Once before start of construction monthly during construction (12 months period considered)	DBO Contractor	Cost for implementation of monitoring measures responsibility of contractor (13 samples x 4000 per sample = 52,000)

Table 13: Environmental Monitoring Plan of Anticipated Impacts during Operation

Monitoring field	Monitoring location	Monitoring parameters	Frequency	Responsibility	Cost & Source of Funds
Source water quality	Near intake point in Kutni Dam	pH, Cl, F, NO ₃ , TC, FC, Hardness, Turbidity BOD, COD, DO, Total Alkalinity heavy metals & pesticides	Yearly twice (pre & post monsoon)	DBO Contractor / ULB	O&M costs (water quality will be tested at the internal laboratory part of WTP – parameters like pesticides will be tested at an accredited laboratory)
Monitoring of quality of water supplied to consumers	Consumer end-random sampling in all zones	pH, Nitrite, Nitrate, Turbidity BOD, Total Alkalinity, Total coliform and Feacal coliform	Monthly once	DBO Contractor / ULB	O&M costs (water quality will be tested at the internal laboratory part of WTP)
Sludge quality and suitability as manure	WTP	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) <ul style="list-style-type: none"> • 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 once	DBO Contractor / ULB	O&M costs (testing to be done at an accredited external laboratory)

B. Implementation Arrangements

144. Urban Development and Housing Department (UDHD) of Government of Madhya Pradesh will be the Executing Agency for the Program, responsible for management, coordination and execution of all activities funded under the loan. Implementing Agency will be the recently established Madhya Pradesh Urban Development Company (MPUDC), a wholly owned subsidiary of GoMP. A central Project Management Unit (PMU) attached to MPUDC will be responsible for implementing the MPUSIP. The PMU will be supported by Program Implementation Units (PIUs) with a flexibility to redeployment depending upon the implementation requirements.

145. The PMU and PIUs will be supported by several teams of Design Consultants in preparation of preliminary engineering designs.

146. Water Resource Review Committee (WRRRC) is constituted to undertake a thorough review of the source when recommended by the Design Consultant in regard to techno-economic feasibility and sustainability especially ensuring climate change resilience, and Technical Review Committee (TRC) to review and approve the preliminary designs developed by the Design Consultants.

147. Project Management Consultant (PMC) centrally located in PMU and with field teams located in PIUs shall be responsible for implementation of the Program. All infrastructure contracts will be procured through performance-based contracts (PBCs) and include build-operate (BO) framework. Based on the preliminary designs prepared by Design Consultants, the DBO (design-build-operate) Contractor will design, construct, commission and operate for 10 years, after which it will be transferred to the respective ULB. The preparation, review, and approval of project design and due diligence studies including bidding process is centralized at the PMU. PIUs will provide necessary support to PMU in preparation, and will play main role in supervising the construction process.

148. Two Committees - an Empowered and Executive Committee and a Technical Clearance and Tender Committee have been constituted by the Government to be responsible for effective and timely implementation of the Program.

149. **Safeguards Compliance Responsibilities.** At PMU, there will be two safeguard specialists: (i) Project Officer (Environment) and (ii) Social & Gender Offer, who will responsible for compliance with the environmental and social safeguards in program implementation. PO (Environment) will have overall responsibility in implementation of the investment program as per the Environmental Assessment & 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. Environmental Specialist (ES) of the PMC will have primary responsibility of preparing the safeguard documents and supervising the EMP implementation, while the PO (Environment) will review, approve and oversee the compliance. At each PIU, an Assistant Project Manager will be given additional responsibilities of safeguard tasks and will be designated as Assistant Environmental Officer (ASO). ASO will oversee the safeguards implementation at PIU level and report to PO (Environment) at PMU. Specifically ASO will coordinate public consultation, information disclosure, regulatory clearances and approvals, EMP implementation and grievance redress. EHS supervisor of DBO Contractor will provide all necessary assistance to ES of PMC in updating IEEs and will supervise day-to-day EMP implementation.

150. **PMU Responsibilities.** PO (Environment) will be supported by PMC, which will be staffed with an Environmental Specialist, and Environmental Coordinators. Key tasks and responsibilities of the PO (Environment) for this subproject include the following:

1. Bidding stage:

- (i) Prior to invitation of bids for civil works contract, ensure that
 - a. Water Resources Department (WRD) permission is obtained for sourcing water from Kutni Feeder Reservoir and to construct jack well cum pump house in the reservoir
 - b. Consent for establishment (CFE) is obtained from MPPCB for WTP construction
- (ii) Ensure that EMP is included in bidding documents and civil works contracts
- (iii) Ensure that the bid/contract documents include specific provisions requiring contractors to comply with all applicable labor laws and core labor standards including:
 - a. Labour welfare measures and provision of amenities
 - b. prohibition of child labor as defined in national legislation for construction and maintenance activities;
 - c. equal pay for equal work of equal value regardless of gender, ethnicity, or caste;
 - d. elimination of forced labor;
 - e. the requirement to disseminate information on sexually transmitted diseases, including HIV/AIDS, to employees and local communities surrounding the project sites.
- (iv) Ensure that staff required for implementation of EMP (EHS officer and Archaeological Expert for Khajuaraho) is included in the bid requirements
- (v) Ensure that EMP cost is included in the project cost
- (vi) In the pre-bid meeting, provide insight into the EARF requirements, IEE update, EMP measures, and overall compliance requirements to the bidders

2. Construction stage:

- (i) Facilitate and ensure that all necessary environmental clearances/permissions, including that of contractor's are in place prior to start of construction
- (ii) Organize an induction course for the training of contractors, preparing them on EMP implementation, environmental monitoring, and on taking immediate action to remedy unexpected adverse impacts or ineffective mitigation measures found during the course of implementation.
- (iii) provide oversight on environmental management aspects of subprojects and ensure EMPs are implemented by PIU and contractors
- (iv) Supervise and provide guidance to the PIUs to properly carry out the environmental monitoring as per the EMP
- (v) Oversee grievance redress mechanism to address any grievances brought about in a timely manner; ensure that records are properly maintained

- (vi) Consolidate monthly environmental monitoring reports from PIU and submit semi-annual monitoring reports to ADB
- (vii) Oversee site closures to ensure that all work / facility sites are restored properly prior to issuing work completion certificate to the contractor

3. Operation stage:

- (i) Ensure and consent for operation (CFO) is obtained from MPPCB for WTP prior to start of operation

151. **PIU Responsibilities.** PIU will be headed by a Project Manager and supported by PMC. An Assistant Project Manager of PIU will be given additional responsibilities of safeguard tasks and will be designated as Assistant Environmental Officer (ASO). ASO will be supported by PMC Environmental Specialist and Environmental Coordinator. Key tasks and responsibilities of the ASO for this subproject include the following:

- (i) Provide necessary support to PIU and Nagar Parishads in obtaining permission from WRD and MPPCB; liaison with PMU and regulatory agencies
- (ii) Oversee day-to-day implementation of EMPs by contractors, including compliance with all government rules and regulations, take necessary action for obtaining rights of way
- (iii) Oversee environmental monitoring by contractors
- (iv) Take corrective actions when necessary to ensure no environmental impacts
- (v) Submit monthly 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 EMP

152. Contractor's Responsibilities

1. Bidding stage:

- (i) Understand the EMP requirements and allocate necessary resources (budget, staff, etc.,)
- (ii) Understand the regulatory compliance requirements related to labour welfare, safety, environment etc.,

2. Design stage:

- (xx) Review the IEE Report including the REA checklist, category and the EMP, and conduct site visits to understand the environmental sensitivity of the project sites.
- (i) Update the REA checklist, confirm the category, and update/revise the IEE Report of the project reflecting the changes /amendments /additions that are effected in the project during the detailed design
- (ii) Update / revise and finalize the EMP
- (iii) Provide all necessary technical assistance to PIU / ULB in obtaining regulatory clearances/approvals.
- (iv) Ensure that all design-related measures of the EMP, and conditions, if any, of government regulatory agencies (like MPPCB consent conditions) are duly included in the final designs.

3. Construction stage:

- (i) Ensure that all regulatory clearances (both project related and contractor related) are in place before start of the construction work.
- (ii) Mobilize EHS officer and Archaeological supervisor prior to start of work
- (iii) Confirm with PIU availability of rights of way at all project sites prior to start of work.
- (iv) Prepare and submit:
 - a. Construction waste management (CWM) plan
 - b. Traffic management (TM) plan
- (v) Implement the mitigation measures as per the EMP including CWM & TM Plans
- (vi) Follow the EMP measures/guidelines for establishment of temporary construction camps, construction waste disposal sites, and material borrow areas, etc.,
- (vii) Implement EMP and ensure compliance with all the mitigation and enhancement measures
- (viii) Conduct environmental monitoring (air, noise, water etc.,) as per the EMP
- (ix) Undertake immediate action as suggested by PIU / PMU / PMC to remedy unexpected adverse impacts or ineffective mitigation measures found during the course of implementation
- (x) Submit monthly compliance reports on EMP implementation
- (xi) Act promptly on public complaints and grievances related to construction work and redress in a timely manner in coordination with PIU
- (xii) Comply with applicable government rules and regulations

4. Operation stage:

- (xxi) Obtain CFO from MPPCB in coordination with the ULB, and comply with MPPCB conditions, if any, during the operation phase
- (xxii) Implement the operation phase EMP including the monitoring plan
- (xxiii) Submit quarterly EMP implementation report

C. Training Needs

153. The following **Table 14** 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 ES of PMC.

Table 14: Outline Capacity Building Program on EMP Implementation

Description	Target Participants& 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 Madhya Pradesh applicable safeguard laws, regulations and policies including but not limited to core labor standards, OH&S, etc. - Incorporation of EMP into the project design and contracts - Monitoring, reporting and corrective action	All staff and consultants involved in the project At PMU, Bhopal (combined program for all subprojects)	-	Included in the overall program cost

Description	Target Participants & Venue	Estimate (INR)	Cost and Source of Funds
planning			
2. EMP implementation (1/2 day) - EMP mitigation & monitoring measures - Roles and responsibilities - Public relations, - Consultations - Grievance redress - Monitoring and corrective action planning - Reporting and disclosure - Construction site standard operating procedures (SOP) -- Chance find (archeological) protocol - AC pipe protocol - Traffic management plan - Waste management plan - Site clean-up & restoration	All PIU staff, contractor staff and consultants involved in the Khajuraho-Rajnagar subproject At PIU	INR 100,000 (Lump sum)	Included in subproject cost estimates
3. Contractors Orientation to Workers (1/2 day) - Environment, health and safety in project construction	Once before start of work, and thereafter regular briefing every month once. Daily briefing on safety prior to start of work All workers (including unskilled laborers)	-	Contractors cost

D. Monitoring and Reporting

154. Immediately after mobilization and prior to commencement of the works, the contractor will submit a compliance report to PIU that all identified pre-construction mitigation measures as detailed in the EMP are undertaken. Contractor should confirm that the staff for EMP implementation (EHS & Archeological supervisors) is mobilized. PMU with the assistance of the PMC will review the report and permit commencement of works.

155. During construction, results from internal monitoring by the contractor will be reflected in their monthly EMP implementation reports to the PIU. ES will review and advise contractors for corrective actions if necessary. Quarterly report summarizing compliance and corrective measures taken will be PMC field team at PIU and submitted to PMU (**Appendix 13**). During operation, the contractor will conduct management and monitoring actions as per the operation stage EMP, and submit to PMU and ULB a quarterly report on EMP implementation and compliance.

156. Based on monthly & quarterly reports and measurements, PMU will draft, review, and submit to ADB, 6-monthly semi-annual Environmental Monitoring Report (EMR). Once concurrence from the ADB is received the report will be disclosed in the MPUDC and PMU websites.

157. ADB will review project performance against the MPUSIP 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

158. 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. The costs which are specific to EMP implementation and are not covered elsewhere in the projects are given below.

Table 15: Cost Estimates to Implement the EMP

	Particulars	Stages	Unit	Total Number	Rate (INR)	Cost (INR)	Costs Covered By
A.	Implementation staff						
1	Environmental Specialist	Design & pre construction	Per month	0.5	150,000	75,000	DBO Contract
1	EHS Supervisor	Construction	per month	24	50,000	1,200,000	DBO contract
2	Archeological supervisor	Construction	Per month	12	75,000	900,000	
	Subtotal (A)					2,175,000	
B.	Mitigation Measures						
1	Consent for establishments & consent for operation from MPPCB	Pre construction	Lump sum			100,000	Project costs
2	Provision for tree cutting & compensatory plantation measures	Construction	Per tree	100	1,000	100,000	DBO contract
3	Traffic management at work sites (Pavement Markings, Channelizing Devices, Arrow Panels and Warning Lights)	Construction	Lump sum	-	-	200,000	DBO contract
	Subtotal (B)					400,000	
C.	Monitoring Measures						
1	Air quality monitoring	Construction	per sample	45	5,000	225,000	DBO contract
2	Noise levels monitoring	Construction	Per sample	45	1,500	67,500	DBO contract
3	Surface water monitoring	Construction	Per sample	13	4,000	52,000	DBO contract
4	Source water quality, water quality at consumer end, sludge quality	Operation	Lump sum / year	-	-	70,000	DBO Contract
	Subtotal (C)					414,500	
D.	Capacity Building						
1.	Training on EMP implementation	Pre-construction	lump sum			100,000	PMU
2	Preparation of plans and protocols (traffic management plan, waste (spoils) management plan etc., chance find protocol	Pre-construction	Lump sum			50,000	DBO contract
5.	Contractors Orientation to Workers on EMP implementation	Prior to dispatch to worksite	Lump sum			25,000	DBO contract
	Subtotal (D)					175,000	
	Total (A+B+C+D)				INR	3,164,500	

Contractor Cost	- 3,064,500
PMU Cost	- 100,000
Total	- 3,164,500

IX. CONCLUSION AND RECOMMENDATIONS

159. The process described in this document has assessed the environmental impacts of all elements of the Khajuraho-Rajnagar water supply improvement 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.

160. There two important location and design aspects. First, Khajuraho is a world heritage site with a number of protected monuments within the municipal area where the project is being implemented, and second, design water supply with Kutni Dam as new water source.

161. Although none of the components are located within the protected monuments, distribution lines works will located within the regulated area around the monuments (300 m). Given the minimal excavation (0.4 m wide and 0.7 m deep), there will be no risk to any structure. Nevertheless, the works will be implemented only after due permission of ASI and also the construction methodology will be discussed with the ASI. For chance finds, works will be observed by a person with archeological background. Water source sustainability of Kutni dam has been reviewed based on the available data. Permission of water resources department is a prerequisite for this project, and this needs to be obtained prior to invitation of bids for civil works. The proposed water abstraction is just about 3% of the gross storage capacity of the dam. Water quality is appropriate for drinking water supply after treatment and disinfection.

162. 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 sand to support the pipe in the trenches; and from the disturbance of residents, businesses, traffic and important buildings by the construction work. The social impacts (access disruptions) due to construction activities are unavoidable, as the residential and commercial establishments exist along the roads where pipes will be laid. Avoidance of work at important tourist place during the peak tourist season is suggested. As the jack well works are conducted in Kutni reservoir, there is a risk of water contamination. Appropriate measures are suggested.

163. Anticipated impacts of water supply during operation and maintenance will be related to detection and repair of leaks, pipe bursts. These are, however, likely to be minimal, as proper design and selection of good quality pipe material shall mean that leaks are minimal. Leak repair work will be similar to the pipe-laying work. Application and handling of chlorine gas will involve certain risks, and appropriate measures are suggested for safe application. The DBO Contractor will implement the operation stage EMP.

164. The public participation processes undertaken during project design ensured stakeholders are engaged during the preparation of the IEE. The planned information disclosure measures and process for carrying out consultation with affected people will facilitate their participation during project implementation.

165. The project's grievance redressal mechanism will provide the citizens with a platform for redressal of their grievances, and describes the informal and formal channels, time frame, and mechanisms for resolving complaints about environmental performance.

166. The EMP will assist the PMU, PIU, PMC and DBO contractor in mitigating the environmental impacts, and guide them in the environmentally sound execution of the proposed project.

167. A copy of the EMP/approved SEP shall be kept on-site during the construction period at all times. 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.

168. The project will benefit the general public by contributing to the long-term improvement of water supply and sewerage systems and community livability in Khajuraho and Rajnagar. The potential adverse environmental impacts are mainly related to the construction period, which can be minimized by the mitigating measures and environmentally sound engineering and construction practices.

169. 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 projects require (i) permission of WRD, GoMP for water abstraction from Kutni Dam; (ii) permission of ASI for works within 300 m of protected monuments, and (iii) WTP requires Consent for Establishment (CFE) and Consent for Operation (CFO) from Madhya Pradesh Pollution Control Board. These permissions/approvals shall be obtained prior to invitation of bids..

170. This IEE shall be updated during the detailed design stage by the DBO contractor to reflect any changes, amendments and will be reviewed and approved by PMU.

APPENDIX 1: REA CHECKLIST**WATER SUPPLY****Instructions:**

- ☐ This checklist is to be prepared to support the environmental classification of a project. It is to be attached to the environmental categorization form that is to be prepared and submitted to the Chief Compliance Officer of the Regional and Sustainable Development Department.
- ☐ This checklist is to be completed with the assistance of an Environment Specialist in a Regional Department.
- ☐ 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 / Madhya Pradesh Urban Services Improvement Program –
Khajuraho – Rajnagar Water Supply Subproject

Sector Division: Urban Development

SCREENING QUESTIONS	Yes	No	REMARKS
Water Supply			
A. Project Siting Is the project area...			
▪ Densely populated?	√		Subproject activities extend to the entire town including the densely populated areas. There are no major negative impacts envisaged, because pipeline will be located in unused government lands alongside the existing roads and can be constructed without causing disturbance to, houses, and commercial establishments. In narrow streets, disruption to road users is likely, and measure like best activity scheduling, alternative routes, prior information to road users, houses and shops will minimize the impact to acceptable levels.
▪ Heavy with development activities?		√	-
▪ Adjacent to or within any environmentally sensitive areas?		√	
• Cultural heritage site	√		Khajuraho is world heritage site with a number of protected monuments. But none of the components are located within the monuments or protected areas.
• Protected Area		√	
• Wetland		√	
• Mangrove		√	
• Estuarine		√	
• Buffer zone of protected area		√	
• Special area for protecting biodiversity		√	
• Bay		√	

B. Potential Environmental Impacts Will the Project cause...			
<ul style="list-style-type: none"> Pollution of raw water supply from upstream wastewater discharge from communities, industries, agriculture, and soil erosion runoff? 		√	There are no significant water pollution sources in the catchment. Raw water quality is tested and found that it is suitable for domestic use
<ul style="list-style-type: none"> Impairment of historical/cultural monuments/areas and loss/damage to these sites? 		√	Khajuraho is a world heritage site with a number of protected monuments. However, project works do not impair any monument or sites
<ul style="list-style-type: none"> Hazard of land subsidence caused by excessive ground water pumping? 		√	Not applicable; subproject does not involve groundwater abstraction
<ul style="list-style-type: none"> Social conflicts arising from displacement of communities? 		√	Project does not involve land acquisition /displacement. No social conflicts envisaged
<ul style="list-style-type: none"> Conflicts in abstraction of raw water for water supply with other beneficial water uses for surface and ground waters? 		√	No; the water will be abstracted only with due permission of government and allocation of water from Kutni dam for water supply of Kjahuraho and Rajnagar. Drinking water is priority as per the MP water policy. Moreover, water abstraction is just about 3% of gross storage.
<ul style="list-style-type: none"> Unsatisfactory raw water supply (e.g. excessive pathogens or mineral constituents)? 		√	Raw water quality is tested and found that it is suitable for domestic use. Bacteriological contamination is noticed, and water will be subjected for treatment prior to supply
<ul style="list-style-type: none"> Delivery of unsafe water to distribution system? 		√	Water will be treated and disinfected prior to supply
<ul style="list-style-type: none"> Inadequate protection of intake works or wells, leading to pollution of water supply? 		√	Water is abstracted from Kutni reservoir. There are no major polluting sources in the catchment.
<ul style="list-style-type: none"> Over pumping of ground water, leading to salinization and ground subsidence? 		√	-
<ul style="list-style-type: none"> Excessive algal growth in storage reservoir? 		√	Regular cleaning of storage tanks will be conducted during operation
<ul style="list-style-type: none"> Increase in production of sewage beyond capabilities of community facilities? 	√		Sewerage system is also being planned for project towns under the MPUSIP
<ul style="list-style-type: none"> Inadequate disposal of sludge from water treatment plants? 		√	Appropriate provisions for sludge drying and disposal is included in the project
<ul style="list-style-type: none"> Inadequate buffer zone around pumping and treatment plants to alleviate noise and other possible nuisances and protect facilities? 		√	-
<ul style="list-style-type: none"> Impairments associated with transmission lines and access roads? 		√	-
<ul style="list-style-type: none"> Health hazards arising from inadequate design of facilities for receiving, storing, and handling of chlorine and other hazardous chemicals. 		√	Measures for safe handling of chlorine are included
<ul style="list-style-type: none"> Health and safety hazards to 		√	Measures for safe handling of chlorine are included

workers from the management of chlorine used for disinfection and other contaminants?			
• Dislocation or involuntary resettlement of people		√	There is no resettlement of people for project implementation.
• 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 unavoidable, labour camps and facilities will be provided appropriately. No conflicts envisaged
• Noise and dust from construction activities?	√		All the construction machineries employed will comply with noise emission standards of Central Pollution Control Board. Dust suppression measures such as water sprinkling will be employed
• Increased road traffic due to interference of construction activities?	√		Excavation and laying pipelines along public roads will interfere with the traffic. Construction material transport will increase traffic within city. Proper traffic management and construction planning will be ensured to minimize the interference
• Continuing soil erosion/silt runoff from construction operations?	√		Construction work during monsoon shall be carried out with due care so that silt run off due to construction operation is prevented. No construction will be allowed during rains.
• Delivery of unsafe water due to poor O&M treatment processes (especially mud accumulations in filters) and inadequate chlorination due to lack of adequate monitoring of chlorine residuals in distribution systems?		√	No; appropriate O&M will be conducted
• Delivery of water to distribution system, which is corrosive due to inadequate attention to feeding of corrective chemicals?		√	Not envisaged
• Accidental leakage of chlorine gas?		√	Measures for safe handling of chlorine are included
• Excessive abstraction of water affecting downstream water users?		√	Water abstraction will be limited to the allocated quantity for Khajuraho and Rajnagar
• Competing uses of water?		√	Water abstraction will be limited to the allocated quantity for Khajuraho and Rajnagar
• Increased sewage flow due to increased water supply	√		Sewerage system is also being planned for project towns under the MPUSIP
• Increased volume of sullage (wastewater from cooking and washing) and sludge from wastewater treatment plant	√		Sewerage system is also being planned for project towns under the MPUSIP

Climate Change and Disaster Risk Questions The following questions are not for environmental categorization. They are included in this checklist to help identify potential climate and disaster risks.	Yes	No	Remarks
Is the Project area subject to hazards such as earthquakes, floods, landslides, tropical cyclone winds, storm surges, tsunami or volcanic eruptions and climate changes?	√		Semi-arid zone, unreliable rainfall, less vegetation cover. Promote more efficient use of water by reducing losses and wastage to counter increased demands due to higher temperatures.
Could changes in temperature, precipitation, or extreme events patterns over the Project lifespan affect technical or financial sustainability (e.g., changes in rainfall patterns disrupt reliability of water supply; sea level rise creates salinity intrusion into proposed water supply source)?	√		Reduction in rainfall may affect the water availability from dam. Given the priority for drinking water supply, dead storage will be utilized in case of low rain fall years
Are there any demographic or socio-economic aspects of the Project area that are already vulnerable (e.g., high incidence of marginalized populations, rural-urban migrants, illegal settlements, ethnic minorities, women or children)?		√	No
Could the Project potentially increase the climate or disaster vulnerability of the surrounding area (e.g., by using water from a vulnerable source that is relied upon by many user groups, or encouraging settlement in earthquake zones)?		√	No

APPENDIX 2: NATIONAL AMBIENT AIR QUALITY STANDARDS

SL NO:	Pollutants	Time weighted average	Concentration in ambient air		Method of measurement
			Industrial, Residential, Rural & Other Areas	Ecologically Sensitive Areas	
1	Sulphur Dioxide (SO ₂) µg/m ³	Annual 24 hours	50 80	20 80	Improved West and Geake-Ultraviolet fluorescence
2	Nitrogen Dioxide (NO ₂) µg/m ³	Annual 24 hours	40 80	30 80	Modified Jacob &Hochheiser (Na-Arsenite) Chemiluminescence
3	Particulate Matter (Size less than 10 µm) or PM10 µg/m ³	Annual 24 hours	60 100	60 100	Gravimetric -TOEM -Beta attenuation
4	Particulate Matter (Size less than 2.5 µm) or PM2.5 µg/m ³	Annual 24 hours	40 60	40 60	Gravimetric -TOEM -Beta attenuation
5	Carbon Monoxide (CO) mg/m ³	8 hours 1 hours	02 04	02 04	Non Dispersive Infra Red (NDIR) Spectroscopy

APPENDIX 3: VEHICLE EXHAUST EMISSION NORMS**1. Passenger Cars**

Norms	CO(g/km)	HC+ NO _x (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)

2. Heavy Diesel Vehicles

Norms	CO(g/kmhr)	HC (g/kmhr)	NO _x (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

Source: Central Pollution Control Board

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

APPENDIX 4: NATIONAL AMBIENT AIR QUALITY STANDARDS IN RESPECT OF NOISE

Area code	Category of area/zone	Limit in dB (A)	
		Day time	Night time
A	Industrial area	75	70
B	Commercial area	65	55
C	Residential area	55	45
D	Silence zone	50	40

APPENDIX 5: EXTRACT FROM CONSTRUCTION & 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 devise 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 of 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 6: SALIENT FEATURES OF MAJOR LABOR LAWS APPLICABLE TO ESTABLISHMENTS ENGAGED IN CONSTRUCTION OF CIVIL WORKS

- (i) Workmen Compensation Act, 1923 - The Act provides for compensation in case of injury by accident arising out of and during the course of employment.
- (ii) 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.
- (iii) 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.
- (iv) Maternity Benefit Act, 1951 - The Act provides for leave and some other benefits to women employees in case of confinement or miscarriage etc.
- (v) 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.
- (vi) Minimum Wages Act, 1948 - The employer is supposed to pay not less than the Minimum Wages fixed by appropriate Government as per provisions of the Act if the employment is a scheduled employment. Construction of Buildings, Roads, Runways are scheduled employment.
- (vii) 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.
- (viii) 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.
- (ix) 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.
- (x) 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.

(xi) 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.

(xii) 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.

(xiii) 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.

(xiv) 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

(xv) 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.

APPENDIX 7: DRINKING WATER STANDARDS

No.	Substance or characteristic	Requirement Desirable limit	Undesirable effect outside the desirable	Permissible limit in the absence of alternate Source	Remarks
Essential Characteristic					
1.	Colour Hazen Units, Max	5	Above 5, consumer acceptance decreases	25	Extended to 25 only if toxic Substance are not suspect in absence of alternate sources
2.	Odour	Unobjectionable	-	-	a) test cold and when heated b) test are several dilutions
3.	Taste	Agreeable	-	-	Test to be conducted only after safely has been established
4.	Turbidity (NTU) Max	5	Above 5, consumer acceptance decreases	10	-
5.	pH value	6.5 to 8.5	Beyond this range the water will alter the mucous membrane and/or water supply system	No relaxation	-
6.	Total Hardness (mg/L) CaCO ₃	300	Encrustation in water supply structure and adverse effects on domestic use	600	-
7.	Iron (mg/L, Fe) Max	0.3	Beyond this limit taste/appearance are affected; has adverse effects on domestic uses and water supply structure and promotes iron bacteria	1.0	-
8.	Chlorides 250 (mg/L, Cl) Max	250	Beyond effects outside the desirable limit	1000	-
9.	Residual free Chlorine (mg/L), Max	0.2	-	-	To be applicable only when water is chlorinated. Tested at customer end. When protection against viral infection is required, it should be min. 0.5 mg/L.
Desirable Characteristics					
10.	Dissolved solids mg/L. Max	500	Beyond this, palatability decreases and may cause gastrointestinal irritation.	2000	-
11.	Calcium (mg/L, Ca) Max.	75	Encrustation in water supply structure and adverse effects on domestic use.	200	-
12.	Magnesium (mg/L, Mg) Max	30	Encrustation in water supply structure and adverse effects on domestic use.	100	-
13.	Copper (mg/L, Cu) Max	0.05	Astringent taste discoloration and corrosion of pipes fittings and utensils	1.5	-

			will be caused beyond this.		
14.	Manganese (mg/L, Mn) Max	0.1	Beyond this limit taste/appearance are affected, has adverse effect on domestic use and water supply structure	0.3	-
15.	Sulphate (mg/L, SO ₄) Max.	200	Beyond this causes gastro intestinal irritation when magnesium or sodium are present	400	May be extended upto 400 provided magnesium (as Mg) does not exceed 30
16.	Nitrate (mg/L, NO ₃) Max.	45	Beyond this methaemoglobinemia takes place.	100	-
17.	Fluoride (mg/L, F) Max.	1.0	Fluoride may be kept as low as possible. High fluoride may cause fluorosis.	1.5	-
18.	Phenolic Compounds (mg/L C ₆ H ₅ OH) Max.	0.001	Beyond this, it may cause objectionable taste and odour	0.002	-
19.	Mercury (mg/L Hg) Max	0.001	Beyond this the water becomes toxic	No Relaxation.	To be tested when pollution is suspected
20.	Cadmium (mg/L, Cd) Max	0.01	Beyond this the water becomes toxic	No Relaxation.	To be tested when pollution is suspected
21.	Selenium (mg/L, Se) Max	0.01	Beyond this the water becomes toxic.	No Relaxation.	To be tested when pollution is suspected
22.	Arsenic (mg/L, As) Max.	0.05	Beyond this the water becomes toxic	No Relaxation	To be tested when pollution is suspected
23.	Cyanide	0.05	Beyond this the water becomes toxic	No Relaxation	To be tested when pollution is suspected
24.	Lead (mg/L Pb) Max.	0.05	Beyond this the water becomes toxic	No Relaxation	To be tested when pollution is suspected
25.	Zinc (mg/L, Zn) Max.	5	Beyond this limit it can cause astringent taste and an opalescence in water	15	To be tested when pollution is suspected
26.	Anionic detergents (mg/L, MBAS) Max	0.2	Beyond this limit it can cause a light froth in water	1.0	To be tested when pollution is suspected
27.	Chromium (mg/L, Cr ⁶⁺)	0.05	May be carcinogenic above this limit	-	-
28.	Polynuclear Aromatic Hydrocarbons (mg/L, PAH) Max	-	May be carcinogenic	-	-
29.	Mineral oil (mg/L)	0.01	Beyond this limit, undesirable taste and odour after chlorination takes place	0.03	To be tested when pollution is suspected
30.	Pesticides (mg/L) max	Absent	Toxic	0.001	-
Radioactive materials					
31.	Alpha emitters Bq/L Max	-	-	0.1	-
32.	Beta emitters Pci/L Max	-	-	1.0	-
33.	Alkalinity (mg/L,) Max	200	Beyond this limit, taste becomes unpleasant	600	-
34.	Aluminum (mg/L, Al) Max	0.03	Cumulative effect is reported to cause dementia	0.2	
35.	Boron (mg/L) Max	1.0	-	5.0	-

APPENDIX 8: STAKEHOLDER CONSULTATIONS

S. No	Name of the participant	Representing area/agency
1.	Prabhu Saran Masih	Emmanuel Hospital Chattarpur (NGO)
2.	Surya Pratap Singh Bundela	Darsana Mahila Kalyan Samiti, Chattarpur (NGO)
3.	Afsar Jahan	Chattarpur Mahila Jagriti Manch (NGO)
4.	Prabha Baidya	Darsana Mahila Kalyan Samiti, Chattarpur (NGO)
5.	Vinay Srivas	Chetna Organization, Nowgon (NGO)
6.	Anjana Chaturbedi	Priyabrat Mahila Samiti, Chattarpur (NGO)
7.	Gayatri Devi Parmar	Mahila Samiti, Chattarpur (NGO)
8.	Ram Gopal Sharma	Chattarpur
9.	Rajendra Singh	Kabir Foundation, Khajuraho (NGO)
10.	Omprakash Tiwari	Mahila Samiti, Chattarpur (NGO)
1.	Rahul	Local resident, Rajnagar
2.	Bimli	Local resident, Rajnagar
3.	Rameswar	Local resident, Rajnagar
4.	Anil	Local resident, Rajnagar
5.	Ramesh	Local resident, Rajnagar
6.	Sampu	Local resident, Rajnagar
7.	Sallu	Local resident, Rajnagar
8.	Dinesh Bhadediya	Local resident, Rajnagar
9.	Anil Bhadediya	Local resident, Rajnagar
10.	Manish Balmiki	Local resident, Rajnagar
11.	Dipak Balmiki	Local resident, Rajnagar
12.	Ashish Balmiki	Local resident, Rajnagar
13.	Mithla Balmiki	Local resident, Rajnagar
14.	Mamata Balmiki	Local resident, Rajnagar
15.	Usha Balmiki	Local resident, Rajnagar
16.	Krishna Devi	Local resident, Rajnagar
17.	Usha Damor	Local resident, Rajnagar
18.	Jyoti Devi	Local resident, Rajnagar
19.	Usha Devi	Local resident, Rajnagar
20.	Kavita Devi	Local resident, Rajnagar
21.	Sibani	Local resident, Rajnagar
22.	Gouri Devi	Local resident, Rajnagar
23.	Nisha Devi	Local resident, Rajnagar
24.	Ramrani Devi	Local resident, Rajnagar
25.	Vimla Devi	Local resident, Rajnagar
26.	Ramesh Balmiki	Local resident, Rajnagar
1.	Kalyan Singh	Khajuraho Nagar Parishad
2.	Satya Darsha	Local resident, Khajuraho
3.	Javed Ali	Local resident, Khajuraho
4.	Santosh Sharma	Local resident, Khajuraho
5.	Rasid Khan	Local resident, Khajuraho
6.	MD Sajid	Local resident, Khajuraho
7.	Sakti Devi	Local resident, Khajuraho
8.	Onkit Gupta	Local resident, Khajuraho
9.	Ramachar Tiwai	Local resident, Khajuraho
10.	Jitendra Shrintya	Local resident, Khajuraho
11.	Chandra Prakash Bhargav	Local resident, Khajuraho
12.	Ram Sigh	Local resident, Khajuraho
13.	Sangita Sukla	Local resident, Khajuraho
14.	Vina Abasthi	Local resident, Khajuraho
15.	Iva Diwadi	Local resident, Khajuraho
16.	Laxi Doube	Local resident, Khajuraho

S. No	Name of the participant	Representing area/agency
17.	Ram Devi Sen	Local resident, Khajuraho
18.	Nam Krishna Lata	Local resident, Khajuraho
19.	Tasmeen	Local resident, Khajuraho
20.	Asha Isami	Local resident, Khajuraho
21.	Girja devi	Local resident, Khajuraho
22.	Puspa Raja	Local resident, Khajuraho
23.	Mamt Debedi	Local resident, Khajuraho
24.	ANIL Begam	Local resident, Khajuraho
25.	Asha Devi	Local resident, Khajuraho
26.	Rekha Devi	Local resident, Khajuraho
1.	Narayan Das Patel	Affected person, Khajua Village (WTP site)
2.	Bal Krishna Patel	Affected person, Khajua Village (WTP site)
3.	Dwarka Prasad Patel	Affected person, Khajua Village (WTP site)
4.	Brijlal Patel	Affected person, Khajua Village (WTP site)
5.	Sibu Patel	Affected person, Khajua Village (WTP site)
6.	Sadda Patel	Affected person, Khajua Village (WTP site)
7.	Akhilesh Patel	Affected person, Khajua Village (WTP site)
8.	Chinnu Patel	Affected person, Khajua Village (WTP site)



APPENDIX 9: SAMPLE GRIEVANCE REGISTRATION FORM

(To be available in Hindi and English)

The _____ 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 clarification 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/suggestion/comment/question 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 comment/grievance?					

FOR OFFICIAL USE ONLY

Registered by: (Name of official registering grievance)	
Mode of communication: Note/letter E-mail Verbal/telephonic	
Reviewed by: (Names/positions of officials reviewing grievance)	
Action taken:	
Whether action taken disclosed:	Yes No
Means of disclosure:	

APPENDIX 10: SAMPLE OUTLINE SPOILS (CONSTRUCTION WASTE) 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 PIU, 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 11: SAMPLE OUTLINE TRAFFIC MANAGEMENT PLAN

A. Principles for TMP around the Water Pipes 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.

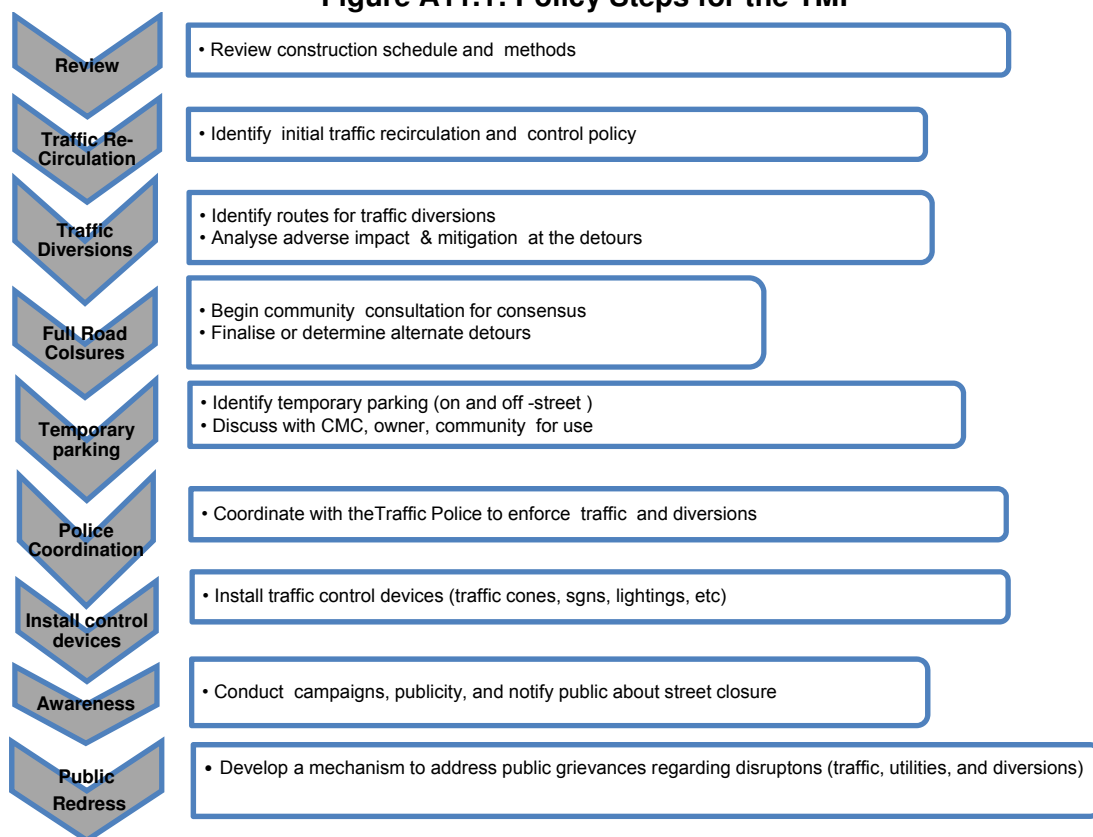
C. Analyze the impact due to street closure

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 A11.1: 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:

- (i) Signs
- (ii) Pavement Markings
- (iii) Channelizing Devices
- (iv) Arrow Panels
- (v) 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 A11.2 to Figure A11.6** 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:

- (i) Work on shoulder or parking lane
- (ii) Shoulder or parking lane closed on divided road
- (iii) Work in Travel lane
- (iv) Lane closure on road with low volume
- (v) 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 A11.2 & A11.3: Work on shoulder or parking lane & Shoulder or parking lane closed on divided road

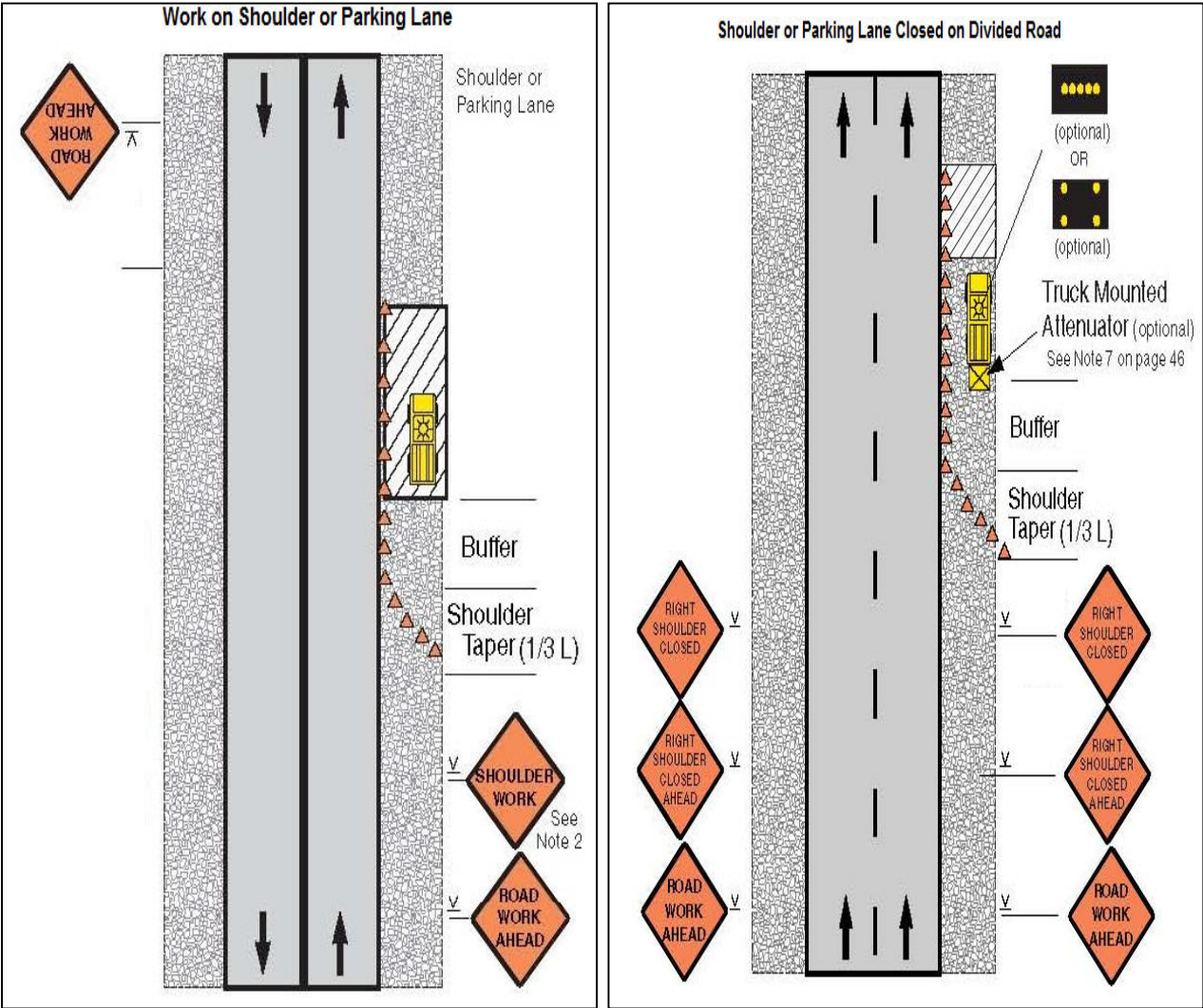
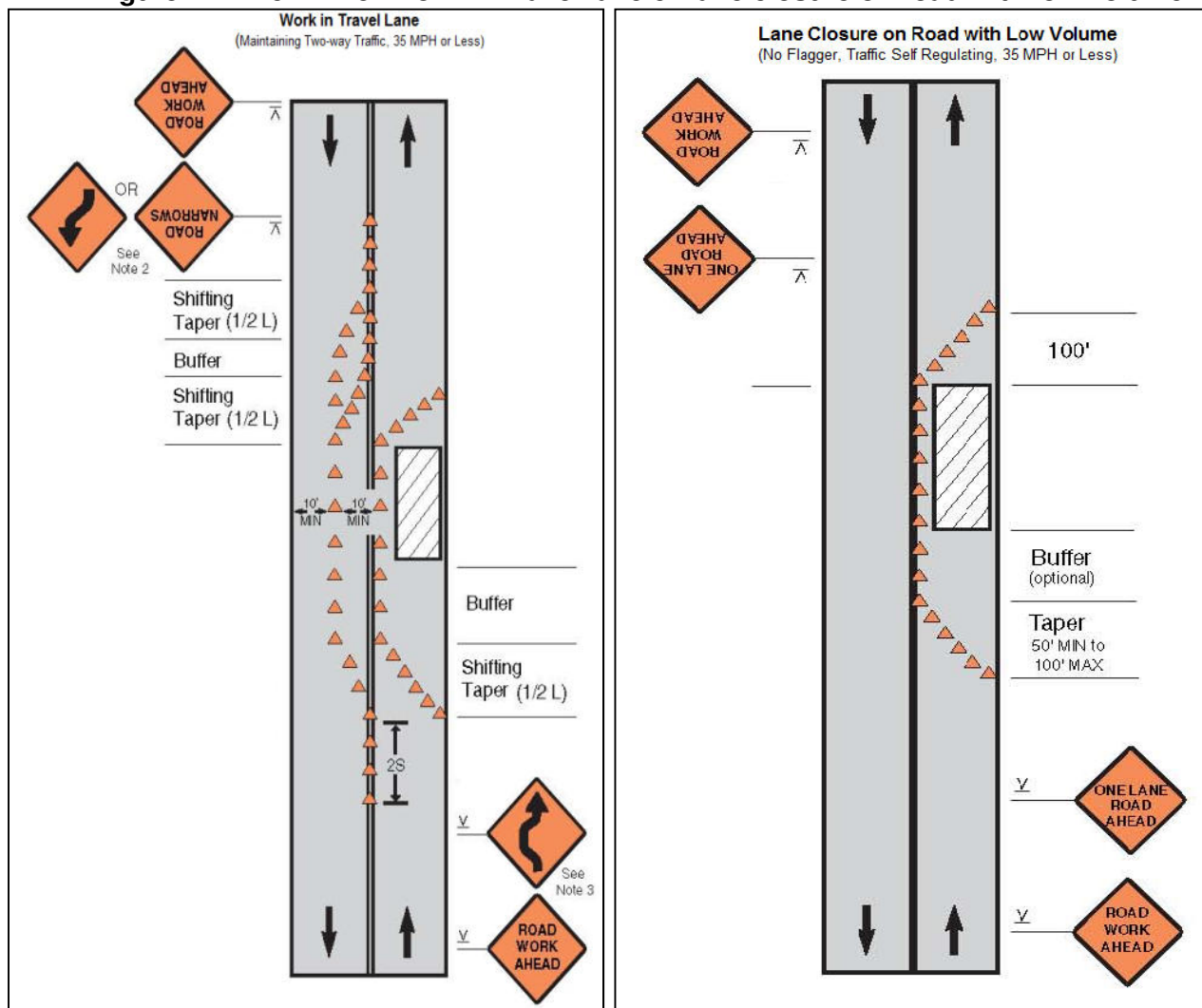


Figure A11.4 & A11.5: Work in Travel lane & Lane closure on road with low volume



APPENDIX 12: SAMPLE ENVIRONMENTAL SITE INSPECTION REPORT

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	
Archaeological 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 AC pipes disturbed/removed during excavation	
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	

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 13: QUARTERLY REPORTING FORMAT FOR ASSISTANT SAFEGUARDS OFFICER

1. Introduction

- Overall project description and objectives
- Description of sub-projects
- Environmental category of the sub-projects
- Details of site personnel and/or consultants responsible for environmental monitoring
- Overall project and sub-project progress and status
(xxiv)

No.	Sub-Project Name	Status of Sub-Project				List of Works	Progress of Works
		Design	Pre-Construction	Construction	Operational Phase		
		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		
		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		
		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		

2. Compliance status with National/ State/ Local statutory environmental requirements

No.	Sub-Project Name	Statutory Environmental Requirements	Status of Compliance	Action Required

3. Compliance status with environmental loan covenants

No. (List schedule and paragraph number of Loan Agreement)	Covenant	Status of Compliance	Action Required

4. Compliance status with the environmental management and monitoring plan

- Provide the monitoring results as per the parameters outlined in the EMP. Append supporting documents where applicable, including Environmental Site Inspection Reports.
- There should be reporting on the following items which can be incorporated in the checklist of routine Environmental Site Inspection Report followed with a summary in the semi-annual report send to ADB. Visual assessment and review of relevant site documentation during routine site inspection needs to note and record the following:
 - What are the dust suppression techniques followed for site and if any dust was noted to escape the site boundaries;
 - If muddy water was escaping site boundaries or muddy tracks were seen on adjacent roads;
 - adequacy of type of erosion and sediment control measures installed on site, condition of erosion and sediment control measures including if these were intact following heavy rain;
 - Are their designated areas for concrete works, and refuelling;
 - Are their spill kits on site and if there are site procedure for handling emergencies;
 - Is there any chemical stored on site and what is the storage condition?
 - Is there any dewatering activities if yes, where is the water being discharged;

- How are the stockpiles being managed;
- How is solid and liquid waste being handled on site;
- Review of the complaint management system;
- Checking if there are any activities being under taken out of working hours and how that is being managed.

Summary Monitoring Table

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						

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

5. Approach and methodology for environmental monitoring of the project

- Brief description on the approach and methodology used for environmental monitoring of each sub-project

6. 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 (Government Standards)		
			PM10 $\mu\text{g}/\text{m}^3$	SO ₂ $\mu\text{g}/\text{m}^3$	NO ₂ $\mu\text{g}/\text{m}^3$

Site No.	Date of Testing	Site Location	Parameters (Monitoring Results)		
			PM10 $\mu\text{g}/\text{m}^3$	SO ₂ $\mu\text{g}/\text{m}^3$	NO ₂ $\mu\text{g}/\text{m}^3$

Water Quality Results

Site No.	Date of Sampling	Site Location	Parameters (Government Standards)					
			pH	Conductivity $\mu\text{S}/\text{cm}$	BOD mg/L	TSS mg/L	TN mg/L	TP mg/L

Site No.	Date of Sampling	Site Location	Parameters (Monitoring Results)					
			pH	Conductivity $\mu\text{S}/\text{cm}$	BOD mg/L	TSS mg/L	TN mg/L	TP mg/L

Noise Quality Results

Site No.	Date of Testing	Site Location	LA _{eq} (dBA) (Government Standard)	
			Day Time	Night Time

Site No.	Date of Testing	Site Location	LA _{eq} (dBA) (Monitoring Results)	
			Day Time	Night Time

7. Summary of key issues and remedial actions

- Summary of follow up time-bound actions to be taken within a set timeframe.

8. Appendixes

- Photos
- Summary of consultations
- Copies of environmental clearances and permits
- Sample of environmental site inspection report
- Other