Initial Environmental Examination

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November 2016

IND: Madhya Pradesh Urban Services Improvement Project – Water Supply Improvement Subproject in Kothri

Package No.: MPUSIP – 1A

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 November 2016)

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

ABBREVIATIONS

ADB	–	Asian Development Bank
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	–	Kothri Nagar Panchayat
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
PMC	–	Project Management Consultant
PE	–	Polyethylene
PHED	–	Public Health Engineering Department
PIU	–	Project Implementation Unit;
PMU	–	Project Management Unit
PO	–	Project Officer
PPTA	–	Project Preparatory Technical Assistance
PWD	–	Public Works Department
REA	–	Rapid Environmental Assessment Checklist
RoW	–	Right of Way
SEIAA	–	State Environmental Impact Assessment Authority
SPS	–	Safeguard Policy Statement, 2009
UDHD	–	Urban Development & Housing Department
ULB	–	Urban Local Body

WEIGHTS AND MEASURES

°C	–	Degree Celsius
km	–	kilometre
lpcd	–	litres per capita per day
m	–	meter
mm	–	milimeter
mld	–	million litres per day
nos	–	numbers
sq. km	–	square kilometers

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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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. Kothri is a small town in Sehore District of in the central part of the state. Improvement of water supply in Kothri is one of the subprojects proposed under the program. ADB requires consideration of environmental issues in all aspects of the Bank’s operations, and the requirements for Environmental Assessment are described in ADB’s SPS (2009). This Initial Environmental Examination (IEE) addresses the infrastructure components proposed under Kothri water supply subproject.

5. **Categorization.** Kothri water supply subproject is classified as Environmental Category B as per the SPS as no significant impacts are envisaged. Accordingly, this Initial Environmental Examination (IEE) assesses the environmental impacts and provides mitigation and monitoring measures to ensure that there are no significant impacts as a result of the project.

6. **Project Scope.** The objective of the proposed improvements in Kothri is to achieve safe and sustainable water services both in terms of services to customers, cost recovery and conservation of precious water resources. The project proposals envisage 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 include following (i) construction of 7 tube wells; (ii) chlorination plants for disinfection; (iii) 2 over head tanks and 2 ground level reservoirs; (iv) 51 km of feeder mains (v) bulk flow meters and (vi) house service connection including consumer meters

7. **Implementation Arrangements**. 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 Madhya Pradesh Urban Development Company (MPUDC) of GoMP. MPUDC will implement this program via a Project Management Unit (PMU) and Project Implementation Units (PIUs). PIUs will coordinate construction of subprojects. PMU and PIUs will be assisted by a Project Management Consultant (PDC). Project Officer (Environment) at PMU and Assistant Safeguard Officer (ASO) at each of the PIU will be responsible for environment management and monitoring activities, and will be supported by Environment Specialist of PMC Team. Contractor personnel will include an Environment, Health and Safety (EHS) 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.

8. **Description of the Environment.** All the subproject components are located in immediate surroundings of Kothri municipal area which were converted into urban and agricultural use for many years ago. Majority (88%) of the municipal area is still under agricultural use, and land s are extensively cultivated in the study area. Tube well sites are

located on the bank of Kothri stream that flows through the town. This is a seasonal stream and flows only during monsoon. Aquatic life is negligible. All the reservoirs are located on government owned barren land with no tree cover. Groundwater is extensively used for agriculture and domestic purpose. Current groundwater development, as per the CGWB, is at critical stage.

9. **Environmental Management.** An environmental management plan (EMP) is included as part of this IEE, which includes

(i) mitigation measures for environmental impacts during implementation;
(ii) an environmental monitoring program, and the responsible entities for mitigating, monitoring, and reporting;
(iii) public consultation and information disclosure; and
(iv) a grievance redress mechanism.

10. A number of impacts and their significance have already been reduced by amending the designs. The construction phase EMP will be included in civil work bidding and contract documents.

11. Locations and siting of the proposed infrastructures were considered to further reduce impacts. These include

(i) locating facilities (tube wells and overhead tanks) 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.

12. Potential impacts were identified in relation to location, design, construction and operation of the improved infrastructure. There is an important issue related to project design based on groundwater. In the absence of any reliable surface water source in the proximity, it is proposed to continue groundwater source for Kothri. However, given the current critical stage of groundwater development, the abstraction should be combined with groundwater augmentation measures, and therefore it is proposed to undertake a detail study and include the recommendation of the study in the project implementation. This study will look into both groundwater sustainability and quality. During the construction phase, impacts mainly arise from the need to dispose of moderate quantities of waste soil and disturbance of residents, businesses, and traffic. These are common temporary impacts of construction in urban areas, and there are well developed methods for their mitigation. Mitigation measures have been developed to reduce all negative impacts to acceptable levels.

13. Enhancement measures like quick leak detection and rectification to save the resources, etc., are included. Construction related measures such as appropriate scheduling of works and dust control etc will be employed. Traffic management will be implemented for pipe works on busy roads. In the operational phase, all facilities and infrastructure will operate with routine maintenance, which should not affect the environment. 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. Regular groundwater monitoring to be conducted to check the quality.

14. Mitigation measures have been developed to reduce all negative impacts to acceptable levels. Mitigation will be assured by a program of environmental monitoring to be conducted during construction. The environmental monitoring program will ensure that all measures are implemented, and will determine whether the environment is protected as intended. It will include observations on- and off-site, document checks, and interviews with

workers and beneficiaries. Any requirements for corrective action will be reported to the ADB.

15. 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.

16. The citizens of the Kothri town will be the major beneficiaries of this subproject. With the improved water supply, they will be provided with a constant supply of better quality water, delivered at their homes with adequate pressure. The project will improve the over-all health condition of the town. People would 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.

17. **Consultation, Disclosure and Grievance Redress.** Public consultations were done in the preparation of the project and IEE. Consultations will continue throughout the project implementation period. A grievance redress mechanism is described within the IEE to ensure any public grievances are addressed quickly.

18. **Monitoring and Reporting.** The PMU and PMDC 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.

19. **Conclusions and Recommendations.** The proposed project is therefore unlikely to cause significant adverse impacts. As per ADB SPS, the project is classified as environmental category B and does not require further environmental impact assessment. However, a groundwater sustainability plan should be prepared through a detailed groundwater study, and the measures of which are to be incorporated into the project to ensure the project sustainability. This IEE needs to be updated during the project design finalization stage.

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.

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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

B. Purpose of this IEE Report

4. ADB requires the consideration of environmental issues in all aspects of the Bank's operations, and the requirements for environmental assessment are described in ADB's Safeguards Policy Statement (2009). Accordingly, this Initial Environmental Examination (IEE) has been conducted to assess the environmental impacts and provide mitigation and monitoring measures to ensure that there are no significant impacts as a result of the subproject.

5. This IEE is prepared for Kothri water supply improvement subproject. 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 project area covers the urban area of Kothri Town in Sehore District. This draft IEE is based on the detailed engineering report prepared by the PPTA team and will be finalized during bidding stage to reflect any changes and latest subproject designs.

6. The environmental impacts of Kothri water supply subproject have been identified and assessed as part of the planning and design process. An environmental assessment using ADB's Rapid Environmental Assessment Checklist for Water Supply (**Appendix 2**) was conducted, and results of the assessment show that the subproject is unlikely to cause significant adverse impacts. Thus, this IEE has been prepared in accordance with ADB SPS's requirements for environment category B projects.

7. The IEE was based mainly on secondary sources of information and field reconnaissance surveys; no field monitoring (environmental) survey was conducted. Stakeholder consultation was an integral part of the IEE.

C. Report Structure

8. This Report contains the following nine (9) sections, besides the executive summary:
(i) Introduction

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

II. DESCRIPTION OF THE PROJECT

A. Project Area

9. Project area comprises the urban area and surroundings of Kothri Nagar Panchayat in Sehore District, in Malwa Region of Madhya Pradesh State. Kothri has a population of 10,256 (2011 census) and has a geographical area of 18 sq. km. Project area is situated at about 60 km southwest of state capital Bhopal. Situation along the highway connecting Bhopal-Indore, two main cities in the state, Kothri is well connected with the other parts of the state. Nearest railway station is at Sehore, the district headquarter town. Nearest airport is at Bhopal.

B. Existing Water Supply Situation

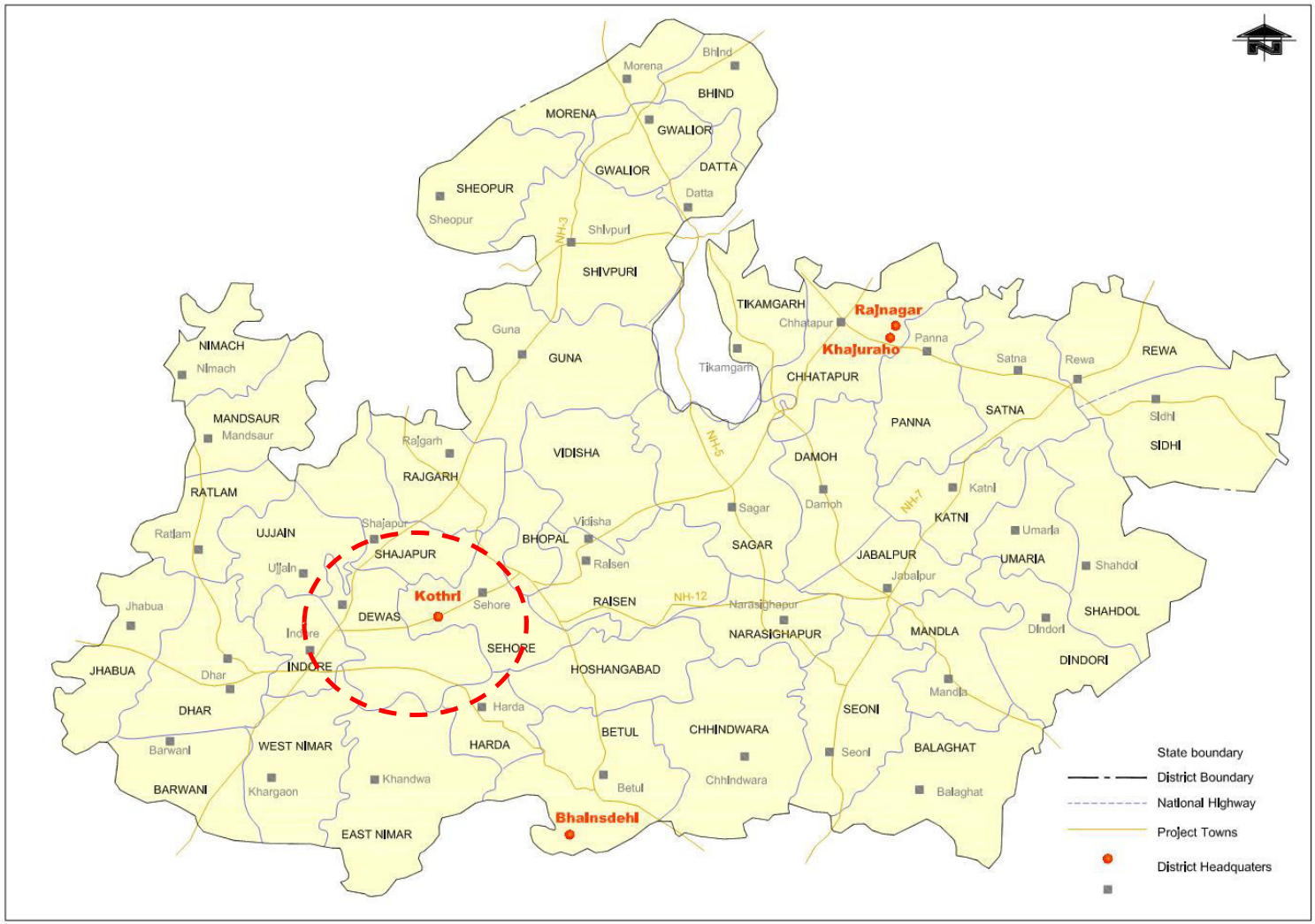
10. Groundwater is the only source of water supply in Kothri. Kothri Nagar Panchayat abstracts groundwater through 5 tube wells. Currently 200 kilo liters (kl) of water is abstracted and supplied daily to the consumers at a rate of 20 litre per capita per day (lpcd). Groundwater from tube wells is pumped to a ground level sump of 30 kl capacity located near the Burial Ground. There is also an overhead tank (220 kl capacity) near the sump for distribution; however, this is currently unused. Water from the sump is directly pumped into the distribution system for supply to consumers. Transmission and distribution network consists of uPVC pipes, and the total length of network is 8.7 km.

11. KNP has provided 182 domestic water connections to the households which is about 10% coverage. Besides, there are public taps provided at several places in the town. Water supply in the town is intermittent is supplied at a frequency of 1 – 1.5 hours every alternative day. Groundwater is directly supplied to households, therefore no practice of disinfection of water supplies.

12. Since the piped water supply provides very limited coverage, KNP has installed 50 hand pumps covering entire town. Majority of the population depend on these hand pumps for their water needs. However, of the 50 hand pumps at presently only few (approximately 10 no,s) are in operation and the rest have dried up. Due to unavailability of water in hand pumps, households also source water from nearby agricultural wells, spending large amounts of time for water. Very few households have private tube wells in their houses.

13. The existing water supply system in the town thus is failing to deliver the demand due to limited source capacity, seasonal variations in availability, inadequate storage, poor network efficiency and low management capability.

Figure 1: Location of Subproject Towns in Madhya Pradesh



C. Proposed Project

14. **Per capita water supply**. It is proposed to supply water in the town at a rate of 70 lpcd at consumer end. The grass per capita water demand is estimated as 85 lpcd (at source) considering the transmission and distribution losses.

15. **Water Demand**. The base year (2019) gross water demand of Kothri is estimated as 1073 kld (1.07 mld), while the intermediate (2034) and ultimate design year (2049) demands are projected at 1,448 kld (1.45 mld) and 1,906 kld (1.91 mld) respectively.

16. **Water Source**. Taking into consideration that there is no dependable surface water source in the proximity of the town, it is proposed to continue the groundwater source for Kothri water supply. However given the low yield of existing tube wells and frequent dry up, a groundwater study has been commissioned as part of the project preparation and an experienced hydrogeologist engaged to conduct the study and identified 7 new locations for groundwater abstraction (for drilling tube wells) in Kothri town.

17. **Proposed project components**. It is proposed to develop a groundwater based water supply system consists of abstraction of groundwater from 7 tube wells and pumping into sumps, disinfection with chlorine, pumping to overhead tanks, and distribution from OHTs. Following 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 5.

Table 1: Proposed Kothri Water Supply Subproject Components

Infrastructure	Function	Description	Location
Tube wells	Groundwater abstraction	7 no,s of tube wells of depth 90 m diameter 350 mm	All the tube well sites are located along/banks of a stream within the municipal boundary. Tube well require a very small area (1 m x 1m)
Chlorination units	Disinfection of groundwater prior to supply	2 no,s: Electronically controlled chlorination units producing chlorine from common salt Water quality laboratory	Chlorination units will be located in a small room at sumps (ground level reservoirs). These are government owned lands, and are currently vacant.
Water service reservoirs	Water storage for supply	RCC tanks including compound walls at the sites • 2 lakh liter (LL) ground level service reservoir (GLSR) • 1.5 LL GLSR • 3.5 LL Elevated Service Reservoir (ESR) • 0.6 LL ESR	• At graveyard near KNP office; site is vacant and owned by KNP • At existing OHT; site is vacant and owned by KNP • Site is near the highway at hospital; site is currently vacant and owned by GoMP • Site is in school compound at Manakhedi village; site is owned by GoMP
Pumping infrastructure	Pump water from ground level reservoir to overhead reservoir	Pumping stations with HSC centrifugal pumping machinery including mechanical, electrical and instrumentation works,	

Infrastructure	Function	Description	Location
		including dedicated power supply. • 22 cum/hour capacity pump for pumping from Grave Yard GLSR to Hospital OHT • 9 cum/hour capacity pump for pumping from GLSR (near existing OHT) to existing OHT • 10 cum/hour capacity pump for pumping from GLSR near existing OHT to Grave Yard GLSR	• At Grave yard GLSR within the indented site for GLSR • At GLSR near existing OHT • At GLSR near existing OHT
Transmission & distribution network	Water transmission from tube wells to GLSRs to OHTs, and from OHTs to distribution network for supply to consumers	51 km PE pipes of following sizes: • 25.5 km - 75 mm • 19.6 km - 110 mm • 5.5 km - 160 mm • 1.2 km - 200 mm • 32 m – 250 mm	Pipes will be laid underground along the public roads, and public lands. All the tube wells are proposed along a stream, and the pipelines that transmit water from the tube wells to the water tanks will be laid along the stream (buried in the bank or adjacent within the available land of the stream) Distribution network will cover entire town, including Manekhedi village which is located away from the town. in narrow roads, where there is no place, the pipeline will be laid within the tarmac. Existing old pipes will be left as it is in the ground untouched
Bulk Water Meters	Monitor water flow in the improved network	17 no,s Bulk flow Meters	Fixed at strategic locations in at source, OHTs, GLSRs, 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	Consumer connection with meters • 2550 nos,	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

18. **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 – 0.6 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. Feeder main pipeline connecting the tube wells will be buried along a stream. It will be laid in the bank of the stream, buried at a

shallow depth (0.5 m). The stream has sharp turn, and the pipeline will be laid following this only. Other civil works include drilling of tube wells using a drilling machine.

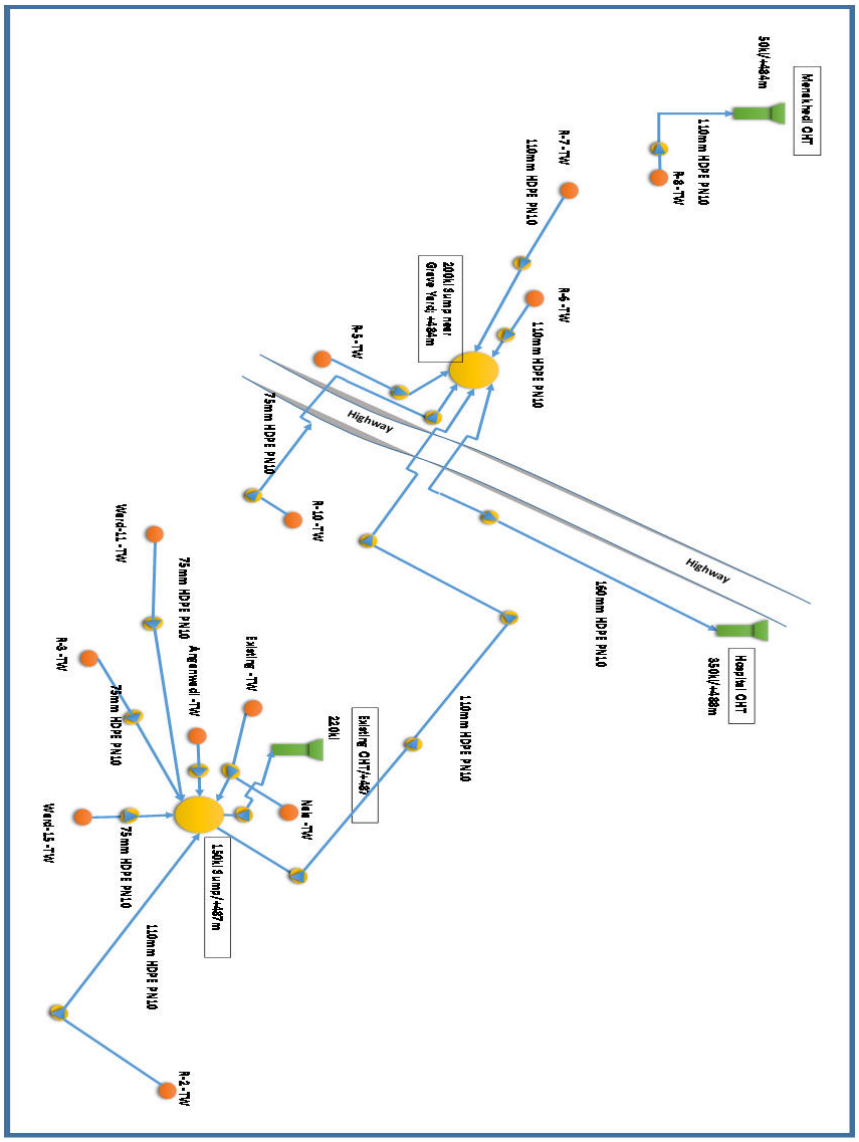
19. Other civil works in the subproject include water tanks and pumping stations, at the identified sites. These works will be confined to sites, and construction will include general activities like excavation for foundation, construction of foundations, columns, walls and roof in cement concrete and masonry, and fixing of mechanical and electrical fixtures, etc.

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 2017, and the contract will be awarded by December 2017. Construction is likely to start in January 2018, and will take about 18 months.

Figure 2: Schematic Diagram of Proposed Water Supply System



III.

Figure 3: Location of Proposed Tube Well Points

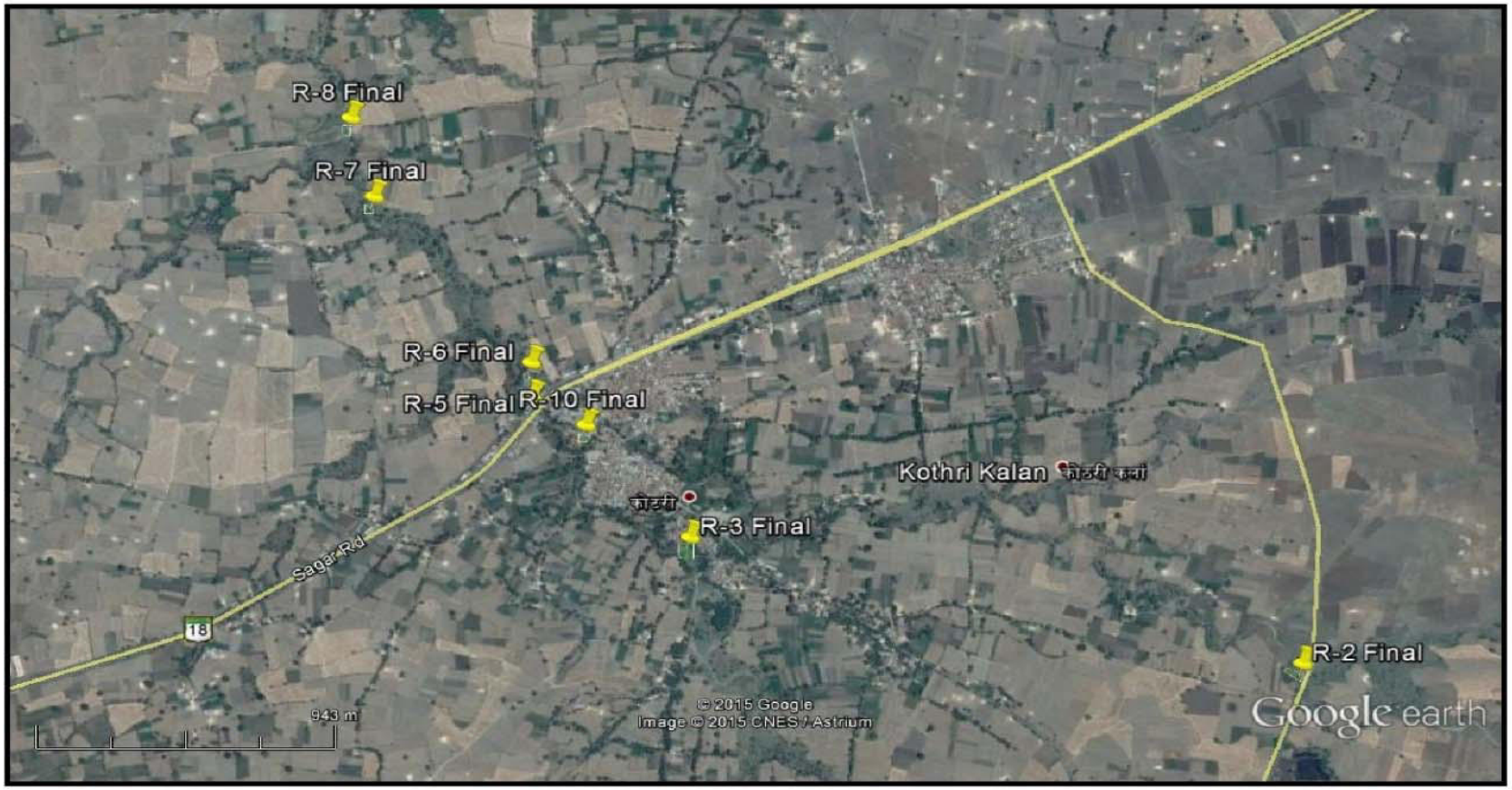
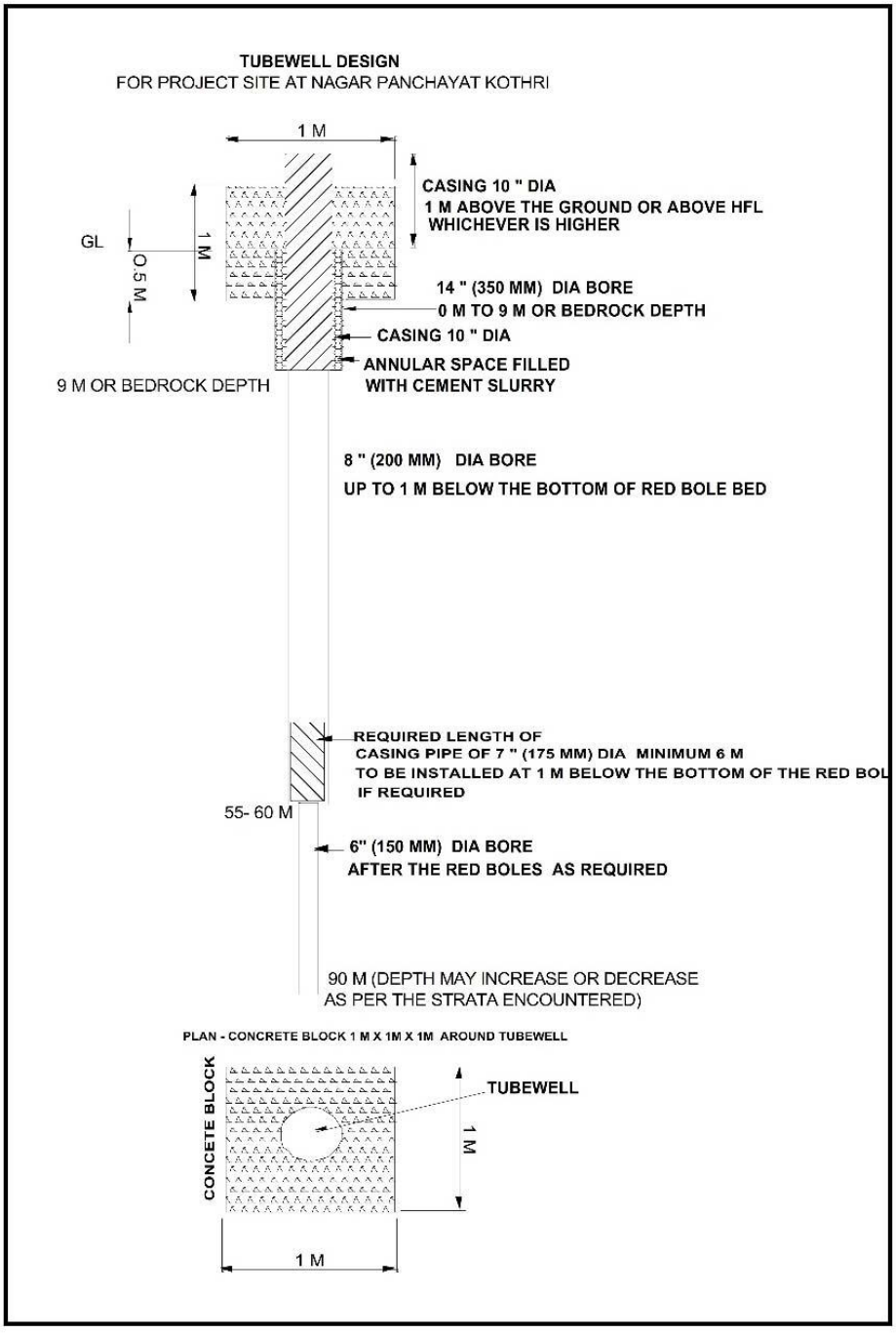


Figure 4: Proposed Tube well design



III. POLICY, LEGAL & 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:

(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.

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.

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

(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. 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 Kothri falls under the ambit of the EIA Notification 2006, and, therefore EC is thus not required for the subproject. 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
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.	**Appendix 3** provides applicable standards for ambient air quality.
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.	**Appendix4** provides applicable noise standards.
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 employment or retirement, and discipline. The contractor shall provide equal wages and benefits to men and women for work of equal value or type.	**Appendix 7** provides applicable labor laws including amendments issued from time to time applicable to establishments engaged in construction of civil works.

IV. DESCRIPTION OF THE ENVIRONMENT

A. Methodology Used for Baseline Study

30. 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.

31. 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 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.

32. **Ocular inspection.** Several visits to the project sites were made during IEE preparation period in 2015-16 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

33. Geographically, the project area is located between 22º31' to 23º40' N latitude to and 76º22' to 78º08'E longitude, in the central part of Madhya Pradesh State. It is located at about 70 km southwest of state capital Bhopal, and 27 km from the district headquarter, Sehore. The national highway (NH 86) connecting the state's administrative capital (Bhopal) and the commercial capital (Indore) passes through Kothri, provide good road connectivity, within Bhopal and neighboring Uttar Pradesh state. Nearest railway station is at Sehor, and the nearest airport is at state capital Bhopal.

34. The town is a trade centre for the agricultural produce (wheat and soyabean) from the neighborhood villages. Kothri Nagar Panchayat (KNP) extends to an area of about 18 sq. km characterized by a mix of urban and few rural settlements. The town is divided into 15 municipal wards, which includes village Manekhedi.

2. Topography, Soils and Geology

35. Kothri is situated in the Malwa region. Topography is mostly plain, and gently slopes toward to northwest. The highest elevation in KNP is around 500 m above the mean sea level (MSL) in the eastern part while with a slope towards northwest. The lowest elevation is in the northwest of the town limits with a level of about 480 m above the MSL. The entire study area is occupied by Deccan traps on the surface and the weathering/alteration products of the Deccan Trap Basalts such as shallow and deep soils, black cotton soils, yellow soils, weathered basalts occupy the top layer of the lithological cross section.

3. Seismology

36. 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

37. The town experience four seasons annually. The period from March to about the middle of June is summer season, which is characterized by very hot days in May. Temperature dips down with the onset of southwest monsoon season in June. Monsoon lasts till September. October-November constitute the post monsoon season. Winter season is from November to February/March.

38. The annual average rainfall of Sehore district is 1217.7 mm, with highest rainfall in Sehore block (1412.3 mm) to lowest (1054.9 mm) in Astha block. Kothri town is in Astha block. Southwest monsoon is the principle monsoon season which commences in the month of late June / July to September. About 92.4% of the annual rainfall is received during this period. Rains are also received during the post monsoon period, especially in October, November. As shown in the figure, there is large fluctuation in amount of rain fall year-on-year.

39. There are significant seasonal and day-night temperature variations almost throughout the year. The average normal temperature is 40.7^{o}C. From March onwards, the temperature starts rising and maximum temperature observed during the month of May. . The summer temperatures can reach a maximum of 42^{o}C. The January is the coldest month of the year. The average normal minimum temperature during the month is about 10.4%. The individual day temperature comes as low as 1 to 2^{o}C.

40. During the southwest monsoon the relative humidity is generally high exceeding about 88% in August. Humidity decreases in the post monsoon season. In the cold season it is fairly good over the district. The driest part of the year is the summer season with the humidity going down to 26% or less. The annual normal relative humidity of the district is 57%. Winds are generally light to moderate with some slight strengthening in force during the monsoon season. The wind velocity in the post monsoon and winter season is in general low as compared to Premonsoon or summer season. The normal average and wind velocity of the district is about 8.3 Km/hr.

Figure 5: Annual & monthly rainfall pattern – Sehore district

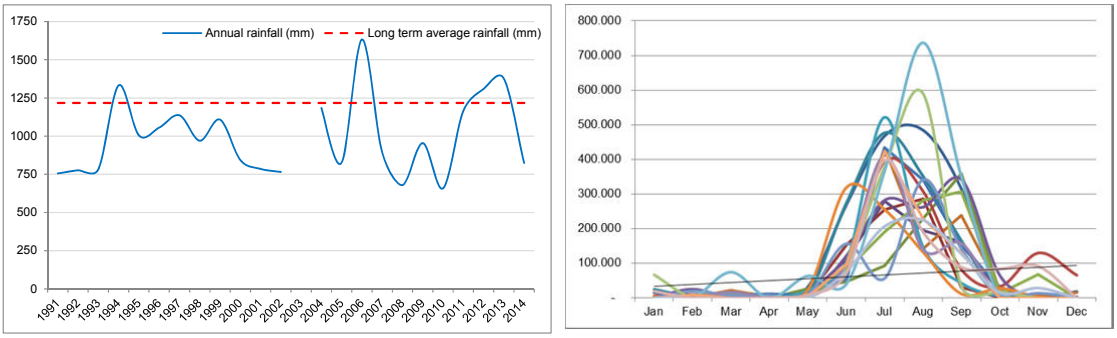
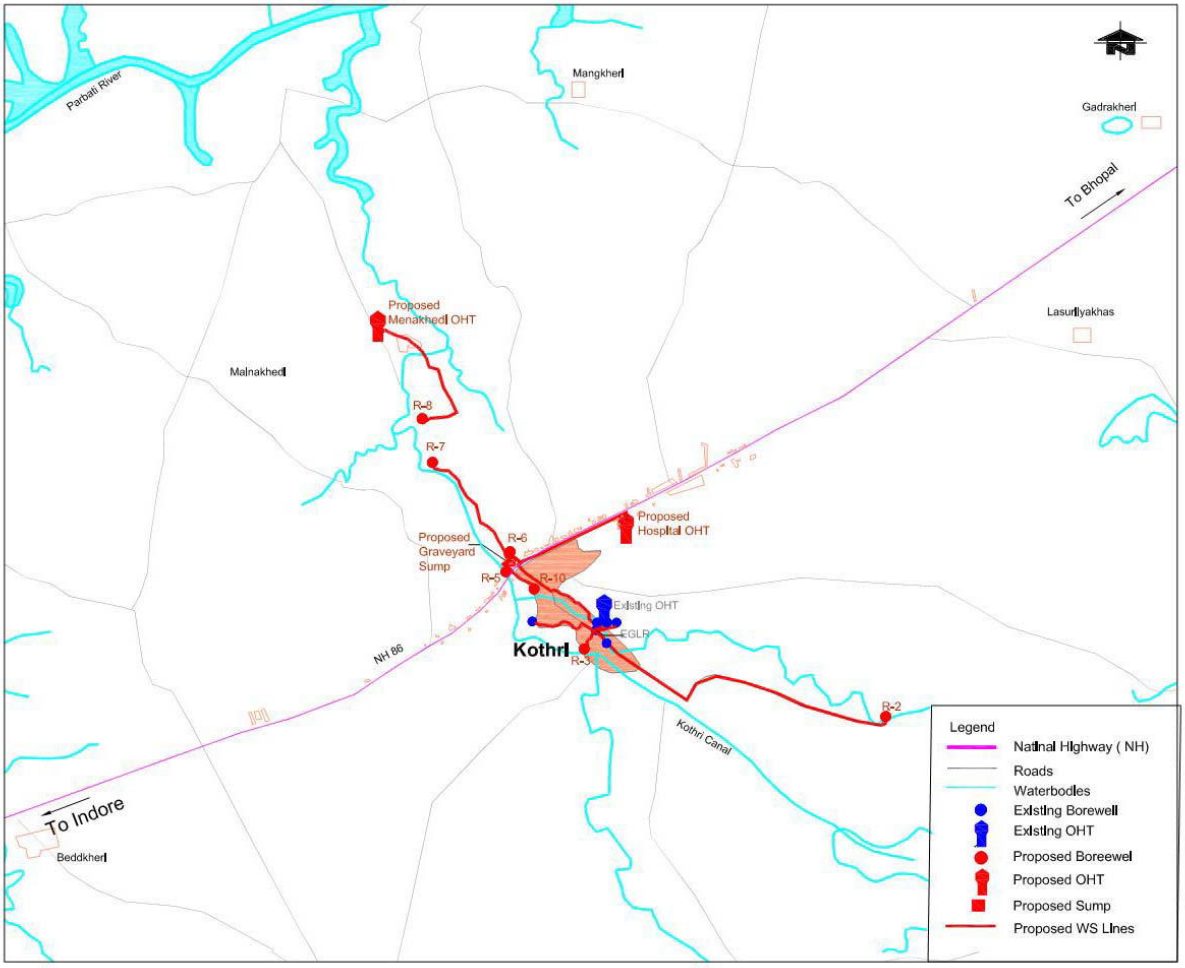


Figure 6: Project area environs



5. Surface Water

41. The major drainage in the area trends southwest to northeast supported by a stream flowing in this direction. Kothri steam, originating in the far upper areas of Kothri town, flows through the town. This stream flows toward north and joins River Parvati after crossing village Manekhedi that is part of KNP. River Parvati is one of the main tributaries of Chambal River part of Yamuna river basin.

42. Kothri stream is a small seasonal stream which only during the monsoon as the principle source is the rainfall. No flow records available for this stream. The local enquiries indicate the stream flows during the southwest monsoon season, and depending on the amount of rainfall received during the season, flow volume and duration varies. On normal rainfall years, it flows for about 1-2 months (between July and September/October). Poor rainfall results in flow for period of just a couple of days to a week, and above average rainfall results into flow period of 2-3 months. The stream is very narrow, and as per the revenue records available, the width varies from 20-30 m, including the banks. During very heavy flow, the stream inundates adjacent areas. The land use along the stream is predominantly agriculture.

43. Originating in Vindhya Range, Parvati River is an important river in the region. It flows at about 4 km from Kothri town in the north, and flows predominantly from south/south west to north/northeast. This river is also seasonal, with high variation from monsoon to summer. During the summer, river almost dries up. This river main source of water for Asthan town on the upstream.

6. Groundwater

44. The entire study area is occupied by Deccan traps on the surface and the weathering/alteration products of the Deccan Trap Basalts such as shallow and deep soils, black cotton soils, yellow soils, weathered basalts occupy the top layer of the lithological cross section. The drainage in the area is controlled by geomorphology and lithology of basalts resulting into Sub-dendritic and Trellis drainage pattern due to large scale fracture patterns. Hydrogeology of the study area comprises the following three formations. In the overall district. 85% of the area is occupied by Deccan Trap, 10% by alluvium, and 5% by Vidhyan formations.

45. Vindhyan system. The area has presence of rocks belonging to Vindhyan system at a depth of 50 to 65 m overlain by Deccan Traps. The Vindhyans are composed of Sandstone and Quartzitic Sandstone, which are generally poor aquifers. However, these formations when subjected to weathering and with the presence of joints and fractures form moderately yielding aquifers with yields of 1 to 2 liters per second (lps).

46. Deccan Trap formations. The Deccan Traps occupy entire area at the top followed by Vindhyans. The main aquifer systems in the formation are the weathered and vesicular zones, flow contacts, jointed and fractured zones. The groundwater occurs mainly under confined conditions due to presence of alternate layers of massive and vesicular basalts. The red bole horizons present at lavaflow contacts are generally act as semi-confining layers in the deep aquifers. The yield expected from tube wells in this formation varies from 1 to 5 lps. The groundwater behavior in Deccan Traps is highly erratic because of high degree of vertical and horizontal lithological properties of the Basalts.

47. Alluvium. Alluvial area in the region occurs mainly along Parvati River with extensive thickness at certain places. Alluvium is also found along the rivulets, streams that are tributaries of Parvati, though the thickness of such alluvium is only up to 1 to 2 m. Because of non-perennial flow of water in these tributaries the groundwater or subsoil water potential

of the alluvium horizon is not very good. However at certain places where thickness of alluvium exceeds 6 to 7 m, the subsoil water may persist up to a significant time after monsoon and may support the Rabi crops, though it may not be sustainable for round the area drinking water supply to the town.

48. The principle aquifers in the area are constituted by Vesicular Basalts and fractured zones in Basalts and inferred Sedimentaries at a depth and beyond, with varying thickness of 5 m onwards.

49. According to CGWB, ground water level in this region ranges from 8 to 12 m below ground level (bgl) during pre-monsoon (May 2012) In the post monsoon period (November 2012) the water level of less than 5m bgl. The recorded fall in groundwater level is 0.1 to 5.22 m/annum during premonsoon and rise of 0.01-2.18 m/annum during post monsoon.In terms of groundwater development, Sehore and Ashta blocks fall under critical category. The stage of ground water development has reached to 89 % in Astha block, in which the project town Kothri is situated.

50. **Ground Water quality**. The pH values of water samples varied in between 7.20 to 7.40 hence proved alkaline in nature and were within permissible limit. Some of the water quality parameters although exceed desirable level (especially Nitrate), are however within the permissible levels of drinking water standards. Bacteriological contamination is evident from the water quality results.

Table 3: Groundwater Quality (2015)

Parameter	Tube well Anganwadi Kothari	H P Anganwadi town Kothari	T W, Ward no 15 Near nalla	H P Tipakheri ward no 15	Drinking water standards*
Temperature, oC	28	28	28	28	-
Turbidity, NTU	1.4	9.5	1.2	6.9	5-10
Color, Hazen units	Nil	Nil	Nil	Nil	5-25
pH	7.4	7.2	7.2	7.4	6.5-8.5
Electrical conductivity (µs/cm)	983	972	881	722	750 – 2000
Total dissolved solids (mg/l)	548	544	492	404	500-2000
Total alkalinity (mg/l)	300	302.1	256.6	231	-
Chlorides as Cl (mg/l)	75.9	67.4	68.5	36.4	250-1000
Total hardness as CaCO3 (mg/l)	460	400	235	305	300-600
Calcium (mg/l)	122	130	88	92	75-200
Magnesium (mg/l)	37.2	18	3.6	18	30-100
Iron (mg/l)	Nil	0.64	0.02	0.21	0.3 – 1
Manganese (mg/l)	0.01	0.01	0.01	0.04	-
Fluoride (mg/l)	0.07	0.04	0.08	0.06	1-1.5
Nitrate (mg/l)	30	44.2	30.2	21.2	45
Sulphates (mg/l)	17.01	17.1	16.5	16	200-400
Total Coliform / 100ml	190	Nil	Nil	Nil	10
Thermo tolerant coliform / 100 ml	Nil	Nil	Nil	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

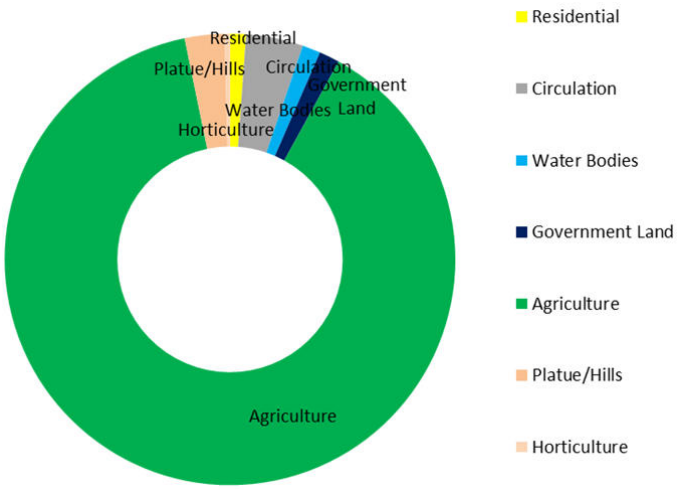
51. There is no data on ambient air quality in Kothri Town, which are not subject to monitoring by the Madhya Pradesh Pollution Control Board (MPPCB) as there are no major industries.

C. Ecological Resources

52. The project area – municipal area of Kothri Nagar Panchayat, comprises the habitation areas of Kothri town, and the village of Manekhedi in the northern outskirts. Majority of the area in the municipal boundary is in agricultural use. There are no ecologically sensitive features like forest in the project area. Streams are seasonal, so there is no noticeable aquatic life. Flora and fauna found in the area is of local species.

D. Economic Development

53. Spread over 18 sq. km area Kothri is a small town, still in the transition phase from rural to urban. Large areas under municipal jurisdiction are still under agricultural use. According to the available land use details, nearly 88% land is under agricultural use, while 5% is only under residential, institutional and transport use. Rest 7% is under water bodies, and government lands.



54. Kothri is an agriculture based economy. It is a local center for agricultural marketing dealing in agriculture produce. Agricultural lands are extensively cultivated in the area, and predominant crops are wheat, soybean, onion, pulses, etc. Main crop season is Rabi, and agricultural is fully dependent on the monsoon. There is no canal irrigation system in Kothri, and farmers mainly irrigate using the groundwater with their own tube wells.

55. There are no notable industries in Kothri. There are some agro based household units, and brick kilns supporting the local market.

56. **Sanitation.** There is no sewerage collection and treatment system in the town. Households mainly depend on individual sanitation systems like pit latrines, septic tanks etc. Open defecation is also prevalent in the project area. Most of the wastewater from households is let into open drains, roads and vacant sites, which ultimately enters Kothri stream. The wastewater washes off during monsoon flow into River Parvati. The vacant lands along the stream are extensively used for open defecation, posing threat to environment and health. There is no proper solid waste management system in the town. KNP is 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.

57. **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 chocked, creating unhygienic conditions.

58. **Transport.** The entire town is divided in to two parts which is core area on south western part and newly developed areas on the south eastern part. National Highway 86 divides the old and new development areas, and acts as a main artery for the road network in the town. The old town area is characterized by very narrow roads and dense housing development. Outer areas have very less density. Traffic in the town is very limited, except on the main highway that carries considerable through traffic. Most of the roads are surfaced with concrete, and roads in the outer areas are mostly unpaved.

E. Socio Cultural Resources

1. Demography

59. According to the census, the population of Kothri was 10,525 in 2011, increased from 8,238 in 2001, which shows an increase of 27.7 % over the decade, slightly higher growth rates than the previous decade of 1991-2001 that experienced a growth of 22%. Overall literacy is 72.29%, which is slightly higher than the state average of 69.3%. The literacy figures are reported at 85.1% for males and 58.8% for females. The sex ratio is 942 females per 1000 males, much higher than the state average of 931. With an area of 18 sq. km under the municipal limits, gross population density is very low (584 persons/sq. 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 1.31% of the populations are scheduled tribes (ST), and about 19.35% belong to scheduled castes (SC). Main language spoken the project areas is Hindi.

2. History, Culture and Tourism

60. There are no specific historical or cultural references available about Kothri town. There are no places of tourism or historical or archeological importance in the town. There are few religious places like temples, mosques in the town, frequented by locals. Town is however known locally for making Sri Krishna idols for the Dol Gyaras festival. This is celebrated on a day in Bhadrapad month of Hindu calendar. About 50 families in the town are engaged in idol and puppet making activities for the festival.

F. Subproject Site Environmental Features

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

Table 4: Site Environmental Features

<table>
<tr><th>Infrastructure</th><th colspan="4">Location & Environmental Features</th></tr>
<tr><td>Tube well sites</td><td colspan="4">Seven (7) tube wells points are identified along Kothri stream at various points. Bore hole will be of 350 mm ia and will have a cap of 1m x 1 m. Sites are vacant.</td></tr>
<tr><td></td><td>  </td><td>  </td><td>  </td><td>  </td></tr>
<tr><td></td><td>Tube well R2 site</td><td>Tube well R3</td><td>Tube well R5</td><td>Tube well R6</td></tr>
<tr><td></td><td>  </td><td>  </td><td>  </td><td></td></tr>
<tr><td></td><td>Tube well R7</td><td>Tube well R8</td><td>Tube well R10</td><td></td></tr>
<tr><td>Water service reservoirs & pumping stations</td><td colspan="2">The proposed site for GLSR (2 LL) is identified in a cremation ground (in the northwest outskirts of town), owned by KNP. The site is vacant and there are no trees at the identified location. A pumping station will also be located at this site.</td><td colspan="2">  </td></tr>
<tr><td></td><td colspan="2">The proposed site for GLSR (1.5 LL) will be located next to the existing OHT, which is located in a cremation ground (in the southwestern outskirts of the worn), owned by KNP. The site is vacant and there are no trees at the identified location. A pumping station will also be located at this site.</td><td colspan="2">  </td></tr>
<tr><td></td><td colspan="2">The proposed site for ESR (3.5 LL) is located along the national highway. The site is owned by GoMP, and is near the government hospital. The site is currently and there are no trees at the identified location.</td><td colspan="2">  </td></tr>
<tr><td></td><td colspan="2">The proposed 0.6 LL ESR at Manekhedi village will be constructed in a school compound. Site is vacant and there are no trees. Site is owned by GoMP</td><td colspan="2">  </td></tr>
</table>

<table>
<tr><th>Infrastructure</th><th colspan="2">Location & Environmental Features</th></tr>
<tr><td rowspan="3">Transmission & distribution network</td><td>Feeder main from the tube well (R8) to Manekhedi OHT will be laid along a field road (cart track). Pipeline will be buried in the track.</td><td>  </td></tr>
<tr><td>Feeder mains from R5, R6, R7 and R10 to Cremation ground GLSR will be laid along Kothri stream. Pipe will be buried on its bank. PE flexible pipe is proposed to suit the site conditions with sharp turns. There are trees on the bank of stream, but will mostly be avoided during the laying of pipe. It will involve removal shrubs and bushes.</td><td>  </td></tr>
<tr><td colspan="2">Feeder mains from R3 and R2 tube well and distribution lines from service reservoirs to houses will be laid along the roads. Pipes will be buried along the roads/streets in the town within the road right of way (ROW). In wider roads pipes 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 comparatively wider. Roads are lined with open drains. There are no trees along the roads, except in some places. In old town areas pipes will be laid in the middle of the road, which may affect the traffic. Given the small diameter (75 - 160 mm) pipes, the trench excavation will be very minimal (0.4 x 0.7m).</td></tr>
<tr><td></td><td colspan="2">     </td></tr>
<tr><td></td><td colspan="2">     </td></tr>
</table>

V. ANTICIPATED ENVIRONMENTAL IMPACTS AND MITIGATION MEASURES

A. Introduction

62. 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.

63. 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.

64. 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).

65. 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.

66. The ADB Rapid Environmental Assessment Checklist in http://www.adb.org/documents/guidelines/environmental_assessment/eaguidelines002.asph as been used to screen the project for environmental impacts and to determine the scope of the IEE.

67. 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; and (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. 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. Nevertheless, the project do have some impacts related to project design, as it choses groundwater as the source of water supply. Appropriate measures are suggest to avoid any impacts on groundwater regime.

B. Pre-Construction Impacts – Design & Location

68. **Design of the Proposed Components**. Technical design of the (i) tube wells; (ii) chlorination units, (iii) storage reservoirs, and (iv) distribution network, connections and other items like flow meters, etc., 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:

69. Conducting a detailed groundwater study and preparation of a groundwater sustainability plan for Kothri to address the groundwater sustainability issue. It is proposed that the implementation of Source Sustainability Plan will be part of the project and will *inter alia* include measures like sub-surface dykes; a combination of sub-surface dyke and check dam; check dam; recharge pits; recharge shafts, community roof top rainwater harvesting systems, etc.,

(i) Minimizing water losses from pipelines by perfect jointing and alignments using appropriate techniques (PE pipes up to 150 mm dia joined by electro fusion couplers using on-site electro fusion welding, and all higher diameter pipes by on site butt welding)
(ii) Designing the entire system to maintain optimal flow and terminal pressure, and optimising the overall energy usage
(iii) Reducing the incidence of water borne diseases by providing 100% population including urban poor with potable water supplies
(iv) 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
(v) Development of laboratory with all necessary environment, health and safety measures and adopting international standard procedures for water quality testing
(vi) 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
(vii) 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
(viii) Using low-noise and energy efficient pumping systems

70. **Selection of water source**. The current water supply system in Kothri is completely groundwater based, and is not able to provide adequate supply. As per the municipality, of 8 tube wells drilled last year, 3 were dried up, and 5 are under operation. These tube wells are drilled very deep (500 feet, ~ 150 m) but due to limited yield, tube wells are operated only for about 10 hours a day. Given this situation, a surface source identification exercise was conducted during the project preparation.

71. The nearest surface water source is River Parvati, flowing at 4-5 km north of Kothri Town. This river is one of the main tributaries of River Chambal, part of the Yamuna River basin. However in view of the following reasons, Parvati River source is not considered dependable for Kothri water supply: (i) river is seasonal; carries significant flows during the monsoon, and in summers the river completely dries up; (ii) water flow in the river is reduced significantly by upstream dams; (iii) information from the upstream towns (Astha and other towns and villages), which are sourcing water from the Astha, indicate very low yield during the summers.

72. Hence, it is recommended to continue the groundwater source for Kothri water supply. However given the low yield of existing tube wells and frequent failures, a groundwater study has been commissioned as part of the project preparation and an

experienced hydrogeologist was engaged to conduct the study with an objective to identify 7 new locations for groundwater abstraction in Kothri town. A summary of the ground water study is given in the following paragraphs.

73. **Groundwater Study methodology**. Study was conducted at two stages: one, to identify areas of interest (or target areas) in the study area, and two, to conduct detailed exploration of target areas. Groundwater behavior in the region is quite erratic and the distribution of groundwater resources is not uniform. Moreover the areas of high groundwater potential are highly localized. Such areas are isolated on the basis of remote sensing studies and were subject to further detailed exploration by surface geophysical methods.

74. **Findings & Recommendations of the study**. Following are the findings and recommendations of the study:

(i) The entire study area is occupied by Deccan traps on the surface and the weathering/alteration products of the Deccan Trap Basalts such as shallow and deep soils, black cotton soils, yellow soils, weathered basalts occupy the top layer of the lithological cross section.

(ii) The drainage in the area is controlled by geomorphology and lithology of basalts resulting into Sub-dendritic and Trellis drainage pattern due to large scale fracture patterns.

(iii) Hydrogeology:

(iv) Vindhyan system. The area has presence of rocks belonging to Vindhyan system at a depth of 50 to 65 m overlain by Deccan Traps. The Vindhyans are composed of Sandstone and Quartzitic Sandstone, which are generally poor aquifers. However, these formations when subjected to weathering and with the presence of joints and fractures form moderately yielding aquifers with yields of 1 to 2 liters per second (lps).

(v) Deccan Trap formations. The Deccan Traps occupy entire area at the top followed by Vindhyans. The main aquifer systems in the formation are the weathered and vesicular zones, flow contacts, jointed and fractured zones. The groundwater occurs mainly under confined conditions due to presence of alternate layers of massive and vesicular basalts. The red bole horizons present at lavaflow contacts are generally act as semi-confining layers in the deep aquifers. The yield expected from tube wells in this formation varies from 1 to 5 lps. The groundwater behavior in Deccan Traps is highly erratic because of high degree of vertical and horizontal lithological properties of the Basalts.

(vi) Alluvium. Alluvial area in the region occurs mainly along Parvati River with extensive thickness at certain places. Alluvium is also found along the rivulets, streams that are tributaries of Parvati, though the thickness of such alluvium is only up to 1 to 2 m. Because of non-perennial flow of water in these tributaries the groundwater or subsoil water potential of the alluvium horizon is not very good. However at certain places where thickness of alluvium exceeds 6 to 7 m, the subsoil water may persist up to a significant time after monsoon and may support the Rabi crops, though it may not be sustainable for round the area drinking water supply to the town.

(vii) Based on the interpretation of satellite data, 14 arears were identified as areas of interest, and based on the land ownership and location (within the municipal boundary, and accessibility considerations) 7 areas are selected for geophysical investigations.

(viii) Resistivity surveys were conducted at these 7 areas using Schlumberger Electrode Configuration, and 7 points for tube wells have been identified. Following are the interpretations from the exploration study:

(ix) There are two distinct aquifer zones at site, first at depths varying from 16 to 28 m, and second one from 50 to 60 m onwards.

(x) The thickness of over burden at the top, constituted by weathering/alteration products of Basalts from ground level to the top of bed rock is varying from 9 to 18 m.

(xi) The principle aquifers in the area are constituted by Vesicular Basalts and fractured zones in Basalts and inferred Sedimentaries at a depth and beyond, with varying thickness of 5 m onwards.

(xii) Saturation levels are found more in second aquifer at moderate depths of 50 m onwards. A shallow depth aquifer constituted by weathered Basalts also is present in the area, but that however is dry at present, though being a favorable recharge response target.

(xiii) Presence of Red Boles is indicated is almost the entire area, at a depth of around 50 to 60 m varying from place to place.

S. No	Recommended points for tube wells	Tube Well Depth Recommended	Yield Expected
1	R-2 (lat 23° 03' 54.2" – long 76° 51' 1.9")	90 m	2400 gallons/hour
2	R-3 (lat 23° 04' 8.9" – long 76° 49' 53.8")	90 m	3600 gallons/hour
3	R-5 (lat 23° 04' 25.3" – long 76° 51' 36.2")	90 m	2400 gallons/hour
4	R-6 (lat 23° 04' 29.3" – long 76° 49' 36.1")	90 m	3600 gallons/hour
5	R-7 (lat 23° 04' 48.7" – long 76° 49' 18.6")	90 m	3600 gallons/hour
6	R-8 (lat 23° 04' 57.9" – long 76° 49' 16")	90 m	3600 gallons/hour
7	R-10 (lat 23° 04' 22" – long 76° 49' 42.2")	90 m	2400 gallons/hour

75. Study also made various observations on the current groundwater situation and recommended various measures for source sustainability and groundwater quality. These are as follows:

(i) CGWB[1] has classified Astha block of Sehore district, in which Kothri town is located, as semi critical[2] meaning that the groundwater development is more than 70%.[3] Therefore suitable measures for groundwater recharge have to be taken up.

(ii) Create an inventory of all groundwater sources in the municipality (existing and proposed)

(iii) Suitable measures to be taken to prevent contamination of water sources; cement sealing and length of casing pipe is to be included in the design. Suitable provisions should be made for lining of drains and prevention and chocking / overflow / lateral and vertical seepage.

(iv) Proper monitoring groundwater withdrawal to be conducted; all the tube wells should be fitted with flow meters. Piezometers should be constructed at suitable locations to identify ground water aquifer zones.

(v) A detailed study of hydrogeology, land use and geomorphology of the region should be conducted and source sustainability plan should be prepared

[1] Ground Water Information Booklet; Sehore District, CGWB, Bhopal 2013

[2] CGWB assesses the ground water resources in units (i.e blocks/ talukas/ watersheds). These assessment units are categorized for ground water development based on two criteria - a) stage of ground water development, and b) long-term of pre and post monsoon water levels. There are four categories, namely - 'Safe' areas (70% groundwater development) which have ground water potential for development; 'Semi-critical' areas (70%-90%) where cautious groundwater development is recommended; 'Critical' areas (90%-100%); and 'Over-exploited' areas (above 100%), where there should be intensive monitoring and evaluation and future ground development be linked with water conservation measures.

[3] During IEE, the CGWB booklet (2013) of Sehore district was reviewed and observed that the groundwater development is at 89%, which is almost at critical stage (i.e. 90%-100%). For critical areas, CGWB recommends intensive monitoring and evaluation and links the future ground water abstraction with water conservation measures.

incorporating the water cycle of KNP area, the water budget, and the groundwater assessment.

(vi) Following sustainability structures are suggested: sub-surface dyke; a combination of sub-surface dyke and check dam; check dam; recharge pits; recharge shafts, community roof top rainwater harvesting systems. However, it is highly recommended that these structurers, their design and location, must be finalized after a thorough study of groundwater conditions of the area and must be as per the sustainability plan of the KNP.

(vii) Conjunctive use of ground and surface water must be promoted.

76. **Groundwater Sustainability.** Overexploitation of groundwater resources i.e. abstracting more than the net annual ground water available in the area will lead to several environmental and economic issues. Abstracting water from static water resources may lead to contamination due to geo-hydro chemical processes, and may also lead to land subsidence. Tube wells will dry up quickly, with falling water table pumping costs will go up, and the effect on competing uses can cause social conflicts.

77. Given that there is no reliable surface water source in the proximity of the town, even though groundwater development in the project area is already in critical stage as per the groundwater development, it is proposed to continue the groundwater as source of water supply. The present groundwater development is at 89%, and the groundwater is the only source of water in the region for agricultural and domestic purposes. CGWB cautions use of groundwater resource over 90% of net available resources, and recommends linking water abstraction in these areas to water conservation measures like augmenting groundwater recharge through artificial measures.

78. The location of tube wells are identified through a scientific groundwater study, and therefore it is most likely that the yield will be as estimated by the study. The groundwater yield will however depend solely on the annual rainfall. Given the climate change effects, the rainfall is becoming more erratic and unpredictable, combined with increasing frequency of extreme weather events. The project should therefore account for these.

79. The groundwater study recommends a further detailed study to look into groundwater sustainability and to suggest various measures as detailed above in the para 74. Implementation of these measures is crucial for sustainability of this water supply project and therefore should be integrated into the project implementation.

80. Besides the above, the following measures are suggested for consideration during the detailed study and implementation appropriately:

(i) All the proposed tube wells are located in along a seasonal stream. The groundwater recharge occurs mainly from the flowing stream, and partly from agricultural field. The recharge will increase the water is retained in the stream for more time. Construction of a series small check dams in the stream (say at every 500 m or as appropriate) will ensure water retention thereby augmenting the groundwater recharge. Check dams can be constructed with locally available material (say stone masonry or soil), and the height of which shall be limited, so that water inundation is confined to the stream section itself. No water abstraction directly from the storage shall be allowed.

(ii) Creation of recharge shafts in the stream body. This will involve creation of bore hole of appropriate depth and of larger size and filled with filler material (like gravel, aggregate). This will augment the recharge.

(iii) Creation of artificial recharge pits in public places / public buildings. Local body can issue a notification to this effect.

(iv) Household level artificial recharge (like roof top rainwater harvesting) should be encouraged.
(v) Groundwater regulation – all the tube wells in houses in Kothri to be discontinued in a phased manner once the project is implemented.

81. **Groundwater quality**. The existing groundwater shows the presence of (i) nitrates at a concentration nearing the prescribed limit (30-44 mgh/l while the prescribed limit is at 45 mg/l), and (ii) bacteriological contamination. Nitrate pollution can be attributed to sewage disposal including human excreta, animal wastes and runoff from agricultural areas. Bacteriological contamination can be directly linked to indiscriminate sewage disposal and the leaching of leachates from latrine pits, open defecation etc. Detailed study proposed in the above paragraph also includes a source protection plan. Measures as suggested by the study should be included in the project. Besides, the groundwater study also recommends the following measures for construction of tube wells, which needs to be included in the project design:

(i) The annular space between the casing pipe and the wall of the bore well must be sealed with cement slurry in order to prevent groundwater contamination
(ii) A 1m x 1m x 1m concrete block is to be constructed around the exposed casing pipe above the surface. The block will be 50 cm above the ground and 50 cm below the ground to holdfast the casing pipe.
(iii) The top of the casing pipe should be at least 90 cm above the ground or above the reported HFL of the site, whichever is higher.
(iv) Suitable measures to be taken to prevent contamination of source since the water quality may be impacted by untreated sewage flowing nearby; suitable provisions should be made for lining of drains and prevention and chocking / overflow / lateral and vertical seepage.
(v) In addition to the above, measures should be taken to control the open defecation, and to close all unsafe latrines (for example pit latrines).
(vi) Awareness programs shall be conducted regarding the sanitation practices and its effect on groundwater quality

82. **Use of Chlorine as disinfectant**. It is proposed to install electronically controlled chlorination units that produce chlorine from common salt. As the chlorine is produced in small quantities as required during operation, no significant risk is envisaged, however, the following measures should be followed:

(i) Personal protection and safety equipment for the operators in the chlorine plant
(ii) Provide training to the staff in safe handling and application of chlorine
(iii) Supplier of Chlorinator equipment shall provide standard operating manual for safe operation and as well as maintenance and repairs

83. **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.

84. **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 inconvenience the community.

85. **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 avoid 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.

C. Construction Impacts

86. **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 1.0 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.

87. Earth work excavation will be undertaken by mostly manually due to narrow roads. 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 m deep, 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 of 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 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 work at other sites.

88. 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.

89. Pipeline on the bank of Kothri stream will be laid by manually excavating the trench, and placing and jointing the pipe, and refilling the trench. No trees of more than 10 cm girth size will be removed for placing the pipe. As the flexible PE pipe is proposed, alignment will be modified locally where required to avoid trees and private lands.

90. Other **construction works.** Other civil works in the subproject include construction of tube wells, water tanks, installation of chlorination units, 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. Tube wells will be constructed using a small drilling rig (mounted on mobile truck) to make small tunnel vertically down into the aquifer, into which lengths of 400-500 mm diameter PE pipe are gradually inserted.

90. **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.

91. **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

92. **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) Pipeline works along Kothri stream shall be conducted during the no flow period. All the works should be completed including proper refilling and consolidation of refilled trench and site restoration prior to onset of monsoon in June.
(iii) Avoid stockpiling of earth fill especially during the monsoon season unless covered by tarpaulins or plastic sheets;
(iv) Prioritize re-use of excess spoils and materials in the construction works. If spoils will be disposed, only designated disposal areas shall be used;
(v) Install temporary silt traps or sedimentation basins along the drainage leading to the water bodies;
(vi) Place storage areas for fuels and lubricants away from any drainage leading to water bodies;
(vii) Dispose any wastes generated by construction activities in designated sites; and
(viii) Conduct surface quality inspection according to the Environmental Management Plan (EMP).

92. **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.

93. **Noise and Vibration Levels**. Drilling tube wells will produce noise and vibration in considerable levels, the noise generation may be in the range of 85 – 98 dBA, which is damaging to human ear if experienced for long period. Of the 7 tube well points, 4 are located far from habitations 2 are located in proximity to the town (there are houses at about 50 m from the selected point). Increase in noise level may be also caused by excavation, particularly breaking of cement concrete or bitumen roads, operation of construction equipment like concrete mixers. 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) Provide personal protection equipment (ear plugs) to the rig operators and other staff engaged in supervision of rig

94. **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 Kothri groundwater is deeper than the proposed excavation depths, and rains are limited to 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. Drilling operation for tube well construction will generate a slurry material (water mixed with clay/earth). This material should be disposed in the following manner:

(i) Hold the slurry material in a temporary ditch for some time to allow sedimentation of solids, and dispose the clear water in the stream.
(ii) Dispose appropriately or use the solid material in construction

95. **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 Kothri are very narrow. However, most of the roads are used by pedestrians, bicycles and two wheelers. 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.

96. 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.

97. **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.

98. Tube well site at R7 is not accessible to vehicle. It is located at about 100 m from the nearby access road. The rig should access this site through agricultural fields only, which may damage the standing crops. Following measures should be implemented:

(i) Construct tube well only after the harvesting season, when there is no standing crop in the adjacent fields
(ii) If there is any damage to crops or trees, it shall be compensated as per the resettlement framework

99. **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

100. **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 7);
(ii) Implement site-specific occupational health and safety (OH&S) measures including: (a) prevent entry of public into construction sites; (b) ensue all workers are provided with and use personal protective equipment; (c) OH&S Training[4] for all site 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;

[4] 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. 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.

(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.

101. **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.

102. 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:

(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

103. **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 workers from hunting wild animals 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.

104. **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.[5]
(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.

D. Operation and Maintenance Impacts

105. Operation and Maintenance of the water supply system will be carried out by KNP 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 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.

106. 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.

107. Regular groundwater monitoring to be conducted to ensure the quality of groundwater suitable for drinking after disinfection. If the groundwater quality is deteriorated, the immediate steps to be taken to change the source or creating appropriate treatment facilities.

108. The citizens of Kothri 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.

[5] 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.

VI. PUBLIC CONSULTATION AND INFORMATION DISCLOSURE

A. Overview

109. 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.

110. 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, farmers and businesspeople who live and work alongside the roads in which network improvements will be provided and near sites where facilities will be built (tube wells and water tanks), and government and utility agencies responsible for provision of services in Kothri 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

111. 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

112. Institutional consultations were conducted with the Governmental Departments such as PMU, Pollution Control Board and Public Health Engineering Department, etc. The project proposal is formulated in consultation with KNP to suit the requirements of the ULB.

113. 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 February 2016 with NGOs actively working in the district.

114. Given the existing poor water supply system, all the stakeholders totally welcomed the project and indicated their willingness to extend their cooperation for successful implementation of the project. Stakeholders believe that the proposed project will enhance the living standard of the public, and informed the project that lack of water supply is main reason for lack of toilets in the houses and thus prevalence of open defecation. Some of the stakeholder expressed their concerns on increasing water tariff above the affordable levels.

2. Consultation during construction

115. 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.

116. 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

117. Executive summary of the IEE will be translated in Hindi and made available at the offices of PMU, PIU, KNP 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.

118. 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.

119. 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

120. 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.

121. 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.

122. **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.

123. **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.[6]

124. **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 KNP office, PIU office, CM (Chief Minister) Helpline, or by e-mail or by writing in a complaints register in the PIU offices or at construction site offices.

125. **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 11**.

(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.

126. **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.

127. **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 KNP. 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.

128. Following process will be followed:

(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

[6] 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.

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).[7] 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.

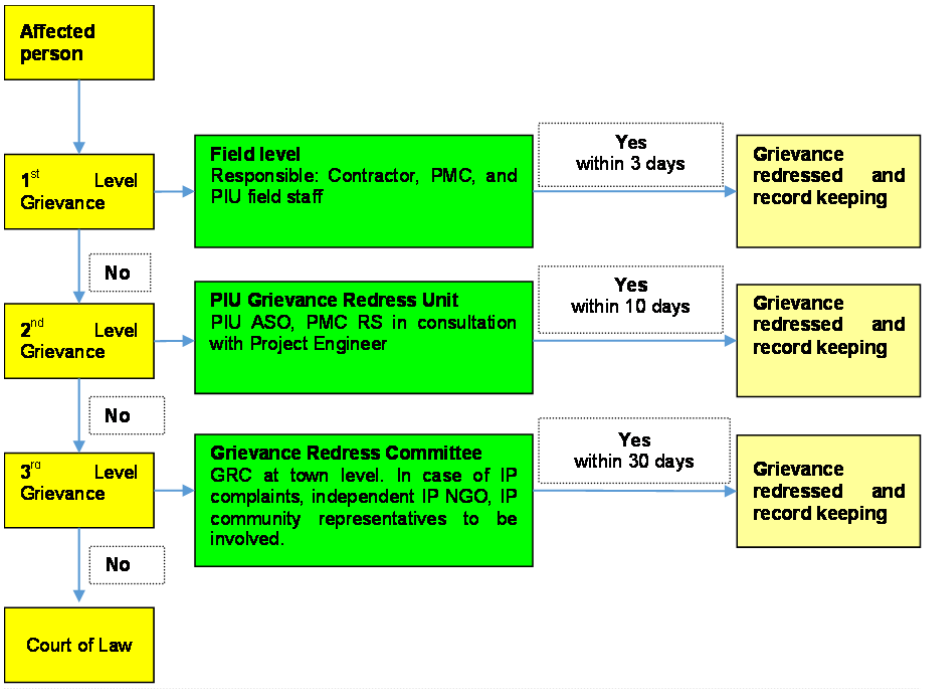
129. In case of any inter-departmental or inter-jurisdictional coordination required for resolution of specific grievances, the PIU will refer the matter directly to the PMU for state-level or inter-departmental coordination and resolution, instead of the town-level GRC. The project GRM notwithstanding, 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,[8] 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.

130. **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.

[7] 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.

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

Figure 1: 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

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

132. The purpose of the environmental management plan (EMP) is to: ensure that the activities are undertaken in a responsible, non-detrimental manner following the measures and recommendations of the environmental assessment conducted for the project, monitor and report the on-site environmental performance; and to ensure that safety recommendations are complied with.

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

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

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Table 5: 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 – depleting resource and source contamination	• Conduct a detailed groundwater study and prepare a groundwater sustainability plan for Kothri to address the groundwater sustainability issue. • Implementation of Source Sustainability Plan will be part of the project and will inter alia include measures like sub-surface dykes; a combination of sub-surface dyke and check dam; check dam; recharge pits; recharge shafts, community roof top rainwater harvesting systems, etc., • All the proposed tube wells are located in along a seasonal stream. The groundwater recharge occurs mainly from the flowing stream, and partly from agricultural field. The recharge will increase the water is retained in the stream for more time. Construction of a series small check dams in the stream (say at every 500 m or as appropriate) will ensure water retention thereby augmenting the groundwater recharge. Check dams can be constructed with locally available material (say stone masonry or soil), and the height of which shall be limited, so that water inundation is confined to the stream section itself. No water abstraction directly from the storage shall be allowed. • Creation of recharge shafts in the stream body. This will involve creation of bore hole of appropriate depth and of larger size and filled with filler material (like gravel, aggregate). This will augment the recharge. • Creation of artificial recharge pits in public places / public buildings. Local body can issue a notification to this effect. • Household level artificial recharge (like roof top rainwater harvesting) should be encouraged. • Groundwater regulation – all the tube wells in houses in Kothri to be discontinued in a phased manner once the project is implemented • Measures should be taken to control the open defecation, and to close all unsafe latrines (for example pit latrines). • Awareness programs shall be conducted regarding the sanitation practices and its effect on groundwater quality	PMU	Project Costs

Field	Anticipated Impact	Mitigation Measures	Responsible for Implementation/ Monitoring	Cost and Source of Funds
Design of water supply system	Unsustainable source – depleting resource and source contamination	Following measures suggested by the groundwater study conducted in Kothri during PPTA, which should be implemented: • Suitable measures for groundwater recharge have to be taken up. • Create an inventory of all groundwater sources in the municipality (existing and proposed) • Suitable measures to be taken to prevent contamination of water sources; cement sealing and length of casing pipe is to be included in the design. Suitable provisions should be made for lining of drains and prevention and chocking / overflow / lateral and vertical seepage. • Proper monitoring groundwater withdrawal to be conducted; all the tube wells should be fitted with flow meters. Piezometers should be constructed at suitable locations to identify ground water aquifer zones. • A detailed study of hydrogeology, land use and geomorphology of the region should be conducted and source sustainability plan should be prepared incorporating the water cycle of KNP area, the water budget, and the groundwater assessment. • Following sustainability structures are suggested: sub-surface dyke; a combination of sub-surface dyke and check dam; check dam; recharge pits; recharge shafts, community roof top rainwater harvesting systems. However, it is highly recommended that these structurers, their design and location, must be finalized after a thorough study of groundwater conditions of the area and must be as per the sustainability plan of the KNP. • Conjunctive use of ground and surface water must be promoted • The annular space between the casing pipe and the wall of the bore well must be sealed with cement slurry in order to prevent groundwater contamination • A 1m x 1m x 1m concrete block is to be constructed around the exposed casing pipe above the surface. The block will be 50 cm above the ground and 50 cm below the ground to holdfast the casing pipe. • The top of the casing pipe should be at least 90 cm above the	PMU	Project Costs

Field	Anticipated Impact	Mitigation Measures	Responsible for Implementation/ Monitoring	Cost and Source of Funds
		ground or above the reported HFL of the site, whichever is higher. • Suitable measures to be taken to prevent contamination of source since the water quality may be impacted by untreated sewage flowing nearby; suitable provisions should be made for lining of drains and prevention and chocking / overflow / lateral and vertical seepage.		
	Improper use of resource and energy	• Minimize water losses from pipelines by perfect jointing and alignments using appropriate techniques (PE pipes up to 150 mm dia joined by electro fusion couplers using on-site electro fusion welding, and all higher diameter pipes by on site butt welding) • Design the entire system to maintain optimal flow and terminal pressure, and optimising the overall energy usage • Reducing the incidence of water borne diseases by providing 100% population including urban poor with potable water supplies • 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 • 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 • 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 • Use low-noise and energy efficient pumping systems		
Chlorine usage as disinfectant	Chlorine handling & application risk – health & safety risk to	• Personal protection and safety equipment for the operators in the chlorine plant • Provide training to the staff in safe handling and application of	PMU	Project Costs

Field	Anticipated Impact	Mitigation Measures	Responsible for Implementation/ Monitoring	Cost and Source of Funds
	workers	chlorine • Supplier of Chlorinator equipment shall provide standard operating manual for safe operation and as well as maintenance and repairs		

Table 6: 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 contractors to prepare a contingency plan to include actions to be taken in case of unintentional interruption of services. (iii) Require contractors to prepare spoils (waste) management plan (**Appendix 8**)	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 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	(i) Prioritize areas within or nearest possible vacant space in the project location;	Contractor to finalize locations in consultation and approval of PIU	(i) List of selected sites for construction work camps, hot mix plants, stockpile areas, storage areas, and	-

Field	Anticipated Impact	Mitigation Measures	Responsible for Implementation	Monitoring of Mitigation	Cost and Source of Funds
		(ii) If it is deemed necessary to locate elsewhere, consider sites that will not promote instability and result in destruction of property, vegetation, irrigation, and drinking water supply systems; (iii) Do not consider residential areas; (iv) Take extreme care in selecting sites to avoid direct disposal to water body which will inconvenience the community. (v) For excess spoil disposal, ensure (a) site shall be selected preferably from barren, infertile lands. In case agricultural land needs to be selected, written consent from landowners (not lessees) will be obtained; (b) debris disposal site shall be at least 200 m away from surface water bodies; (c) no residential areas shall be located within 50 m downwind side of the site; and (d) site is		disposal areas. (ii) Written consent of landowner/s (not lessee/s)	

Field	Anticipated Impact	Mitigation Measures	Responsible for Implementation	Monitoring of Mitigation	Cost and Source of Funds
		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.	(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.	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;	-
Consents, permits, clearances, NOCs, etc.	Failure to obtain necessary consents, permits, NOCs, etc. can result to design revisions and/or stoppage of works	(i) Obtain all necessary consents, 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	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

Field	Anticipated Impact	Mitigation Measures	Responsible for Implementation	Monitoring of Mitigation	Cost and Source of Funds
		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.

Table 7: 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.	Construction 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	(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	Construction Contractor	(i) Location of stockpiles; (ii) Complaints from sensitive receptors; (iii) Heavy equipment and machinery with air pollution control	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
	in concentration of vehicle-related pollutants such as carbon monoxide, sulfur oxides, particulate matter, nitrous oxides, and hydrocarbons.	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		devices; (iv) Pollution under control certificate	
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) Pipeline works along Kothri stream shall be conducted during the no flow period. All the works should be completed including proper refilling and consolidation of refilled trench and site restoration prior to onset of monsoon in June (iii) 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	Construction 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 measures; (v) No visible degradation to nearby drainages, nallahs or water bodies due to civil works	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
		and lubricants away from any drainage leading to water bodies; (vi) Dispose any wastes generated by construction activities in designated sites; (vii) Hold the slurry material generated from drilling operation in a temporary ditch for some time to allow sedimentation of solids, and dispose the clear water in the stream. (viii) Dispose appropriately or use the solid material in construction; and, (ix) Conduct surface quality inspection according to the Environmental Management Plan (EMP).			
Noise Levels	Increase in noise level due to earth-moving and excavation equipment, and the transportation of equipment, materials, and people	(i) Plan activities in consultation with PIU 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; (iv) Maintain maximum sound levels not exceeding 80 decibels	Construction Contractor	(i) Complaints from sensitive receptors; (ii) Use of silencers in noise-producing equipment and sound barriers; (iii) Equivalent day and night time noise levels **(**	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
		(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) Provide personal protection equipment (ear plugs) to the rig operators and other staff engaged in supervision of rig			
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.	(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	Construction Contractor	(i) Complaints from sensitive receptors; (ii) Worksite clear of hazardous wastes such as oil/fuel (iiv) 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.

Field	Anticipated Impact	Mitigation Measures	Responsible for Mitigation	Monitoring of Mitigation	Cost and Source of Funds
		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.			
Existing Infrastructure and Facilities	Disruption of service and damage to existing infrastructure at specified project location	(i) Obtain from PIU the list of affected utilities and operators if any; (ii) Prepare a contingency plan to include actions to be done in case of unintentional interruption of service	Construction Contractor	Existing Utilities Contingency Plan	Cost for implementation of mitigation measures responsibility of contractor.
Ecological Resources – Terrestrial	Loss of vegetation and tree cover	(i) Minimize removal of vegetation and disallow cutting of trees; (ii) If tree-removal will be required, obtain tree-cutting permit and (iii) Plant 5 native trees for every one that is removed.	Construction Contractor	PIU to report in writing the no of trees cut and planted.	Cost for implementation of mitigation measures responsibility of contractor.
Land use	Environmental Issues due to land use change	The impact due to change in land use will be negligible due to this project.	Not applicable	Not applicable	Not applicable
Accessibility	Traffic problems and conflicts near project locations and haul road	(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	Construction Contractor	(i) Traffic route during construction works including number of permanent signages, barricades and flagmen on worksite; (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
		(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. **For works in very narrow roads** (i) Inform the affected local population 1-week in advance			

Field	Anticipated Impact	Mitigation Measures	Responsible for Mitigation	Monitoring of Mitigation	Cost and Source of Funds
		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.			
Socio-Economic – Income.	Impede the access of residents and customers to nearby shops	(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. (i) Provide alternate sources of clean water until water supply is restored.	Construction Contractor	(i) Complaints from sensitive receptors; (ii) Spoils management plan (iii) Number of walkways, signages, and metal sheets 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
		(ii) At R7 tube well site: • Construct tube well only after the harvesting season, when there is no standing crop in the adjacent fields • If there is any damage to crops or trees, it shall be compensated as per the resettlement framework			
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	Construction Contractor	(i) Employment records; (iii) Compliance to labor laws (see **Appendix 7** 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 7**of this IEE) (ii) Implement site-specific occupational health and safety (OH&S) measures including: (a) prevent entry of public into construction sites; (b) ensue all workers are provided with and use personal protective equipment; (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	Construction 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;	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
		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 substances; (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; (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; (ix) Ensure the visibility of workers through their use of high visibility vests when working in or walking through heavy equipment operating areas; (x) Ensure moving equipment is outfitted with audible back-up alarms; (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		(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 **Appendix 7**of this IEE)	

Field	Anticipated Impact	Mitigation Measures	Responsible for Mitigation	Monitoring of Mitigation	Cost and Source of Funds
		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 (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.			
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.	Construction Contractor	(i) Traffic management measures at site; (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 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	Construction Contractor	Complaints from neighborhood and monitoring of accidents	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
		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			
Work Camps and worksites	Temporary air and noise pollution from machine operation, water pollution from storage and use of fuels, oils, solvents, and lubricants Unsanitary and poor living conditions for workers	(i) Consult with PIU before locating project offices, sheds, and construction plants; (ii) Minimize removal of vegetation and disallow cutting of trees; (iii) Provide drinking water, water for other uses, and sanitation facilities for employees; (iv) 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	Construction Contractor	(i) Complaints from sensitive receptors; (ii) Drinking water and sanitation facilities for employees	Cost for implementation of mitigation measures responsibility of contractor.

Field	Anticipated Impact	Mitigation Measures	Responsible for Mitigation	Monitoring of Mitigation	Cost and Source of Funds
		allowed in any worksite at any given time.			
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; (ii) All excavated roads shall be reinstated to original condition. (iii) All disrupted utilities restored (iv) All affected structures rehabilitated/compensated (v) The area that previously housed the construction camp is to be checked for spills of substances such as oil, paint, etc. and these shall be cleaned up. (vi) All hardened surfaces within the construction camp area shall be ripped, all imported materials removed, and the area shall be top soiled and regrassed. (vii) The contractor must arrange the cancellation of all temporary services. (viii) Request PIU to report in writing that worksites and camps have been vacated and restored to pre-project conditions before acceptance of work.	Construction Contractor	PIU/PMC report in writing that (i) worksite is restored to original conditions; (ii) camp has been vacated and restored to pre-project conditions; (iii) all construction related structures not relevant to O&M are removed; and (iv) worksite clean-up is satisfactory.	Cost for implementation of mitigation measures responsibility of contractor.

Table 8: 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	It may affect the water supply system	Effectiveness of leak detection and water auditing to reduce the water losses	Operator	Kothri Nagar Panchayat (KNP)	Operating costs of KNP
Water contamination – raw water contamination at source and treated water during transmission	Impacts on public health	• Ensure protection of water source quality. • Contamination of treated water during transmission and distribution should be prevented by quickly identifying, isolating and repairing the leak section. Develop a system of leak detection and rectification. • Prepare and implement a water quality surveillance program including development of a water quality laboratory. • Conduct regular monitoring of raw & treated water and ensure that water supplied at all times meets the drinking water standards (Appendix 7)	KNP DBO Contractor	KNP PIU	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 meet the increased sewage demand	KNP	PMU	To be identified by KNP, GoMP

Table 9: 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 11	Weekly during construction	Supervising staff and safeguards specialists	No costs required
Ambient air quality	2 locations (OHT site near hospital compound and at existing	• PM10, PM2.5 NO2, SO2, CO	Once before start of construction Quarterly (yearly 4-times) during	Contractor	Cost for implementation of monitoring measures responsibility of contractor

Monitoring field	Monitoring location	Monitoring parameters	Frequency	Responsibility	Cost & Source of Funds
	OHT)		construction (1.5 year period considered)		(14 samples x 5000 per sample = INR 70,000)
Ambient noise	2 locations	• Day time and night time noise levels	Once before start of construction Quarterly (yearly 4-times) during construction (1.5 year period considered)	Contractor	Cost for implementation of monitoring measures responsibility of contractor (14 samples x 1500 per sample = 21,000)
Surface water quality	1 location Kothri stream (downstream of R7 tube well site)	• pH, Oil & grease, Cl, F, NO3, TC, FC, Hardness, Turbidity BOD, COD, DO, Total Alkalnity	Once before start of construction and after construction	Contractor	Cost for implementation of monitoring measures responsibility of contractor (2 samples x 4000 per sample = 8,000)

Table 10: Environmental Monitoring Plan of Anticipated Impacts during Operation

Monitoring field	Monitoring location	Monitoring parameters	Frequency	Responsibility	Cost & Source of Funds
Groundwater quality	All tube wells	pH, Cl, F, NO3, TC, FC, Hardness, Turbidity BOD, COD, DO, Total Alkalnity heavy metals & pesticides	Year twice (pre monsoon – May and post monsoon	KNP	Operating costs (water quality will be tested at the internal laboratory to be established in the project – 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 Alkalnity, Total coliform and Feacal coliform	Monthly once	KNP	Operating costs (water quality will be tested at the internal laboratory)

B. Implementation Arrangements

135. 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.

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

137. Water Resource Review Committee (WRRC) 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.

138. 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.

139. 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.

140. **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.

141. **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:

Final design stage:

(i) Commission detailed groundwater study and prepare groundwater sustainability plan for Kothri water focusing both on yield and groundwater contamination
(ii) Integrate all the measures suggested in the sustainability plan in the project design for implementation
(iii) Update the IEE

Bidding stage:

(i) Ensure that EMPs are included in bidding documents and civil works contracts
(ii) 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.
(iii) Ensure that staff required for implementation of EMP (EHS officer) is included in the bid requirements
(iv) Ensure that EMP cost is included in the project cost
(v) In the pre-bid meeting, provide insight into the EMP measures, and overall compliance requirements to the bidders

Construction stage:

(i) Ensure that all necessary 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

Operation stage:

(i) Conduct regular monitoring to ensure that groundwater quality is appropriate for supply after disinfection

142. **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) 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
(ii) Oversee environmental monitoring by contractors
(iii) Take corrective actions when necessary to ensure no environmental impacts
(iv) Submit monthly environmental monitoring reports to PMU
(v) Conduct continuous public consultation and awareness
(vi) Address any grievances brought about through the grievance redress mechanism in a timely manner as per the EMP

143. Contractor's responsibilities.

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.

Construction stage:

(i) Obtain all necessary permissions/approvals (labour, pollution control, quarries, right of ways, etc.) prior to start of work
(ii) Mobilize EHS officer prior to start of work
(iii) Prepare and submit:
  a. Construction waste management (CWM) plan
(iv) Implement the mitigation measures as per the EMP including CWM & TM Plans
(v) Conduct environmental monitoring as per the EMP
(vi) Undertake immediate action as suggested by PIU / PMU / PMC to remedy unexpected adverse impacts or ineffective mitigation measures found during the course of implementation
(vii) Submit monthly compliance reports on EMP implementation
(viii) Act promptly on public complaints and grievances related to construction work and redress in a timely manner in coordination with PIU

C. Training Needs

144. The following **Table 11** presents the outline of capacity building program to ensure EMP implementation. The estimated cost is Rs.100,000 (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 11: 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)	All staff and consultants involved	-	Included in the overall program

Description	Target Participants& Venue	Estimate (INR)	Cost and Source of Funds
- ADB Safeguards Policy Statement - Government of India and Rajasthan 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 planning	in the project At PMU, Bhopal (combined program for all subprojects)		cost
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) - AC pipe protocol - Traffic management plan - Waste management plan - Site clean-up & restoration	All PIU staff, contractor staff and consultants involved in Kothri 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

145. 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 supervisor) is mobilized. PMU with the assistance of the PMC will review the report and permit commencement of works.

146. During construction, results from internal monitoring by the contractor will be reflected in their monthly EMP implementation reports to the PIU. ASO will review and advise contractors for corrective actions if necessary. Quarterly report summarizing compliance and corrective measures taken will be prepared by ASO with the assistance of PMC environmental coordinators and submitted to PMU (**Appendix 10**)

147. 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.

148. 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

149. 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 12: Cost Estimates to Implement the EMP

	Particulars	**Stages**	**Unit**	**Total Number**	**Rate (INR)**	**Cost (INR)**	**Costs Covered By**
A.	**Implementation staff**						
1	EHS Supervisor	Construction	per month	18	50,000	900,000	Civil works contract
	Subtotal (A)					**900,000**	
B.	**Mitigation Measures**						
1	Provision for tree cutting & compensatory plantation measures	Construction	Per tree	100	1,000	100,000	Civil works contract
2	Traffic management at work sites	Construction	Lump sum	-	-	50,000	Civil works contract
	Subtotal (B)					**150,000**	
C.	**Monitoring Measures**						
1	Air quality monitoring	Construction	per sample	14	5,000	70,000	Civil works contract
2	Noise levels monitoring	Construction	Per sample	14	1,500	21,000	Civil works contract
3	Surface water monitoring	Construction	Per sample	2	4,000	8,000	Civil works contract
	Subtotal (C)					**99,000**	
D.	**Capacity Building**						
1.	Training on EMP implementation	Pre-construction	lump sum			100,000	PMU
2.	Contractors Orientation to Workers on EMP implementation	Prior to dispatch to worksite	Lump sum			25,000	Civil works contract
	Subtotal (D)					**125,000**	
	Total (A+B+C+D)				**INR**	**1,274,000**	

Contractor Cost	- 1,299,000
PMU Cost	- 100,000
Total	**- 1,199,000**

IX. CONCLUSION AND RECOMMENDATION

150. The process described in this document has assessed the environmental impacts of all elements of the Kothri 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; additional measures are suggested for final design stage of the project; thus, environmental impacts as being due to the project design or location were not significant.

151. There is an important design issue related to selection of groundwater as source. In the absence of any reliable surface water source in the proximity, it is proposed to continue groundwater source for Kothri. However, given the current critical stage of groundwater development, the abstraction should be combined with groundwater augmentation measures, and therefore it is proposed to undertake a detail study and include the recommendation of the study in the project implementation. This study will look into both groundwater sustainability and quality.

152. 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 sewer 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. As a feeder main is proposed on the bank of Kothri stream, there is a risk of water pollution. Appropriate measures are suggested.

153. 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. Regular groundwater monitoring suggested for all tube wells to check the status of groundwater quality.

154. 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.

155. 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.

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

157. A copy of the EMP 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.

158. The project will benefit the general public by contributing to the long-term improvement of water supply and sewerage systems and community livability in Kothri. 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.

159. The proposed project is therefore unlikely to cause significant adverse impacts. As per ADB SPS, the project is classified as environmental category B and does not require further environmental impact assessment. However, a groundwater sustainability plan should be prepared through a detailed groundwater study, and the measures of which are to be incorporated into the project to ensure the project sustainability. This IEE needs to be updated during the project design finalization stage.

APPENDIX 1: STAKEHOLDER CONSULTATIONS

Sl. No.	Date	Participants	Issues Raised
1	22nd Feb. 2016 Kothri Nagar Panchayat Office	Local MLA, Govt. of MP, Chairman and Vice-Chairman of Kothri Nagar Panchayat, Councilors, Chief Municipal Officer, Secretary, Sub-Asst Engineer, Land Surveyor	• The Chairman of the ULB expressed willingness to accept the project; • Operation and maintenance of the facilities developed under the project and community participation; • Probability of keeping the poor and the vulnerable out of the user charge • The existing water supply system is in dilapidated condition and needs refurbishment along with water supply coverage (100 percent). • Land required for the water supply project will be dealt by the ULB and they will handle this with the concerned government departments. • The existing water supply system is in dilapidated condition and needs refurbishment along with water supply coverage (100 percent).
2	22nd Feb. 2016 Kothri Nagar Panchayat Office	Representatives from 8 NGOs	• Project effective for community people of Kothri. Water supply is major issue of concern; • It was reported that lack of water was reported as one of the main restraint for households to build a sanitary toilet and practice hygiene behaviour • Community participation in project implementation to build ownership • Completion of project on time. • NGO involvement in the program implementation
3	23rd Feb. 2016 Bijli Colony, Ward 8, Kothri	Community Members	• The commencement of the project work Commissioning of the project. Scarcity of drinking water in area like Bijli • Quality and quantity of the water to be supplied after completion of the project. • The water is supplied for an hour daily which is inadequate. There are long queues and frequent quarrels over water collection. • The adolescent girls were particularly interested in getting water at the housheold level as it would reduce their workload to a great extent and give them more time for education or recreational activities. • Lack of water was reported as one of the main deterrent for households to build a sanitary toilet and practice hygiene behavior. • The community agreed that it will cooperate and manage temporary discomfort arising due to construction in view of the larger benefits of getting water at the doorstep.

PHOTOGRAPHS

Community Consultation

NGO Meeting

Transect Walk and Site Visit

List of Participants

Participants List

Name of Place (Ward No) 09.

Date : 23.02.16.

Sl. No.	Name of Participants	Contact No.	Signature
01	हेमराज वर्मा सोहागर	८८८३२६९८८८	हेमराज सोहागर
02	राम बाबू	9755643209	रामबाबू
03	श्री लक्ष्मण सिरसे	9630940752	लक्ष्मण
04	भगवत मालाकार	9589832575	
05	महेन्द्र वर्मा	8871120411	[illegible]
06	संजय वर्मा	8982694264	संजय
07	ललित वर्मा		
09	धनपाल राठौर		
10	कमल वर्मा		कमल
11	रचना बाई		
12	कांता बाई		
13	गायत्री बाई		
14	रमप्रभा बाई		
15	रीना		
16	सरजू बाई		

10	Ravindra Malviya	Nav Ankur Asha	8871248184	
11	BHAGWAN SINGH VERMA	SHRI JANSEWA SANKALP SANSTHAN	8461888390 JSSS.vinod@gmail.com	
12	Vinod Badodiya	—11—	9425755929 JSSS.Vi	
13	Hema Meena (Sub engineer)	Nagar Parishad Kotharі	8964986062	Hema
14	N. K. Parsaniya (C.M.O.)	Nagar Parishad Kotharі	9406645822	
15	Manohar Jawariya (	Nagar Parishad Kotharі	9039945742	

APPENDIX 2: 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 – Kothri 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		√	
• Protected Area		√	
• Wetland		√	
• Mangrove		√	
• Estuarine		√	
• Buffer zone of protected area		√	
• Special area for protecting biodiversity		√	
• Bay		√	
B. Potential Environmental Impacts Will the Project cause…			
• Pollution of raw water supply from upstream wastewater discharge from communities, industries, agriculture, and soil erosion runoff?	√		Groundwater contamination is likely from untreated sewage disposal, open defecation.

SCREENING QUESTIONS	Yes	No	REMARKS
• Impairment of historical/cultural monuments/areas and loss/damage to these sites?		√	
• Hazard of land subsidence caused by excessive ground water pumping?		√	Groundwater management measures suggested to avoid over exploitation of resources
• Social conflicts arising from displacement of communities?		√	Project does not involve land acquisition /displacement. No social conflicts envisaged
• Conflicts in abstraction of raw water for water supply with other beneficial water uses for surface and ground waters?		√	N
• 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. Nitrate pollution is observed but within the prescribed limits. Bacteriological contamination is noticed, and water will be subjected for treatment prior to supply
• Delivery of unsafe water to distribution system?		√	Water will be disinfected prior to supply
• Inadequate protection of intake works or wells, leading to pollution of water supply?		√	
• Over pumping of ground water, leading to salinization and ground subsidence?		√	Groundwater management measures suggested to avoid over exploitation of resources
• Excessive algal growth in storage reservoir?		√	Regular cleaning of storage tanks will be conducted during operation
• Increase in production of sewage beyond capabilities of community facilities?	√		Sewerage system is also being planned for project towns under the MPUSIP
• Inadequate disposal of sludge from water treatment plants?		√	Appropriate provisions for sludge drying and disposal is included in the project
• Inadequate buffer zone around pumping and treatment plants to alleviate noise and other possible nuisances and protect facilities?		√	-
• Impairments associated with transmission lines and access roads?		√	-
• Health hazards arising from inadequate design of facilities for receiving, storing, and handling of chlorine and other hazardous chemicals.		√	
• Health and safety hazards to workers from the management of chlorine used for disinfection and other contaminants?		√	Measures for safe handling of chlorine are included
• 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

SCREENING QUESTIONS	Yes	No	REMARKS
• 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 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?		√	
• Excessive abstraction of water affecting downstream water users?		√	
• Competing uses of water?		√	
• 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?	√		
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)?	√		Groundwater yield is directly linked to annual rainfall. Study area is also susceptible to erratic rainfall and extreme weather conditions. Therefore groundwater management measures and more efficient use of water by reducing losses and wastage to counter increased demands due to higher temperatures are included in the project
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 3: 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) $\mu g/m^3$	Annual 24 hours	50 80	20 80	Improved West and Geake-Ultraviolet fluorescence
2	Nitrogen Dioxide (NO_2) $\mu g/m^3$	Annual 24 hours	40 80	30 80	Modified Jacob &Hochheiser (Na-Arsenite) Chemiluminescence
3	Particulate Matter (Size less than 10 µm) or PM10 $\mu g/m^3$	Annual 24 hours	60 100	60 100	Gravimetric -TOEM -Beta attenuation
4	Particulate Matter (Size less than 2.5 µm) or PM2.5 $\mu g/m^3$	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 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: VEHICLE EXHAUST EMISSION NORMS

1. Passenger Cars

Norms	CO(g/km)	HC+ NOx(g/km)
1991Norms	14.3-27.1	2.0(Only HC)
1996 Norms	8.68-12.40	3.00-4.36
1998Norms	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)	NOx (g/kmhr)	PM(g/kmhr)
1991Norms	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 Monixide; g/kmhr = grams per kilometer-hour; HC = Hydrocarbons; NOx = oxides of nitrogen; PM = Particulates Matter

APPENDIX 6: 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 after the mucous membrane and/or water supply system	No relaxation	-
6.	Total Hardness (mg/L) CaCO3	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 dis coloration and corrosion of pipes fittings and utensils	1.5	-

No.	Substance or characteristic	Requirement Desirable limit	Undesirable effect outside the desirable	Permissible limit in the absence of alternate Source	Remarks
			will be caused beyond this.		
14.	Manganese (mg/L, Mn) Max	0.1	Beyond this limit taste/appearance are affected, has advers effect on domestic use and water supply structure	0.3	-
15.	Sulphate (mg/L, SO4) 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, NO3) Max.	45	Beyond this methaemoglobinemia takes place.	-	-
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 C6H5OH) 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, Cr6+	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,)	200	Beyond this limit, taste	600	-

No.	Substance or characteristic	Requirement Desirable limit	Undesirable effect outside the desirable	Permissible limit in the absence of alternate Source	Remarks
	Max		becomes unpleasant		
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 7: 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 8: 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 9: 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

No.	Sub-Project Name	Status of Sub-Project				List of Works	Progress of Works
		Design	Pre-Construction	Construction	Operational Phase		
		☐	☐	☐	☐		
		☐	☐	☐	☐		
		☐	☐	☐	☐		

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

(i) Provide the monitoring results as per the parameters outlined in the EMP. Append supporting documents where applicable, including Environmental Site Inspection Reports.

(ii) 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 µg/m^3	SO_2 µg/m^3	NO_2 µg/m^3

Site No.	Date of Testing	Site Location	Parameters (Monitoring Results)		
			PM10 µg/m^3	SO_2 µg/m^3	NO_2 µg/m^3

Water Quality Results

Site No.	Date of Sampling	Site Location	Parameters (Government Standards)					
			pH	Conductivity µS/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 µS/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

APPENDIX 10: 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	
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 **Name**
Position **Position**

APPENDIX 11: 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?					

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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:	